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BUSINESS SCALE IN RELATION TO ECONOMICS

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Business Scale in Relation to Economics**

Publication is not a subject of language check.

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Czech University of Life Sciences Prague, Faculty of Economics and Management

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FOREWORD

The international scientific conference Agrarian Perspectives, organized by the Faculty of Economics and Management, Czech University of Life Sciences Prague has a long tradition that began in 1992. Since that time, the conference has become a popular platform for scientists and experts from all around the world to share their experiences.

The 28th annual Agrarian Perspectives conference was held on the 18th and 19th of September 2019 and was focused on the topic of "Business Scale in Relation to Economics". The conference followed last year's successful format with an opening plenary panel discussion. Leading experts and authorities accepted the invitation to join a fruitful and inspirational discussion.

Today, agriculture is a sector where economic perspectives meet environmental and social requirements to ensure the sustainability of farming and thus the question of small-scale and large-scale production can be perceived from different viewpoints.

The participants had the unique possibility to get a deeper insight into ~~such~~ controversial topics under the moderation of the experienced Milena Vicenová. A wide scope of viewpoints and different perspectives were guaranteed by Josef Bernard, President of the Pilsen Region, Tomáš Doucha, researcher with a focus on agrarian sector economics and agricultural policy, Anna Michalčáková, EU legislation analyst, Jan Miller, farmer, Farm Miller, Martin Pýcha, chairman of the Agricultural Association of the Czech Republic, Pavel Sekáč, deputy for Management Section for EU Funds, Science, Research and Education, Czech Ministry of Agriculture, Miroslav Zámečník, economist and publicist and Jiří Zelenka, member of the Agrarian Chamber of the Czech Republic and chairman of the board ZD Krásná Hora nad Vltavou.

Following parallel paper sessions enabled to share own experience and research results to all participants. In addition, the participants had the opportunity to enjoy a guided tour in the city centre of Prague as well as a visit to the Miller Farm, a modern family farm right outside of campus.

I would like to express my strong belief that the 28th annual Agrarian Perspectives conference created an inspirational framework for all of the participants and contributed to the further development of the research area.

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THE IMPACT OF MACROECONOMIC VARIABLES ON THE INFLOWS OF FDI IN THE LEAST DEVELOPED WEST AFRICAN COUNTRIES

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Annotation: Regardless of its plentiful normal assets, Sub-Saharan Africa is ordinarily seen as a brutal and dangerous spot to do business. However, the mainland whose majority of the general population is caught in destitution is in urgent need of investment to touch off monetary development to decrease poverty. Least developed West African nations specifically have been getting one of the world's most astounding FDI inflows in respect to GDP; in any case, these nations have a fairly little financial development in spite of such high FDI inflows in the course of the most recent 25 years. FDI plays the crucial roles of supporting development, bridging the interchange gap and filling government revenue gaps. This paper aims to examine the linkages between Foreign Direct Investment (FDI), inflation, exchange rate and financial development in the least develop West Africa economies. The study used secondary data from 195 observations of the thirteen (13) least developed countries from this region between the period of 2000 to 2014 and employed panel data regression models to estimate the observed relationships. The study results show that inflation, exchange rate, financial sector development and market size have a negative and a statistical significant relationship with FDI. Infrastructure development on the other hand had a positive and significant relationship with FDI. The study recommended the reduction of money supply within an economy by increasing interest rate and decreasing bond prices. Also, policy makers in these countries should follow the exchange rate and macroeconomic stability sectors of the economy which will boost the attraction of investors. Governments of these nations should manipulate interest rates which will impact on inflation and exchange rates. Countries should also resist from high public debts.

Key words: FDI, inflation, exchange rate and financial development, panel data,

JEL classification: B22, C23, F60, F62, F63

1. Introduction

IMF defines FDI as the purchase of a minimum of common fraction of the standard shares or balloting power in a public or non-public enterprise by nonresident investors (International Monetary Fund [IMF], 2008). FDI is primarily based on a nursing investment by a company or organization in a country (Barro & Lee, 2001). Foreign direct investment plays an important role in supporting development, bridging the point of intersection, inclusion in investment sectors and filling the government's revenue gaps. It also helps to increase domestic savings, create jobs and transfer modern technologies (Filippov & Costa, 2007). Overall, developing countries strive for economic growth despite the confrontation of many political, economic, educational and socio-geographical barriers. However, in the last twenty (25) years, Foreign Direct Investment (FDI) has become the dominant financial instrument increase economic growth in developing countries (Feeny et. al, 2014). Main recipient for foreign direct investment inflows despite other regions such as Carribean, Latin Americans and Asia, have been least developed nations in Africa (Choe, 2003). African countries increased in FDI in 2013 from developed countries (UNCTAD, 2015). Besides, the inflow of FDI into least developed nations has been generally relying upon the world economy appearing decreased in FDI inflows towards developing nations from 2008-2012 due to the economic crises in 2008 and an expansion in FDI inflows in 2013 because of recuperating world markets (International Monetary Fund [IMF], 2008). Despite the increase in foreign direct investments in developing countries in recent years, there are reasons behind these ups and downs and what will foreign investors check out before creating investment includes elections, legal risk, political risk, risk of macroeconomic variables. Huge writing has taken a gander at the determinants of FDI and the effect of FDI on development. Be that as it may, little consideration has been paid to Africa where the issue of development is exceptionally squeezing given the across the board neediness. This study seeks to examine the linkages that these macroeconomic factors; inflation, exchange rate, financial sector development impact on the inflows of FDI into the least develop West Africa nations. The Materials and Methods section of this paper describes how the secondary research was conducted as well as the model specification. Results and Discussion section presents the results obtained and discussion and comparison of the final results of own research with similar studies in the context of the issue are conducted.

2. Materials and Methods

The theoretical background of this paper was based on an analysis of secondary sources gained from scholarly papers, specialized literature, and official web portals. Africa consists of 54 countries which has been divided into 5 main regions: namely northern Africa, western Africa, eastern Africa, central Africa and southern Africa. 34 of them are on the United Nations list of least developed countries (LDCs) UNCTAD (2015). That is, nations that exhibits the lowest indicators of socioeconomic development, with the lowest Human Development Index ratings of all countries in the world. These 34 countries spreads across all the 5 regions of Africa with sub-Sahara Africa representing 33 countries out of the 34.West Africa then recorded 13 countries out of the 33 in sub-Sahara Africa, making it the region with the largest share of least develop countries in the world UNCTAD (2015). Focus on the improvement of this region through FDI and also to access the impacts of some macroeconomic factors on the effectiveness of FDI in the region. The study concentrated on the thirteen (13) least developed countries from this region namely; The Republic of Benin, Burkina Faso, Mali, Togo, Mauritania, Senegal, Sao Tome and Principal, The Gambia, Guinea, Guinea-Bissau, Niger, Liberia and Sierra Leone with the exclusion of Ghana, Nigeria, Cape Verde Island and the Ivory Coast. This study made use of 195 observations from 13 countries between the periods of 2000 to 2014 using panel data analysis. For this, in this research three different panel unit root tests had been applied, LLC, IPS and Fished ADF, to confirm the findings about the data nature.

As a fundamental inquiry, before utilizing any data series, the stationary issue ought to be addressed. So as to examine the determinants of Foreign Direct Investment (FDI) for the least grown West African nations, the present research is led utilizing panel data investigation which is viewed as a ground-breaking research system that can be utilized to quantify the impact of any factors of enthusiasm over some stretch of (time-arrangement) and crosswise over nations (cross-sectional Panel) data approach is utilized to decrease the time-shifting and multicollinearity among endogenous and exogenous factors. After verifying the Heterogeneity of panel time series, as follow:

$YYit = \varphi i + x'it\beta i + \varepsilon it$, i=1,…,,

Where, assumed that $\varepsilon i \sim II$D (0,2ε,). In order to pool the data or not depends on whether the data could be imposed on the homogeneity of slope coefficients; if $\beta i = \beta$ and $\sigma\varepsilon$ 2,= $\sigma\varepsilon$ 2 for all i, upon assuming εit and φi are independent across units. In this way, the model diminishes to the fixed or random effects model. So as to decide the model detail, the fixed effects model ought to beat the pooled OLS by utilizing F-test and Pagan Lagrange multiplier (LM) test to decide the irregular impact model*52/8.7 outflanking the pooled OLS. Hausman test is utilized to differentiate the random effects model compare with fixed effects model. For diagnostic purposes by applying Baltag LM-test for autocorrelation and Erlat LM-test for heteroskedasticity.

We used the Hausman test to compare the fixed effect with the random effect panel. To examine the linkages between macroeconomics factors and the inflows of Foreign Direct Investment (FDI) of least grown West African nations, the accompanying model was assessed:

$$FDIit = \beta0 + \beta1INFit + \beta2\ln(ER)it\text{-}1 + \beta3FSDit + \beta4MKTSZit + \beta5INFRit\text{-}1 + \varepsilon it \qquad (1)$$

Where: FDIit : Foreign Direct investment (FDI net inflows (% of GDP), INFit :Inflation (Consumer Price index), ln(ER)it: Exchange rate (The Official Exchange Rate (LCU per US$, period average), FSDit : Financial Sector Development (Domestic credit to private sector (%of GDP),MKTSZit: Market size (Annual Domestic Product)INFR: Infrastructure Development (Electric power consumption (kWh per capital))εit:Random error

3. Results and Discussion

The results shown in Table 1 show that all the variables of interest are not stationary at the level while documenting that they are stationary in the first difference I (1).

Table 1. Panel Unit-Root Test Results

Panel A: Level

VARIABLES	K	FISHER ADF		LLC		IPS	
		A	B	A	B	A	B
FDI	2	-1.513	-1.041	1.166	1.994	-1.878**	-1.751**
INF	3	-1.432	0.447	2.754	11.247	-1.668	-0.246
ER	2	2.344	3.288	2.690	3.188	5.725	1.377
FS	4	3.747	-0.373	1.540	-1.449	2.056	-1.245
MKTS	2	0.083	-1.224	-0.372	-2.040	-0.317	-1.825
INFR	3	-0.549	0.208	-0.154	0.199	-0.887	-0.249
Panel B: First Difference							
FDI	2	-6.248***	-4.442***	-1.383**	0.773**	-7.153***	-5.532***
INF	3	-4.218***	-1.950**	13.908**	17.532**	-4.023***	-1.910***
ER	2	1.594***	-0.356***	6.531**	12.086**	0.382***	-1.089***
FS	4	-0.298***	4.422***	-0.097**	11.548**	-1.028***	1.925***
MKTS	2	-3.469***	-1.905***	-0.758**	0.854**	-3.576***	-2.264***
INFR	3	-4.152***	-3.312	-3.425**	-3.742**	-4.289**	-3.659***

*** and ***, denotes the stationary of the variables at 5% and 1% respectively based on test critical values. K: is the lag length, it is been determined via applying general to specific method. Column A: Intercept, column B: Intercept and Trend. (Source: Authors' Estimations)*

Below are the interpretations of the results of the model based on table 2 results. The effects of both exchanges. The volatility of the rate and the uncertainty of the inflation rate on FDI in the LDCs are negative. The factually huge negative coefficient of the unpredictability of the exchange rate isn't astounding. This is on the grounds that the exchange rate is a cost and along these lines its developments influence task of assets in the economy. Along these lines, when the exchange rate is exceptionally unpredictable and unsure, similar to the case in the LDCs, blocks the progression of exchanges and the development of money related resources of merchandise and enterprises. Obviously, this result points out the fact that the stability of the exchange rate is fundamental for the flow of foreign capital to these less developed countries in West Africa supporting earlier research of Udoh & Egwaikhide (2010). In addition, the volatility of inflation negatively affects FDI, it is statistically significant at 5 percent level. A direct import of this is that the macroeconomic expansion. The policy that raises the inflation rate will discourage FDI in the West African LDCs. This is consistent with Sumner (2005) who found in his fixed effect regression, using 42 SSA countries.

The outcomes demonstrate that the impact of the improvement of the financial sector driven by the inward credit to the economy is negative. This is as per the aftereffects of different studies dependent on the proposition of capital lack. This recommendation is worked around the customary thought that lacking internal capital because of low investment funds. The limit of less developed nations is the principle explanation behind foreign capital streams. On the off chance that the financial sector division is created and can assemble adequate assets of the household economy and after that local capital would turn into a substitute for the foreign capital. The outcomes in Table 2 additionally demonstrate that foreign financial investors care less about the condition of the market size in the host economies. Household markets are adversely identified with foreign venture and measurably irrelevant even at an essentialness dimension of 9%. The impact of market development. The rate of the economy in the FDI stream is negative and inconsequential, which fortifies the way that expanding the rate of economic development in the nation would not really fill in as a motivating force for FDI entry. These findings support Apergis et al.'s (2008) argument that the inflows of FDI into countries does not depend on the extent to which it complements or substitutes domestic investment. The infrastructure development variable is emphatically identified with foreign direct investment and measurably noteworthy even at an importance dimension of 1%. The impact of infrastructure development rate of the economy in the progression of FDI is sure and noteworthy, which strengthens the way that the expansion in the rate of financial development in the nation would fill in as an impetus for FDI inflows. This is consistent with earlier research of Udoh & Egwaikhide (2010).

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Table 2. The GDP Growth Estimation Results, Panel with Fixed Effect

Independent Variables	Coefficients
$Log(FDI)_{it-1}$	0.505436*** (0.180729)
INF_{it}	-0.14412 (-2.51717)
ER_{it-1}	-0.01082*** (-2.5009)
FS_{it}	-0.09083*** (-0.56862)
$MKTS_{it}$	-0.09623* (-2.5009)
$INFR_{it-1}$	0.50465*** (4.07134)

Intercept	31.13485*** (12.28099)
S.E of country Fixed Effect	4.273157
R-squared	0.85352
Adjusted R-squared	0.75291
F-statistic Prob(F-statistic)	8.75756 0.00000
Durbin-Watson	1.691025
Hausman test Random Effect	x^2=45.774077 P-value 0.0000***
Total panel observation	**195**
Diagnostic test	
Autocorrelations: Baltagi LM-test	x^2=0.629139 P-value 0.427617
Heteroscedasticity: Erlat LM-test	x^2=1.274867 P-value 0.198802

, ** and * denotes significant level at 10%, 5% and 1% respectively. Standard errors are in parentheses.* ***Note****: the Null hypotheses of residuals tests are that the residuals don't display any Serial correlation, and are homoscedastic. (Source: Authors' Estimations)*

4. Conclusion

In as much as the sample West African countries are highly in need of the FDI, the impact of their macroeconomic variables on the inflows of FDI makes it inseparable. The estimated model took into consideration:

In the first place, the discoveries demonstrate that inflation and exchange rates indicated high instability. Instability Inflation and exchange rates expanded the vulnerability and the component of risk that may be encountered by foreign financial specialists and, in this way, adversely influenced foreign investment in the less developed nations in West Africa. This recommends strategies that economies in these nations ought to pursue the conversion standard and macroeconomic steadiness. Second, the investigation likewise demonstrated that the dedication of policy makers towards the inward strategies would improve the acquiring intensity of residents are inescapable. The different neediness decrease techniques must be appropriately figured out how to build the dimension of per capita income since it would pull in foreign investments as well as would prompt more prominent development and advancement in these less developed countries. Global aggressiveness as appeared in this examination is a significant impetus for the section of foreign direct investment. Additionally, current endeavors in the financial exercises of advancement and deregulation must be heightened. Alert should likewise be practiced in the process to guarantee that the deregulation projects does not disintegrate genuine income and strengthens the vulnerability of the inflation rate. So also, the support of the administration in financial exercises, especially underway of private products ought to be debilitated. Wasteful state organizations which speak to a generous extent of government consumptions be privatized or marketed. These, notwithstanding, must be aggrieved with straightforwardness and more prominent responsibility. It ought not to be viewed as a chance to further develop the imbalance in a nation that is more extravagant in more extravagant and more unfortunate masses.

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THE ATTRIBUTE OF LOCAL PRODUCTS IN THE CONTEXT OF REAL KNOWLEDGE OF PURCHASED PRODUCTS

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Annotation: Farmers' markets prevail the most used channel for small farmers to get their products directly to customers. Who seek there mainly healthy, organic and local products with the additional value of direct contact with the farmer. Being local is thus a very useful element of the product in the field of marketing communication. The paper is aimed at two basic aspects gained through a questionnaire survey: defining the product locality from the customer's point of view and the real knowledge of the origin of purchased products. The results based on a case study in Czech Republic (Prague) identify the distance to the place of origin up to 48.2km as a limit for the customer to perceive the product as local. Furthermore, the survey identified that although the locality of the product is very important for customers, the average of 72.4% of customers did not know where the product they had already purchased was produced. Thus, the results suggest that people either believe in the localization of individual products as they are sold at the farmers' markets or trust the communication about the locality of the products. An important aspect for further research is to define the locality from the customer's point of view as a distances between the point of production and sales, and then to define the policy on farmers' markets in terms of local products labelling.

Key words: Marketing communication, Local food, Local Product, Locality, Agricultural Producers, Farmer, Farmer´s market

JEL classification: M31 Marketing, Q13 Agricultural Markets and Marketing / Cooperatives / Agribusiness

1. Introduction

For agricultural producers, Short Food Supply Chain is an ideal channel to get the production to the customer as fast as it gets. Therefore Alternative Food Chains that are built on values such as local, fresh, organic and quality food and help build relationships based on mutual trust between farmers and their customers are sought-after (Motlagh et al., 2015; Pilař et al., 2018; Connell, Smithers and Joseph, 2008; Padel and Foster, 2005; Cameron and de Vries, 2006). It is a channel that large and multinational enterprises do not use. Previous studies also stated, that farmers have been already changing their business strategies as a crucial step in the competition with large producers (Hyblova 2014). These changes are moving also with the rural economic development (Motlagh et al., 2015) as the development of such chains means a large support for local food producers (Migliore, Schifani, and Cembalo, 2015; Pilař et al., 2017; Lanfranchi and Giannetto, 2014; D'Amico et al. 2014). Nowadays it is not surprising, that next to the traditional supply chain through intermediaries, farmers use alternative food chain to meet the customer directly, which mostly takes place at the farmers' markets (Cleveland, Carruth, and Mazaroli, 2014; Venn et al., 2006; by Renting, Marshall and Banks, 2003).

The locality and the local characteristic of the food product is, according to research, very important key factor in the perception of the value of goods purchased on the farmer's market (Coelho, Coelho and Egerer, 2018; Martinez et al., 2010; Sonnino, 2007; Marsden, Banks and Bristow, 2000). Currently, to buy local is one of the consumption trend (Coelho, Coelho and Egerer, 2018; DUHA, 2015; Rojík et al., 2017) which can help small farmers and food producers to cope with the hard competition of large-scale enterprises. As it was already broad discussed, this trend leads to the increase of the popularity of farmers' markets (Šánová, Svobodová, and Laputková, 2017). Customers are sensitive to the quality of the products and they consider as well as the origin of the food, freshness and healthiness as a part of quality characteristics (Miškolci, 2017). As it is stated by authors, for many consumers, the term "local" illustrates the environmentally friendly products that has better characteristics (e.g. freshness, taste and nutrition) than the products bought through conventional chains (Coelho, Coelho and Egerer, 2018; Margarisova et al., 2018).

Local product definition has not been unified yet throughout the research field. There are many different definitions mostly based on the geographical basis (Balcarová et al., 2018; Margarisová et al., 2018, Salazar-Ordóñez,Cordón-Pedregosa and Rodríguez-Entrena, 2018; Coelho, Coelho and Egerer, 2018). The definition base differs and authors perceived it confusing (Bond et al., 2008, Salazar-Ordóñez,Cordón-Pedregosa and Rodríguez-Entrena, 2018, Šánová, Svobodová, and Laputková, 2017). In most cases the localness is define by the physical proximity or geographical location (Salazar-Ordóñez,Cordón-Pedregosa and Rodríguez-Entrena, 2018; Coelho, Coelho and Egerer, 2018; Darby et al., 2008). In contrast, other definitions are based on the indirect characteristics such as authentic, handmade, and typical foods (Dentoni et al., 2009; Giovannucci, Barham, and Pirog, 2010; Groves, 2001).

As it is stated by Salazar-Ordóñez,Cordón-Pedregosa and Rodríguez-Entrena (2018) the current movement of local food is not just a trend in buyers behaviour matched to the society lifestyle but as well: "collaborative effort to build a more local based economy, self-sufficient in food. Sustainable food production, processing, distribution and consumption are integrated to improve the economy, environment and society of a particular place" (Salazar-Ordóñez, Cordón-Pedregosa and Rodríguez-Entrena, 2018; Feenstra, 2002). Local food movements and also tools initiated by the state government such as broad marketing campaign aimed at supporting local producers are being held in the Czech Republic as well (DUHA, 2015). With the local food movements consumers are being encouraged to support local producers and farmers (Motlagh et al., 2015) and as well to consume healthy seasonally- and geographically-appropriate food directly bought from local entrepreneurs (McIntyre and Rondeau, 2011; Kingsolver, Hopp, and Kingsolver, 2007). These incentives to keep ethical shopping and eating are meant to be win win solutions when consumers can help to save the environment and at the same time to consume tasty seasonal fresh local food (McIntyre and Rondeau, 2011; Blue, 2009; Connell, Smithers and Joseph, 2008; Holloway and Kneafsey, 2000).

The aim of the paper is derived from the broad usage of the attribute "local" especially when purchasing at the farmer's market. The paper is aimed at the comparison of how consumers perceive the locality of products bought at the farmer's market with the actual knowledge of the origin of the purchased food.

2. Materials and Methods

The research results are processed on the basis of a questionnaire survey in the farmers' market of 137 customers. Customers were first asked questions about gender, age and education. Subsequently, questions were placed and then measured by means of a 5-point increasing Likert scale in order to identify the customer's perception of local products. The last step was to analyse the origin of individual products that the customer had already purchased on the farmer's market.

3. Results and Discussion

The results indicate that there is no correlation between how much the customer perceives the importance of product locality and the knowledge of the origin of the products he has bought on the farmer's market. Customers consider products to be local within 50 km of sales (48.97 km in diameter) see table 1.

Table 1. Cut-off distance for product localization from the customer's point of view

N	Valid	137
	Missing	0
Mean		48.9708
Median		40.0000
Std. Deviation		33.95043
Variance		1152.631
Minimum		10.00
Maximum		200.00

Source: Own calculation, 2019

From the results it is possible to identify that the product locality is very important for customers. On the question: how important is it for you to support local products, customers have responded based on an arithmetic average of 1-5 o**n the 3.8 (**1 - least important, 5 - most important) rating see table 2.

Table 2. The importance of supporting local manufacturers from the perspective of customers

N	Valid	137
	Missing	0
Mean		3.8686
Median		4
Std. Deviation		1.41846
Variance		2.012
Minimum		1.00
Maximum		5.00

Source: Own calculation, 2019

On the question of whether the products on the farmer's market are chosen according to the production distance from the point of sale, they answered an ave**rage of 3.51 see table 3.**

Table 3. The importance of product locality on the farmer's market when choosing a product

N	Valid	137
	Missing	0
Mean		3.5109
Median		4.0000
Std. Deviation		1.60476
Variance		2.575
Minimum		1.00
Maximum		5.00

Source: Own calculation, 2019

Further question was focused on the origin of the products. By the products that customers had purchased on the farmer's market the day of the survey, they did not know the answer on average 72.4 % of the products.

On the basis of these results, it can be identified that in general, locality is considered as an important element on the farmer's market. Coelho, Coelho and Egerer (2018) stated that customers often consider the local food products as environmentally friendly and they consider to be those that are certainly from local farms. As the previous researches stated, consumers are changing the perception and consumption practices and they are trying to be environmentally aware (Verain, Dagevos, and Antonides, 2015; Annunziata and Scarpato 2014). However, there is no guarantee that the farm does not use industrial farming methods (Coelho, Coelho and Egerer, 2018) but at the same time customers have no real knowledge of the distance between product production and the point of purchase they have bought on the farmer's market. This may be due to either a tendency to respond responsibly to the questionnaire survey, or to the confidence that local products are sold on the farmer's market. This implies a research question for further qualitative research.

By the shopping at alternative food chains such as farmer´s market consumers demonstrate they are willing to support local community and production through the purchase of the fresh and tasty food, but also their normative position of willingness to support local production and community (Calisti, Proietti, and Marchini, 2019; Miškolci, 2017). In previous studies, authors evaluated, that consumers value 'local' attribute high (Printezis, Grebitus, and Hirsch, 2019; James, Rickard and Rossman, 2009). Even the results of the research show that Czech customers are aimed at the local purchase, according to DUHA (2015) we are one of the weakest countries within Europe with the results of the local production purchases.

4. Conclusion

The results indicate that there is no correlation between how much the customer perceives the importance of product locality and the knowledge of the origin of the products he has bought on the farmer's market. Customers consider products to be local within 50 km of sales (48.2 km in diameter). From the results it is possible to identify that the product locality is very important for customers. On the question: how important is it for you to support local products, customers have responded based on an arithmetic average of 1-5 on the 4.2 (1 - least important, 5 - most important) rating. On the question of whether the products on the farmer's market are chosen according to the production distance from the point of sale, they answered an average of 4.1. Further question was focused on the origin of the products. By the products that customers had purchased on the farmer's market the day of the survey, they did not know the answer on average 72.4% of the products.

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EMPLOYMENT IN ENTERPRISES OF DIFFERENT SIZE IN RURAL RUSSIA: SOCIO - DEMOGRAPHIC FEATURES

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Annotation: The structure and characteristics of rural employment in enterprises of different sizes determined by the structure of the rural economy that forms the demand for labor, as well as by the number of able-bodied rural population, which forms supply in the labor market, by the level of education, professional structure and system of labor preferences of people. The purpose of the study is to conduct a comparative analysis of the demographic characteristics of employment and assess the social well-being of the rural population working in large, medium, small and micro-enterprises.

Data and methods: The information base of the study consists of the results of the 26th wave of the Russian Monitoring of the Economic Situation and Public Health of the National Research University Higher School of Economics. The sample formed in accordance with the objectives of the study of 2,686 people who had paid employment at the time of the survey. Of these, 2,266 (84.4%) live in the city, 420 (15.6%) – in rural areas. It is important to note that the sample is representative of the Russian population by age and sex structure, gender composition and spatial criterion in the context of individuals. The distribution of the respondents's answers taken from STATISTICA 10.0 software package.

Results: In rural areas, the majority of respondents (81.5%) work at micro- and small enterprises (employing up to 100 people) and significantly less at medium (7.5%) and large (11.0%) enterprises. Gender asymmetry in the structure of rural employment revealed: more women than men work at micro- and small enterprises (70.4 and 59.3%), while at large ones the number of working men is larger (63.8%). Young people strive to work at large enterprises. The degree of job satisfaction increases with the size of the enterprise: from 64.8% at micro-enterprises to 70.2% at large ones. Workers of medium and large enterprises are satisfied with their financial situation in 12.5% and 12.8% of cases, while workers of micro-enterprise in 11.3% of cases, respectively.

Conclusions: Micro- and small enterprises are typical for Russian rural areas. Large enterprises are more the exception. Rural women more often prefer to work at micro- and small enterprises, while men prefer to work at medium and large enterprises. The greatest anxiety and dissatisfaction with both work and life in general is characteristic of micro-enterprise workers.

Keywords: rural areas, employment, structure, enterprises size, Russia

JEL classification: J21, J28, J63

1. Introduction

One of the important goals of state policy is to provide employment, improve the level and quality of life of the rural population, taking into account modern requirements and standards, as well as creating additional high-tech jobs in agricultural organizations in rural areas (Yanbykh, 2015). The structure and characteristics of rural employment in enterprises of different sizes determined by the prevailing structure of the rural economy forms the demand for labor. On the other hand, the number of able-bodied rural population forms supply in the labor market by the level of education, professional structure and system of labor preferences of people. In the rural areas of Russia, there are located enterprises of different size, including large, medium, small, and microenterprises, which differ in working conditions, career growth opportunities, and wages of employees. Branches of urban companies in small towns and rural areas most often represent large enterprises. These are often agricultural holdings, enterprises of various industries, and construction. Medium-sized enterprises are engaged in agricultural production, trade and consumer services, there are companies in the light and food industries.

Small-sized enterprises, as a rule, represented by budget organizations in the education, health care and culture with state or municipal ownership. In addition, employees of small-sized privately owned enterprises are engaged in the production of agricultural products, construction, and the provision of transportation services. Most rural microenterprises provide services in the field of trade, transport, consumer services, and produce agricultural products.

Technological modernization contributed to reducing the share of people employed in agriculture and to increasing the importance of non-agricultural business in providing employment to the rural population. Research results show a positive dependence of income growth on the increase in non-agricultural employment in rural areas (Winters et al., 2010). Along with the introduction of new technologies, the requirements for the quality of the labor are increasing. In rural areas, there is a shortage of skilled workers, which hampers the development of the agro-food complex and rural areas of Russia. Workers with a high level of education and qualification have higher requirements for working conditions, career opportunities, and wage levels. It is important to know and take into account the peculiarities of the social well-being of different socio-demographic groups in rural population for effective use the labor potential of the village.

The purpose of the study is to conduct a comparative analysis of the demographic characteristics of employment and assess the social well-being of the rural population working in large, medium, small and microenterprises. The main objectives of the study are to assess the socio-demographic and occupational differences of employment; to analyze main concerns and the degree of job satisfaction of people employed in enterprises of different sizes.

2. Materials and Methods

The information base of the study consists of the results of the 26th wave of the Russian Monitoring of the Economic Situation and Public Health of the National Research University Higher School of Economics. The sample formed in accordance with the objectives of the study of 2,686 people who had paid employment at the time of the sur-vey. Of these, 2,266 (84.4%) live in the city, 420 (15.6%) – in rural areas. It is important to note that the sample is representative of the Russian population by age and sex structure, gender composition and spatial criterion in the context of individuals. The distribution of the respondents' answers taken from STATISTICA 10.0 software package.

The object of the research is the working rural population living in settlements with up to 2000 inhabitants. The main criterion for identifying the size of enterprises is the number of employees and business income (Table 1).

Table 1. Enterprise Size Identification Criteria (Federal Law, 2007)

Criterion	**Large-sized enterprise**	**Medium-sized enterprise**	**Small-sized enterprise**	**Microenterprise**
Income	>2 billion rubles	2 billion rubles	800 million rubles	120 million rubles
Staff number	>250 people	101–250 people	100-15 people	15 people and less

The size of the enterprise was determined based on an analysis of the answers to the question "How many people work at your enterprise? If you do not know for sure, tell about". The grouping of organizations, in which respondents work, was carried out through the construction of an interval scale: up to 15 people (microenterprises); 16–100 people (small-sized); 101–250 people (medium-sized); more than 250 people (large-sized enterprises). Further were studied social, demographic and vocational characteristics of employees, informal practices and social well-being of employees. The anxieties and expectations of working villagers, as well as the degree of satisfaction with various aspects of work and life were considered depending on the size of the enterprise.

3. Results

3.1. Social and demographic characteristics of employment

In rural areas, the majority of respondents work in micro- and small-sized enterprises (81.5%) and a much smaller number in large (11.0%) and medium-sized (7.5%) enterprises. There is a gender asymmetry in the employment structure, when micro-and small enterprises employ much more women than men (70.4 and 59.3%, respectively), while large-sized enterprises often employ men - 63.8% (Figure 1).

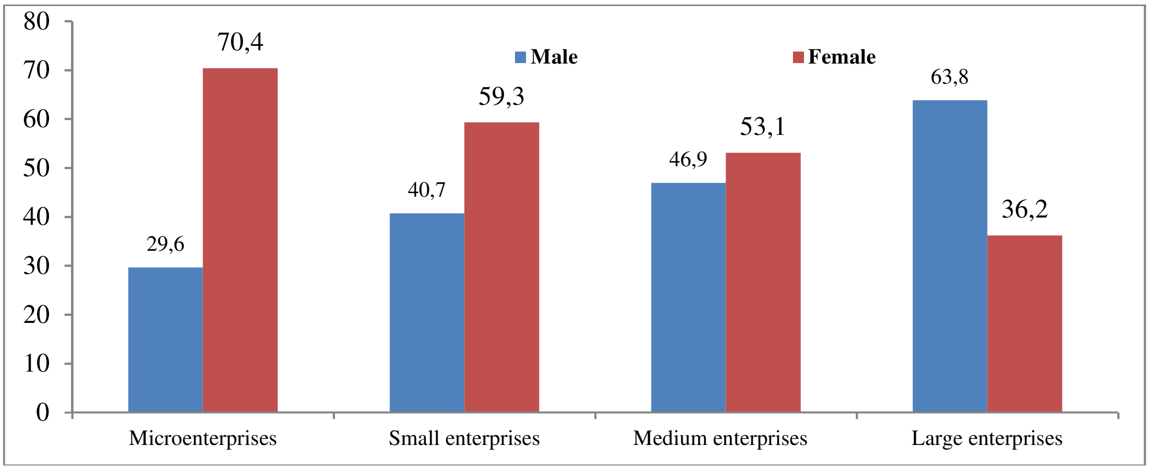

Figure 1. The gender structure of employees in enterprises of different sizes

The average age of people employed in rural areas decreases as the size of the enterprise increases. If the average age of employees of large-sized enterprises is 40.7 years, then in microenterprises it is 45 years (for small-sized ones 44.8 years, for medium ones - 43.5 years). Young people aged 16-30 prefer to work in large-sized enterprises (19.1% compared with 11.6% in small-sized ones). It explained by the desire to have stable and protected employment (Blinova and Vyalshina, 2016). At the same time, 50.0% of workers aged 31-45 years employed in medium-sized enterprises, and 41.5% of employees aged 46-60 years old – in microenterprises.

3.2. Level of education and vocational structure

Working rural residents have a lower level of education in comparison with citizens. In the structure of rural employment, the proportion of people without vocational education is higher. In the large-sized enterprises, the proportion of people with a profession and not having it is approximately equal. The share of employees of medium-sized enterprises with higher education is 25.0% of the employed, with secondary vocational education - 37.5%, with secondary general education - 31.3%, and with the secondary incomplete education - 6.3%. In small-sized enterprises, about 23.1% of workers have higher education, 31.3% - secondary vocational education, 34.1% - secondary general education and 11.5% - secondary incomplete education. A higher share of workers with a secondary general education (32.1%) and secondary incomplete education (19.5%) characterizes microenterprises. Thus, a high share of highly educated employees is typical for medium and small-sized enterprises, where more than half are individuals with higher and secondary vocational education. In the micro-enterprises, 51.6% of workers do not have a profession. Differences in the level of workers' education determine the peculiarities of the professional and qualification structure of enterprises of different sizes. The share of top managers and specialists of the highest level reaches 15.6% among the interviewed workers of medium- and 6.4% of large-sized enterprises. Thus, among the employees of medium- and small-sized enterprises, there are a high proportion of people with higher and secondary vocational education; while in the staff of microenterprises more than half of employees do not have a profession.

3.3. Form of ownership and industry classification of enterprises

In the sample structure, more than half of large-sized enterprises (55.3%) are private, another 46.8% are state-owned, and 10.6% are in mixed ownership. Various branches of the materials sector represent one part of state-owned large-sized enterprises (29.8%), the other (19.1%) are branches of the light and food industries. The private sector represent by agricultural enterprises (19.0%) and construction (8.5%). In the part of medium-sized enterprises, 43.8% are state-owned and 43.8% are private. Public organizations, as a rule, have public health enterprises and enterprises of the light and food industries. Agricultural enterprises (22.0%) and organizations providing services in the field of trade and consumer services (12.5%) are mostly private. The majority of small-sized (67.6%) and microenterprises (59.7%) with up to 100 employees have state or municipal forms of ownership. These are educational organizations (32.4% of small-sized and 13.8% of microenterprises), healthcare (8.8 and 8.2%, respectively), culture (7.1% of microenterprises), as well as transport and communications (10.1% of micro-enterprises) and housing and communal services (5.5% of microenterprises). Private property organizations are represented by trade, agricultural services and personal services (23.9% of microenterprises), as well as agriculture (8.8% of micro- and 17.6% of small-sized enterprises). Some microenterprises located in rural areas do not have state registration as a legal entity, and some employees do not have an official labor contract, forming an informal segment of the agrarian economy.

3.4. Informal employment practices

Informal employment is a segment of the Russian labor market, which operates on the principles of social self-organization, self-regulation and self-control. In the scientific literature, along with the concept of "informal employment" it is used "employment in the informal sector". In Russia, the share of the rural population employed in the informal sector, whose business entities do not have state registration as a legal entity, is 30.5%, there are more working women (33.1%) than men (27.8%) (Statistical Bulletin, 2018). People working in the informal sector of the agrarian economy do not participate in the social insurance and pension system. At the same time, informal employment allows villagers to receive certain incomes and maintain an acceptable standard of living.

The research results show that as the size of the enterprise grows, the proportion of employees with a formal labor contract increases. If in microenterprises only 86.2% have a formal contract, in small-sized it has 97.3% of employees, then in medium- and large-sized enterprises, all respondents have an employment contract.

Since informal employment is a form of socially motivated activity, it is important to determine whether decisions made voluntarily. Most researchers believe that informal employment forced because there are no suitable jobs in the formal sector. In fact, the decision made voluntarily; but it forced, due to the short number of jobs in the formal sector of the region, as well as to the lack of a choice of work in rural areas. According to the authors' research, those who do not have a formal contract, explain this fact by the employer's decision (57.1% of microenterprise employees and 80.0% of employees of small-sized enterprises). In this case, the employer reduces the cost of labor, violating the rights of workers. At the same time, 20.0-23.8% of workers in micro- and small-sized enterprises did not want to formalize labor relations themselves. In most rural settlements, informal employment persists because the formal sector does not offer "decent" jobs.

Thus, it is necessary to strengthen the incentives for creating modern workplaces in the formal sector of the agrarian economy, not limited to legislative upgrading of penalties of informal workers (Blinova and Vyalshina, 2018).

3.5. Social concerns

Scientists note that modern society characterized by the expansion of risks, dangers and threats at both the macro- and micro social level (Dolgorukova et al., 2017). According to sociologists, fear of losing a job is in fourth place in the ranking of social fears of Russians after fears for the well-being of the family, the future of children, and fears of disease (Dolgorukova et al., 2017). According to the results of our research, the greatest social concerns associated with the risks of job loss are typical for employees of micro-enterprises and large-sized enterprises (Table 2).

Table 2. Fear of losing a job, per cent of the respective group

Rate of concern	Microenterprises	Small-sized enterprises	Medium-sized enterprises	Large-sized enterprises
Very worried	40,3	34,6	18,8	40,4
A little worried	27,7	30,2	34,4	27,7
Yes and no	8,8	13,2	15,6	12,8
Not very worried	11,9	15,9	12,5	19,1
Not worried at all	10,7	6,0	18,8	0,0
Hard to say	0,6	0,0	0,0	0,0

Source: own processing based on the results of the RLMS-HSE

As the data in the table shows, 68.0% of microenterprise workers and 68.1% of those employed in large-sized enterprises are concerned about a possible job loss. Workers of medium-sized enterprises (53.2%) are less concerned; among them 31.3% of respondents do not worry about losing their jobs. Only 25.8% of employees in microenterprises and 22.5% of employees in small-sized enterprises are confident in the success of finding a new job in the event of dismissal.

Employees of large-sized enterprises demonstrate the greatest confidence that they will find a job as well as the current one (38.3%), while employees of medium-sized enterprises are most doubtful about the success of finding a new job (68.7%).

Microenterprises characterized by the highest employee turnover: only 81.1% of employees did not change jobs over the past year, about 8.8% changed their place of work and their profession, 10.1% of respondents hired during the year. Near 87.5 and 88.5% of workers did not change jobs in medium- and small-sized enterprises, 91.5% of respondents in large-sized enterprises did not change their work over the past year.

The subjective assessment of the employees' material well-being is of great interest. The respondents asked a question: "Imagine a staircase of 10 steps, at the bottom, the first, of which there are the poor, and at the last, the tenth, rich ones. Which of these steps are you on?". Later we performed the calculations of the average value of the subjective assessment of the material well-being of workers depending on the size of enterprises. The results showed that the highest subjective assessment of the material well-being noted among employees of small-sized enterprises (4.1 points out of 10). In addition, employees of small-sized enterprises more often indicated an improvement in their financial situation over the past year (23.0%). The lowest assessment of the material well-being was in workers of medium (3.7 points) and large-sized enterprises (3.8 points). Most employees of medium-sized enterprises indicated that the financial situation of their families did not change over the past year (62.5%), and employees of large-sized enterprises more often indicated that their financial situation deteriorated during this time (25.6%). Employees of large-sized enterprises are characterized by a high proportion of economic pessimists, those who think that in 12 months their family will live financially worse than they do now (14.9%). They express a high degree of concern about the future material well-being of the family: 55.3% are very worried and another 23.4% are little worried about whether they can provide themselves and their family with the most necessary things for the coming year. The greatest economic optimism is peculiar to employees of small-sized enterprises (21.4%). Among them, the proportion of those who express a high degree of concern about their future financial situation is lower (38.5% are very worried and 33.5% are a little worried).

Thus, the highest subjective assessment of the material well-being was among employees of small-sized enterprises. They more often than others indicate an improvement in their financial situation over the past year.

3.6. Level of job and life satisfaction

Job satisfaction is the collection of feeling and beliefs that people have about their current job, degrees of job satisfaction can range from extreme satisfaction to extreme dissatisfaction (Aziri, 2011). The level of job satisfaction depends on a number of factors, including conditions and remuneration of labor, opportunities for professional growth, and others (Table 3).

Table 3. The degree of job satisfaction in rural areas depending on the enterprises' size (share of the "generally satisfied", %)

	Micro - enterprises	Small enterprises	Medium enterprises	Large enterprises
Job in general	64,8	65,4	68,7	70,2
Working conditions	61,7	65,4	59,7	63,9
Wage	25,2	36,2	37,5	27,6
Career opportunities	44,7	61,0	62,6	61,7

Source: own processing based on the results of the RLMS-HSE

Data of our study shows that job satisfaction increases with the size of enterprises: from 64.8% in microenterprises to 70.2% in large-sized ones. Satisfaction with working conditions is the highest among the employees of small (65.4%) and large-sized (63.9%) enterprises. Employees of medium (62.6%) and large-sized (61.7%) enterprises are more satisfied with the opportunities for professional growth, while the employees of microenterprises (44.7%) are least satisfied.

Wage satisfaction is very low, ranging from 37.5–36.2% for employees of medium and small-sized enterprises to 27.6–25.2% for employees of large-sized and microenterprises. The satisfaction with the material situation is also very low. Thus, employees of medium and large-sized enterprises are satisfied with their financial situation in 12.5 and 12.8%, respectively, while employees of microenterprise are satisfied only in 11.3% of cases. Workers of small and medium-sized enterprises (63.7 and 65.6%, respectively) are satisfied with life in general more than other respondents; workers of microenterprises (54.7%) and least satisfied with life in general. Thus, the least satisfaction with both work, wages and life in general is typical for microenterprise workers.

4. Conclusions

In rural areas, the majority of respondents work in micro- and small-sized enterprises with up to 100 employees and significantly fewer in medium and large-sized ones. Gender asymmetry in the structure of rural employment revealed, when more women than men work in micro- and small-sized enterprises, while more men work in-sized large enterprises. Rural youth seeks to work in large enterprises, while older people work in micro- and small-sized ones.

The article presents an analysis of the demographic and socio-economic characteristics of the villagers working in enterprises of different sizes. The terms of employment, forms of enterprises ownership, belonging to the formal or informal sector of the economy are considered. Concerns and expectations of working villagers, as well as the level of satisfaction with various aspects of work and life, investigated depending on the size of the enterprise.

The materials of the Russian Monitoring of the Economic Situation and Public Health of the National Research University Higher School of Economics (RLMS-HSE) revealed the areas of the greatest vulnerability of rural employment (fear of job loss, difficulty in finding a job in case of its loss, concerns about the future financial situation of the family). The results showed that the most social concerns and dissatisfaction with work and life in general have workers of microenterprise. Microenterprises have the highest proportion of workers with no labor contract, low compliance with social guarantees, the lowest level of remuneration of labor, relatively high labor turnover, high levels of concern about losing the jobs. Employees of large enterprises, where labor turnover is lower and there are no wage arrears, indicate compliance with basic social guarantees of employment.

Employees of medium-sized enterprises are more satisfied with wages and career opportunities than others, and of small ones – with working conditions and the financial situation of their families. Employees of small and medium-sized enterprises demonstrate good social well-being and the greatest economic optimism: they are more satisfied with life than others. Significant parts of small-sized enterprises belong to the public sector and represented by organizations of state and municipal forms of ownership in education, health care and culture.

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QUANTIFICATION OF PYRAMID DECOMPOSITION OF RETURN ON INVESTMENT IN WINERY ENTERPRISES IN SLOVAKIA

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Annotation: Viticulture is one of the most important traditional industries in Slovakia. Almost 8 873 ha are productive vineyards with 11 160 ha of cultivated area. There are currently 6 viticulture areas in Slovakia – Nitra region, Eastern Slovak region, Middle Slovak region, Tokaj region, South Slovak region, and Small Carpathian region.The aim of the paper is to quantify the negative, but also positive influence of the indicators of the pyramid system of Return on Investment (ROI) in the selected group of winery enterprises in the SR through causal analysis. The analyzed period is 2013 – 2017, within which from a total of 145 enterprises, we analyzed 67 enterprises, representing 46.2%. The main criterion for the inclusion of enterprises under the analysis was the accounting in the double-entry accounting system. In order to quantify the impact of changes in individual analytical indicators (return on revenue and total capital binding) to change the synthetic indicator (ROI), we used a functional method based on the coefficients of changes of individual indicators in a multiplicative link between indicators. Based on the quantification of the pyramid decomposition for the selected group of winery enterprises, we can conclude that during the period analyzed the development of ROI decreased, caused by both the binding of total capital and the return on revenues. ROI reduced the cost of goods sold (by 0.0012 € or 4.07%), the cost of service revenues (by 0.0024 € or by 7.13%), the cost of revenue for financial expenses (by 0.0013 € or 8.98%) as well as all bindings of selected items forming the total capital. From the point of view of the quantification of pyramid decomposition in individual viticulture areas, the decrease in the Return on Investment was recorded in the Nitra region, the Small Carpathian region and the Tokaj region.

Key words: viticulture regions, enterprises, Return on Investment, pyramid decomposition

JEL classification: M21, Q1

1. Introduction

The wine tradition has strong roots in Slovakia, the quality of wines ranks among the world leaders. Slovak winemakers have confirmed this by winning numerous prestigious awards. Almost 53% of enterprises were in loss in 2014 and 50% of wineries have sales in excess of 81.023 € (Budinská, 2015). Positive influence on the economic performance of wineries has size of company (Sellers and Alampi-Sottini, 2016). Soil structure is a key factor of soil quality, which plays an important role in forming favourable physical conditions for vine growing (Simansky, 2012). The total area of the active vineyards is 8.619 ha, which is 80.8% of the total vineyard area. The area of the harvesting area of the vineyards fell to 8 471 ha. In 2017, the consumption of wine per capita fell to 12.6 l in total, this year production decreased to 298 thous. Hectoliters (VUEPP, 2018). The import of cheap grape must and wines, increased production costs and insufficient agricultural subsidies have made viticulture unprofitable (Lieskovský et al., 2013). Every region has typical natural conditions which significantly influence the production of vine as well as its quality. Slovakian viticulture and viniculture are the economic results connected with technical, technological and managerial assumptions

(Ubrežiová and Hrdá, 2014).. The quality of the grape however, is the result of the combination of five main factors: the climate, the site or local topography, the nature of the geology and soil, the choice of the grape variety (Jones, Snead and Nelson, 2004).

2. Materials and Methods

The basis for processing the paper is the data from the financial statements of wine companies operating in Slovakia. The set of wine-making enterprises consists of 67 enterprises. Wine businesses in Slovakia are divided into 6 areas: Nitra region, Eastern Slovak region, Middle Slovak region, Tokaj region, South Slovak region, and Small Carpathian region. In the paper, we focused on the compilation of the pyramid decomposition of the return on investment and the analysis of determinants that influence the development of this indicator in both absolute and relative terms. Gross return on investment is at the top of the pyramid, it is a synthetic indicator. This indicator is broken down into individual order of decay by means of links, while the first order of decomposition is the proportion of profitability and the bond of total capital. This is a multiplicative link. From the individual methods we used a functional method, whose methodical procedure is as follows:

Profitability of returns (Profit/Return) and binding of investment (Investment/Return) are analytical indicators „a“ and „b“. We substitute these indicators as follows:

A = $\frac{\Delta\frac{Profit}{Return}}{\frac{Profit_0}{Return_0}}$ B = $-\frac{\Delta\frac{Investment}{Return}}{\frac{Investment_1}{Return}_1}$, whereas if there is 0 in the indicator, it is the previous year and if the indicator 1, it is the current year, Δ indicates the comparison of the indicator in two consecutive years. Impact of profitability of returns and binding of investment is quantified in absolute merit as follows:

$$\frac{Profit}{Investment}_{\frac{Profit}{Return}} = \frac{\Delta\frac{Profit}{Return}}{\frac{Profit_0}{Return_0}} \cdot \frac{Profit_0}{Investment_0} . (1+\frac{\frac{\Delta\frac{Investment}{Return}}{\frac{Invetment_1}{Return}_1}}{2})$$

$$\frac{Profit}{Investment}_{\frac{Investment}{Return}} = -\frac{\Delta\frac{Investment}{Return}}{\frac{Investment_1}{Return}_1} \cdot \frac{Profit_0}{Investment_0} . (1+\frac{\frac{\Delta\frac{Profit}{Return}}{\frac{Profit}{Return_0}}}{2}) \quad \textbf{(1)}$$

In relative terms, we quantify how the result of the return on profitability and the binding of total capital influence in percentage the gross return on investment. In the second order of decomposition, the return on profitability is divided into the proportion of selected cost items on revenues, with the additive bond between the indicators. The impact of selected indicators on gross return on investment is quantified in both absolute and relative merit as follows:

$$\frac{Profit}{Investment}_{\frac{Cots\ on\ Goods}{Return}} = -\frac{\Delta\frac{Cots\ on\ Goods}{Return}}{\Delta\frac{Profit}{Return}} \cdot \frac{Profit}{Investment}_{\frac{Profit}{Return}} \ (€)$$

$$\text{resp. } \frac{Profit}{Investment}_{\frac{Cots\ on\ Goods}{Return}} = -\frac{\Delta\frac{Cots\ on\ Goods}{Return}}{\Delta\frac{profit}{Return}} \cdot \frac{Profit}{Investment}_{\frac{Profit}{Return}} \ (\%) \quad \textbf{(2)}$$

We will also calculate the impact of yields on material and energy consumption, services, personnel costs, taxes, depreciation, financial costs and other costs not included in the analysis. The binding of total capital (investment) is broken down by the commitment of selected items of equity and liabilities together to revenues. The impact of selected indicators on gross return on investment is quantified in both absolute and relative terms as follows:

$$\frac{Profit}{Investment}\frac{Own\ equity}{Return} = \frac{\Delta\frac{Own\ equity}{Return}}{\Delta\frac{Investment}{Return}} \cdot \frac{Profit}{Investment}\frac{Investment}{Return} \ (€)$$

$$\text{resp.}\frac{Profit}{Investment}\frac{Own\ equity}{Return} = \frac{\Delta\frac{Own\ equity}{Return}}{\Delta\frac{Own\ equity}{Return}} \cdot \frac{Profit}{Investment}\frac{Investment}{Return}(\%) \quad \textbf{(3)}$$

We also calculate the impact of liabilities binding and time distinction on the liability side. This method is described in detail in publications by Gurčík (2018) and Zalai et al. (2008).

3. Results and Discussion

Table 1. Quantification of Pyramid Decomposition of ROI in Nitra Region

Indicator	Absolute merit €				Relative merit %			
	2014	2015	2016	2017	2014	2015	2016	2017
Profit/Investment	0.0053	-0.0044	0.0017	-0.0034	10.5278	-7.8853	3.2136	-6.4541
Profit/Return	0.0041	-0.0014	0.0048	-0.0027	8.1020	-2.4091	9.2500	-4.9919
Investment/Return	0.0012	-0.0031	-0.0031	-0.0008	2.4257	-5.4763	-6.0363	-1.4622
Costs on Goods/Return	0.0013	-0.0012	-0.0052	-0.0041	2.5629	-2.1613	-10.0839	-7.6465
Energy and mat. con./Return	0.0042	-0.0174	0.0168	-0.0040	8.2597	-31.0878	32.4583	-7.4493
Services/Return	0.0056	-0.0114	0.0058	-0.0043	10.9505	-20.2567	11.3190	-8.0038
Personal Costs/Return	0.0099	-0.0074	-0.0021	-0.0022	19.4995	-13.2631	-4.0994	-4.1168
Taxes/Return	0.0011	-0.0007	0.0006	0.0003	2.1896	-1.2494	1.1430	0.6467
Depreciation/Return	0.0147	-0.0062	-0.0026	-0.0020	28.9784	-11.0431	-5.0304	-3.7294
Financial costs/Return	-0.0210	0.0206	0.0002	-0.0008	-41.4183	36.7266	0.4008	-1.5326
Other costs/Return	-0.0116	0.0224	-0.0087	0.0143	-22.9202	39.9258	-16.8573	26.8398
Own Equity/Return	-0.0001	-0.0032	-0.0036	-0.0005	-0.2923	-5.6959	-7.0180	-0.8703
Foreign sources/Return	0.0014	0.0010	0.0005	0.0014	2.6797	1.7879	1.0397	2.5542
Accruals/Return	0.0000	-0.0009	0.0000	-0.0017	0.0384	-1.5683	-0.0579	-3.1461

Source: Authors, own calculation

The Nitra Region is the third largest wine-growing area with 3.248 hectares. In the period under review, the ROI achieved a positive value in 2014 and 2016. In 2014, the positive value of ROI was influenced by the return on revenues by 0.0041 €, resp. 8.1%, as well as the binding of total capital (investment) by 0.0012 €, respectively. 2.43%. In this year, ROI increased the cost items: the intensity of revenues for: depreciation by 28.98%, personnel costs by 19.50% and services by 10.95%. In 2016, ROI benefited favorably: return on revenues by 0.0048 €, or by 9.25%, the intensity of revenues to: material consumption by 32.46% and services by 11.32%. Binding of total capital declined caused by ROI by 0.0031 € (or 6.04%). In 2015, ROI reported the most unfavorable value in the analyzed period. The ROI reduced all selected indicators of the pyramid in addition to the cost of revenue for financial and other non-included costs and commitment obligations.

Table 2. Quantification of Pyramid Decomposition of ROI in Eastern Slovakia Region

Indicator	Absolute merit €				Relative merit %			
	2014	**2015**	**2016**	**2017**	**2014**	**2015**	**2016**	**2017**
Profit/Investment	0.1965	-0.1280	0.0838	-0.0458	254.5748	-46.7444	57.5156	-19.9466
Profit/Return	0.1661	-0.1268	0.0771	-0.0450	215.1227	-46.3129	52.9107	-19.5993
Investment/Return	0.0305	-0.0012	0.0067	-0.0008	39.4521	-0.4314	4.6050	-0.3473
Costs on Goods/Return	-0.0002	0.0003	0.0017	0.0005	-0.2254	0.0963	1.1485	0.2288
Energy and mat. con./Return	0.0974	-0.0734	0.0511	-0.0285	126.2193	-26.8184	35.0615	-12.4182
Services/Return	0.0096	-0.0307	0.0063	0.0032	12.4562	-11.2240	4.3465	1.3894
Personal Costs/Return	0.0120	-0.0174	0.0717	-0.1018	15.4855	-6.3405	49.1937	-44.3541
Taxes/Return	0.0015	-0.0008	-0.0005	0.0002	1.9917	-0.3089	-0.3222	0.0749
Depreciation/Return	0.0305	-0.0070	0.0251	0.0011	39.5249	-2.5567	17.1901	0.4705
Financial costs/Return	0.0026	0.0015	-0.0001	-0.0010	3.4185	0.5391	-0.0526	-0.4374
Other costs/Return	0.0125	0.0008	-0.0782	0.0814	16.2520	0.3002	-53.6548	35.4467
Own Equity/Return	-0.0270	0.0006	0.0052	0.0231	-35.0184	0.2046	3.5864	10.0747
Foreign sources/Return	0.0551	0.0011	-0.0040	-0.0252	71.3969	0.3937	-2.7189	-10.9681
Accruals/Return	0.0024	-0.0028	0.0054	0.0013	3.0736	-1.0297	3.7375	0.5460

Source: Authors, own calculation

In Eastern Slovakia Region the positive ROI were reported in 2014 and 2016. In both years, ROI increased the profitability of revenues as well as the binding of total capital. In 2016, ROI increased its return on revenues by 0.771 € respectively. 52,91% as total capital binding 0.0067 € or 4.61%. In this year, only four items reduced ROI: tax and fee income, financial costs, and other non-included costs and liabilities binding. In 2015 and 2017, we record negative ROI, which were negatively affected by the return on revenues as well as the binding of total capital.

Table 3. Quantification of Pyramid Decomposition of ROI in Tokaj Region

Indicator	Absolute merit €				Relative merit %			
	2014	**2015**	**2016**	**2017**	**2014**	**2015**	**2016**	**2017**
Profit/Investment	-0.0380	0.0211	-0.2017	0.1844	-553.5671	46.9473	-847.1773	81.7608
Profit/Return	-0.0729	0.0202	-0.2215	0.0198	-1061.8746	44.9424	-930.1288	8.7803
Investment/Return	0.0349	0.0009	0.0198	0.1646	508.3075	2.0049	82.9515	72.9805
Costs on Goods/Return	-0.0341	0.0108	-0.0166	0.0139	-496.9649	24.0821	-69.8346	6.1793
Energy and mat. con./Return	-0.0852	0.0072	-0.0893	0.0393	-1240.5051	15.9491	-374.9579	17.4433
Services/Return	-0.0520	-0.0015	-0.0329	-0.0102	-757.4536	-3.2925	-138.0167	-4.5191
Personal Costs/Return	-0.0267	-0.0048	-0.0013	-0.0172	-389.4551	-10.5882	-5.3036	-7.6308
Taxes/Return	-0.0009	-0.0006	-0.0006	-0.0006	-12.8439	-1.2709	-2.5051	-0.2571
Depreciation/Return	-0.0423	-0.0121	-0.0215	-0.0179	-616.1528	-27.0035	-90.3047	-7.9141
Financial costs/Return	-0.0296	0.0132	-0.0012	-0.0051	-431.4298	29.4402	-4.9706	-2.2477
Other costs/Return	0.0664	0.0079	-0.0582	0.0174	967.3562	17.6262	-244.2356	7.7265
Own Equity/Return	0.0323	-0.0045	0.0019	0.1433	469.9047	-10.1235	7.9720	63.5443
Foreign sources/Return	-0.0003	0.0054	-0.0084	0.0251	-3.7568	11.9585	-35.3968	11.1375
Accruals/Return	0,0029	0,0001	0,0263	-0,0038	42,1596	0.1699	110.3763	-1.7012

Source: Authors, own calculation

Tokaj is part of a region whose majority lies in Hungary. Its 929 ha is one of the smaller regions. It is one of the five regions in the world where grapes are grown for the production of naturally sweet wine. The Return on Investment achieved positive values in the two years 2015 and 2017. In 2017, ROI achieved the highest positive value of 81.76% resp. 0,1844 €. In this year, ROI increased the predominance of total capital by 72.98%, equity bonding by 63.54%, the intensity of revenues for material and energy consumption by 17.44% and the binding of foreign sources by 11.14%. In 2014 and 2016, ROI was negative. The lowest value in 2016 is -0.2017 € resp. -847.18%. In this year, ROI was declined by predominantly return on profitability (by 930.13%), difficulty on material and energy consumption by 374.96%, difficulty on other non-included costs by 244.24%, demand on services by 138.02% , the intensity of depreciation revenues by 90.30%, the intensity of revenues on the cost of goods sold by 69.83%.

Table 4. Quantification of Pyramid Decomposition of ROI in Middle Slovak Region

Indicator	**Absolute merit €**				**Relative merit %**			
	2014	**2015**	**2016**	**2017**	**2014**	**2015**	**2016**	**2017**
Profit/Investment	0.0162	-0.0122	0.0110	0.0042	302.5568	-112.3474	821.1554	43.4443
Profit/Return	0.0164	-0.0114	0.0109	-0.0006	306.2027	-104.7312	814.1878	-6.6663
Investment/Return	-0.0002	-0.0008	0.0001	0.0048	-3.6459	-7.6162	6.9676	50.1105
Costs on Goods/Return	0.0052	0.0226	-0.0187	-0.0159	97.4184	208.2276	-1391.4223	-163.9364
Energy and mat. con./Return	0.0138	-0.0084	0.0215	0.0391	257.3942	-77.0418	1600.3661	404.4541
Services/Return	-0.0199	-0.0272	0.0073	0.0373	-371.5533	-250.3877	541.8371	385.6011
Personal Costs/Return	0.0254	0.0060	-0.0015	0.0212	474.1347	55.0067	-115.2805	219.4478
Taxes/Return	0.0005	-0.0004	0.0006	0.0015	9.0920	-4.0817	45.9900	15.1887
Depreciation/Return	-0.0024	-0.0065	-0.0052	0.0194	-44.2507	-59.8696	-383.8516	200.4307
Financial costs/Return	-0.0080	0.0044	0.0056	-0.0979	-148.3366	40.2588	415.1039	-1011.1439
Other costs/Return	0.0017	-0.0018	0.0014	-0.0055	32.3039	-16.8435	101.4450	-56.7084
Own Equity/Return	0.0000	0.0000	0.0000	0.0010	0.2894	0.0873	1.7031	10.5183
Foreign sources/Return	-0.0002	-0.0004	0.0000	0.0029	-3.9626	-3.5253	3.1646	30.1227
Accruals/Return	0.0000	-0.0005	0.0000	0.0009	0.0273	-4.1781	2.1000	9.4695

Source: Authors, own calculation

The Central Slovakia region has an area of 1,883 ha. In the period under review, the ROI achieved positive values with the exception of 2015. In this year, ROI reduced difficulty to: material consumption by 77.04%, services by 250.39%, taxes and fees by 4.08%, depreciation by 59.87 %, other non-analyzed costs by 16.84%. In 2014, 2016 and 2017, ROI was positive. It reaches its highest value in 2016. ROI was predominantly increased in this year by: return on revenues by 0.0109 € (or by 814.19%), difficulty on material and energy consumption by 1600.37%, service intensity of services by 541 , 84%, the cost of revenue for financial costs by 415.10%.

Table 5. Quantification of Pyramid Decomposition of ROI in South Slovak Region

Indicator	Absolute merit €				Relative merit %			
	2014	2015	2016	2017	2014	2015	2016	2017
Profit/Investment	0.0389	0.0265	-0.0023	-0.0084	57.7952	93.3394	-119.3392	-202.9959
Profit/Return	0.0476	0.0398	-0.0026	-0.0076	70.7800	140.1874	-139.4991	-183.1704
Investment/Return	-0.0087	-0.0133	0.0004	-0.0008	-12.9848	-46.8481	20.1599	-19.8255
Costs on Goods/Return	0.0010	0.0026	-0.0006	-0.0012	1.4708	9.1627	-33.9553	-28.0731
Energy and mat. con./Return	0.0138	0.0087	0.0025	-0.0180	20.5687	30.7078	134.7351	-434.5133
Services/Return	-0.0015	-0.0038	0.0215	0.0044	-2.2519	-13.2634	1139.2540	106.7370
Personal Costs/Return	0.0119	0.0177	-0.0126	0.0024	17.6765	62.4891	-668.2772	58.1784
Taxes/Return	0.0004	0.0004	-0.0001	0.0000	0.6439	1.4263	-7.8015	-0.5786
Depreciation/Return	0.0196	0.0108	-0.0128	0.0021	29.0907	38.1617	-678.6884	49.5282
Financial costs/Return	0.0006	-0.0041	0.0007	0.0037	0.8904	-14.5256	36.5223	90.2712
Other costs/Return	0.0018	0.0074	-0.0012	-0.0010	2.6910	26.0288	-61.2881	-24.7201
Own Equity/Return	-0.0012	0.0005	0.0000	0.0006	-1.7541	1.9285	-1.3862	14.0451
Foreign sources/Return	-0.0029	-0.0113	0.0004	-0.0012	-4.2408	-39.8421	21.5770	-29.9105
Accruals/Return	-0.0047	-0.0025	0.0000	-0.0002	-6.9900	-8.9345	-0.0309	-3.9601

Source: Authors, own calculation

The second largest area is the South Slovak region with an area of 4 170 ha. ROI was positive only in the first half of the reporting period. In 2014, ROI reached 0.0389 €, with a return on revenues of 0.0476 € (70.78%). In the given year, ROI was increased by almost all items except for the total capital commitment, service revenue intensity, equity and accruals. In 2016 and 2017 ROI shows negative values. The lowest value was achieved in 2017, represented by -203% resp. -0.0084 €. ROI have been reduced by return on profitability, total capital ties, yields to: cost of goods sold, material and energy consumption, taxes and fees, other non-included costs, accruals and liabilities.

Table 6. Quantification of Pyramid Decomposition of ROI in Small Carpathian Region

Indicator	Absolute merit €				Relative merit %			
	2014	2015	2016	2017	2014	2015	2016	2017
Profit/Investment	0.0240	-0.0053	-0.0027	-0.0216	613.6105	-26.1037	-18.0350	-177.2798
Profit/Return	0.0237	-0.0053	-0.0024	-0.0216	603.4789	-26.3419	-16.3399	-177.0375
Investment/Return	0.0004	0.0000	-0.0003	0.0000	10.1315	0.2382	-1.6951	-0.2422
Costs on Goods/Return	0.0022	0.0021	0.0004	-0.0052	56.1833	10.6068	2.7387	-42.9344
Energy and mat. con./Return	0.0139	-0.0045	0.0116	-0.0076	354.5687	-22.1968	78.2979	-62.3133
Services/Return	-0.0009	0.0004	-0.0116	0.0006	-23.2106	2.2344	-77.7004	4.8895
Personal Costs/Return	0.0027	-0.0024	-0.0008	-0.0047	69.7402	-11.8400	-5.4239	-38.5844
Taxes/Return	0.0000	0.0004	0.0001	-0.0001	0.7951	1.8781	0.7139	-0.7923
Depreciation/Return	0.0047	-0.0029	0.0041	-0.0032	120.9494	-14.2359	27.3863	-25.9504
Financial costs/Return	0.0047	0.0002	0.0001	-0.0012	118.8024	1.0239	0.4051	-9.5990
Other costs/Return	-0.0037	0.0012	-0.0064	-0.0002	-94.3496	6.1877	-42.7575	-1.7533
Own Equity/Return	0.0003	-0.0003	0.0005	0.0000	6.8787	-1.2931	3.1089	0.3699
Foreign sources/Return	0.0002	0.0001	-0.0007	-0.0001	4.0678	0.5986	-4.6956	-0.5558
Accruals/Return	0.0000	0.0002	0.0000	0.0000	-0.8150	0.9328	-0.1084	-0.0563

Source: Authors, own calculation

The Small Carpathian region is the largest and most intense of wine-growing regions in Slovakia. Its area is 4 260 ha. Only in 2014, the ROI achieved a positive value of 0.0240 € or 613.61%. This year, was ROI increased by all items, except for the difficulty of service revenues and other non-included costs. In 2015, 2016 and 2017, ROI was negative. The lowest value was in 2017, -0.0216 € or -177.28%. In the last year, ROI was increased only by its difficulty of service revenues by 0,0006 €, or by 4.89% and by own equity by 0.37%, other items caused decrease in ROI.

4. Conclusion

In terms of the pyramid decomposition of ROI, the return on profitability dominates on the development of ROI, and the revenue-intensive items at selected costs. In almost all wine-growing areas, ROI declined in comparison 2014 to 2017, except for Tokaj Region. For winegrowing enterprises as a whole, the ROI only achieved a positive value in 2014, and in recent years it has been showing negative values, the most unfavorable in 2017. In the Nitra region, ROI achieved its worst value in 2015 (-0.044 € or -7.89%). In this area, over the entire period, ROI reduced the cost-intensive costs of goods sold in equity, favorably influencing the ROI revenues to other non-included costs, depreciation and liabilities. In the Eastern part of Slovak Republic, ROI achieved positive values in 2014 and 2016. It showed the most unfavorable value in 2015. In Tokaj Region, ROI reached its highest value in 2017, 81.76%, and the worst in 2016, -847.18%. For the whole period, ROI was most strongly linked to the binding of revenues to other non-included costs, equity bonding, and accruals. In the Middle Slovak region, ROI achieved positive values in 2014, 2016 and 2017, while the negative value in 2015 was influenced predominantly by return on profitability, demand on services, material and energy consumption, depreciation and other non-included costs. Over the entire period, in this area, ROI have reduced difficulties of returns on: cost of goods sold, depreciation, financial costs. ROI achieved the lowest value in 2017 in the South-Slovak region. Mostly (by more than -180% of ROI this year, return on profitability, difficulty of return on material and energy consumption decreased. ROI has increased the cost of services and financial costs the most. In the Small Carpathian region, the ROI achieved a positive value only at the beginning of the analyzed years, it showed negative values in the last three years, with the lowest value of ROI being in 2017, when all items except its income for services and own resources tied up. For the entire period, ROI has reduced the cost of service revenues, other non-included costs, foreign resource commitment and accruals.

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IMPACT OF EU POLICY IN LEGISLATIVE CHANGES ON INCREASING BIOENERGY PRODUCTION IN SLOVAKIA

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Annotation: Biomass is one of the largest sources of energy that shows the untapped potential of modern bioenergy and the greening of industry and transport. The article aims to improve the EU's policy on biofuel production, which can unlock further growth in electricity and biofuels in transport. Furthermore, we are looking at the evolution of bioenergy production, which cannot be at odds with sustainability, and this use of plant production to tackle energy problems must not endanger food and feed production. Most modern bioenergy is used in final energy consumption for the supply of heat to buildings and industry. In the near future, renewable energy sources can be expected to cover almost one third of global demand for electrified transport. The aim of this paper is to provide an overview of biofuel production in Slovakia and the European Union between 2004 and 2016 and to forecast the development of biofuels for energy purposes. The paper deals with four areas, namely the environmental commitment of the Slovak Republic in relation to biofuels, the impact of the latest legislative changes at the European Union level on Slovakia's agriculture, the sustainability of biofuels and the relationship of biofuels to changes in food prices in Slovakia. Renewable energy production in the EU28 will be monitored methodologically from 1990 to 2016 and the development of this energy consumption in the EU28 from 2004 to 2016. Renewable energy is expected to increase rapidly in transport. Electric cars are responsible for this increase and their electricity consumption is constantly increasing. Biomass will be the largest source of renewable energy consumption growth. This is a consequence of the considerable use of bioenergy in the heat and in transport. Currently the transport is a sector, that has a lower share of renewable energy today. However, between 2018 and 2023, renewable energy in transport can be expected to increase due to the rapid expansion of electric mobility, but so far the overall share of renewables in transport remains small. The demanding sustainability criteria that biofuels placed on the market will have to meet must guarantee their environmental benefits. It can be expected that demand for energy agro-commodities will increase and not only Slovak farmers will be able to enjoy stable sales. However, the production and use of biofuels will most likely affect to some extent the level of food commodity prices.

Key words: Bioenergy, Biomass, Biofuels, Sustainability, Renewable Sources of Energy, Transport, European Union

JEL classification: Q15, Q18, Q42, Q56

1. Introduction

The current world, full of technical conveniences, is increasingly dependent on not only the consumption of electricity but also the energy itself. This growing demand for energy, which is produced in a traditional, non-reversible way, is directly related to the rapid reduction of energy sources and, moreover, has a negative impact on the environment. The focus of attention is therefore naturally moving towards finding sustainable alternatives that aim to minimize CO2 production, as well as waste generation from other processing processes and technologies. The European Union has set milestones in its 2020, 2030 and 2050 environmental and energy strategies, particularly in the area of reducing CO2 emissions affecting all Member States (Chitawo, Chimphango, Peterson, 2017). The Slovak Republic responded to the European Union's initiative in 2009 by creating favorable conditions for expanding the use of electricity from renewable energy sources (RES), which led to a high interest in the construction or installation of facilities that produce renewable energy from various natural sources (Lajda, Lajdová, Bielik, 2015). The largest source of energy from RES is biomass, whose large energy potential is still underused. It is a modern and oldest and most accessible source of bioenergy, which should be used to a much greater extent for the greening of industry and transport (Smith, P., Clark, H. et al. 2014). The European Union is heavily dependent on imports of energy from third countries. We are already importing almost 60% of the energy we need. In 2030, it will be about 80% if current policies do not change. For the transport sector, the diversification of energy sources is very limited: oil drives 98% of EU transport. On the other hand, world oil reserves are declining significantly (European Commission 2018). The logical consequence of a shortage of oil and rising demand is therefore to increase its price. It is not true that more energy is needed to produce biofuels than when they are consumed. From an energy balance perspective, biofuel production is always positive, what means that we always get more energy from biofuels than we use to produce them. Biofuels are a permanently renewable source of energy that is not supposed to replace, but complement, oil products.

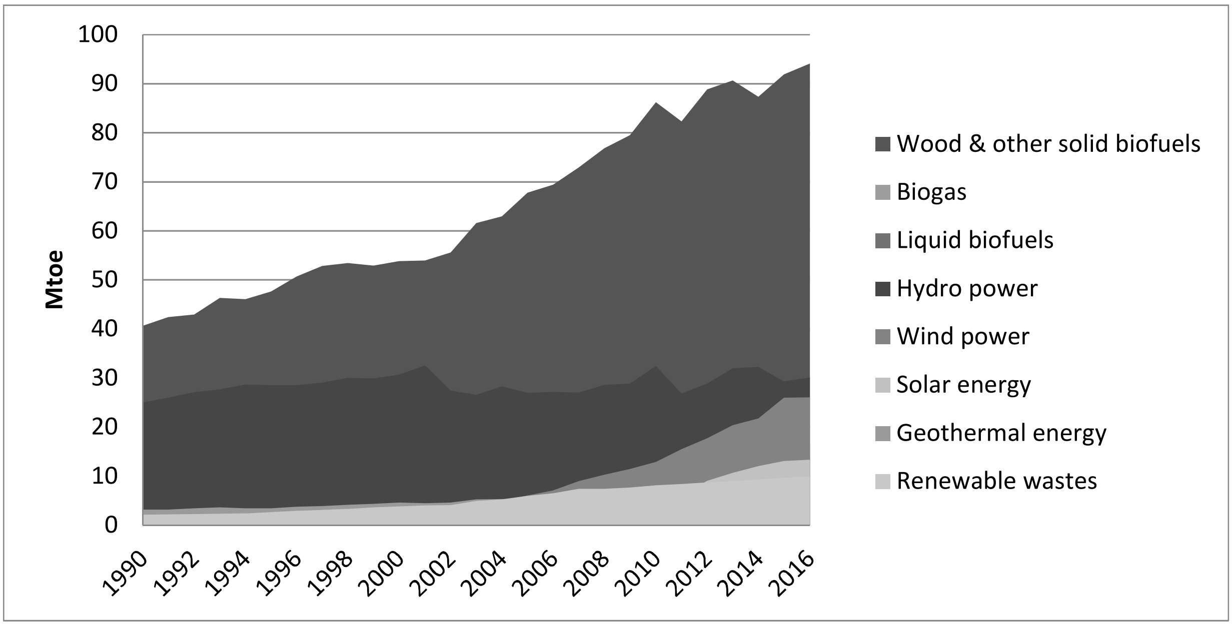
2. Materials and Methods

The aim of this article is to clarify the EU's policy on sustainable development on biofuel production, which can unlock further growth in electricity and biofuels in transport. Furthermore, we are looking at the evolution of bioenergy production, which cannot be at odds with sustainability, and this use of plant production to address energy problems must not endanger food and feed production (Lajda, Lajdová, Bielik, 2015). The task is to provide an overview of biofuel production in Slovakia and the European Union between 2004 and 2016 and to forecast the development of biofuels for energy purposes. Analysis is based on the EUROSTAT data of EU 28 member states within the period of 2004 - 2016. This paper considers the four areas, namely environmental commitment of the Slovak Republic in relation to biofuels, the impact of recent legislative changes at EU level to agriculture in Slovakia, the sustainability of biofuels and biofuel relation to changes in food prices in Slovakia. We are considering the sustainability of biofuels or the relationship of biofuels to changes in food prices in Slovakia. It will methodically monitor the production of renewable energy in the EU28 from 1990 to 2016 and the development of this energy consumption in the EU28 from 2004 to 2016. Most modern bioenergy is used for final energy consumption for building and industrial heat supply. However, in the near future, renewable energy sources can be expected to cover almost one third of global demand for electrified transport. Electric cars are responsible for this increase and their electricity consumption is constantly increasing. The aim is to draw attention to selected aspects of the production and use of biofuels, which we consider most important for the needs of the present. Many countries in the world have committed themselves at the end of the millennium to reducing carbon dioxide and other greenhouse gas emissions by signing the Kyoto Protocol to the UN Framework Convention on Climate Change (UN: Kyoto Protocol 2009). It is on this basis that the competent authorities of the European Union have begun working on a comprehensive environmental protection system, the integral part of which was the promotion of the production and use of biofuels in transport. This process culminated in the adoption of Directive 2003/30 / EC of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport, which has resulted in today's new Renewable Energy Directive. A binding common target for the EU of 32% was agreed in October 2018 to be achieved by 2030 (European Commission 2018).

3. Results and Discussion

Global problems with limited oil supply occurred in the 1970s. The issue of the sustainability of oil supply has been linked to the issue of an ever-deteriorating environment, leading to the signing of the Kyoto Protocol. On the basis of this protocol, the European Union institutions have started working on a system of environmental protection and the promotion of the production and use of biofuels. This process culminated in the adoption of Directive 2003/30 / EC of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport.

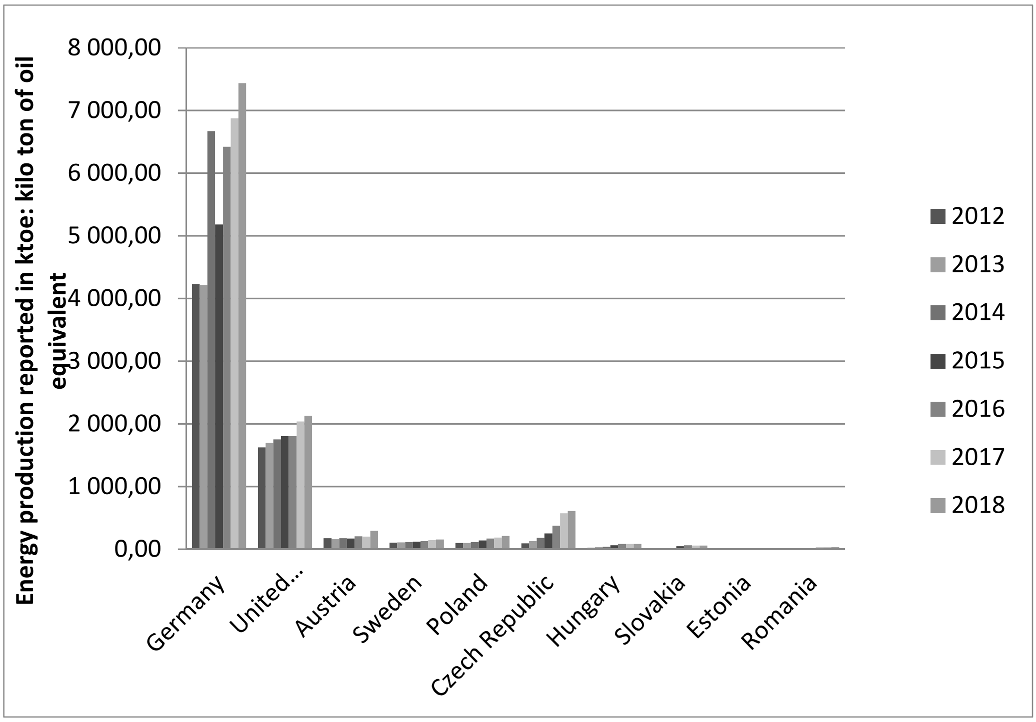
Figure 1. Primary production of energy from renewable sources (1990-2016) in EU 28



Source: Eurostat (online data code: nrg_109a)

The share of renewable energy in the EU has increased sharply since 1990. This positive development was helped by legally binding targets for increasing the share of renewable energy set out in Directive 2009/28 / EC on the promotion of the use of energy from renewable sources. The European Union, as a whole, is well on track to achieve the 2020 targets, but some Member States will need to do more to meet their planned target. A crucial breakthrough in the use of RES, including bioenergy, was the adoption of European Parliament Directive 2009/28 / EC, which obliges Member States to set national targets for the implementation of RES in line with the Union's common objective. The first milestone for 2020 is to achieve a 20% share of RES in the Union's gross final consumption. Thus, the Slovak Republic has an obligation to increase the use of RES from final energy consumption from 6.7% to 14% by 2020. In doing so, each Member State must ensure that its RES share in 2020 is at least its national target. Currently, the European Union has set milestones in its 2020, 2030 and 2050 environmental and energy strategies, particularly in the area of CO2 reduction affecting all Member States. The Slovak Republic responded to the European Union's initiative in 2009 by creating favorable conditions for expanding the use of electricity from renewable energy sources, which led to a high interest in the construction or installation of renewable energy installations from various natural sources. The relatively rapid development also followed in biogas production, which was related to the construction of new biogas plants. These provisions guaranteed the compulsory purchase of electricity by distribution companies with a fixed purchase price for 15 years. However, this trend ended in 2014 when legislation was changed not only by the Slovak Republic but also by the EU on financial support for biogas plants, which subsequently became unprofitable. It is precisely this legislative change that has resulted in the cessation of energy production from agricultural biomass, and unfortunately this technology is not yet economically competitive compared to fossil fuel processing. Nevertheless, the European Biomass Association (AEBIOM, 2018) considers bioenergy, that is, the energy generated by the processing of biomass, to be the leading component in the primary energy produced from RES.

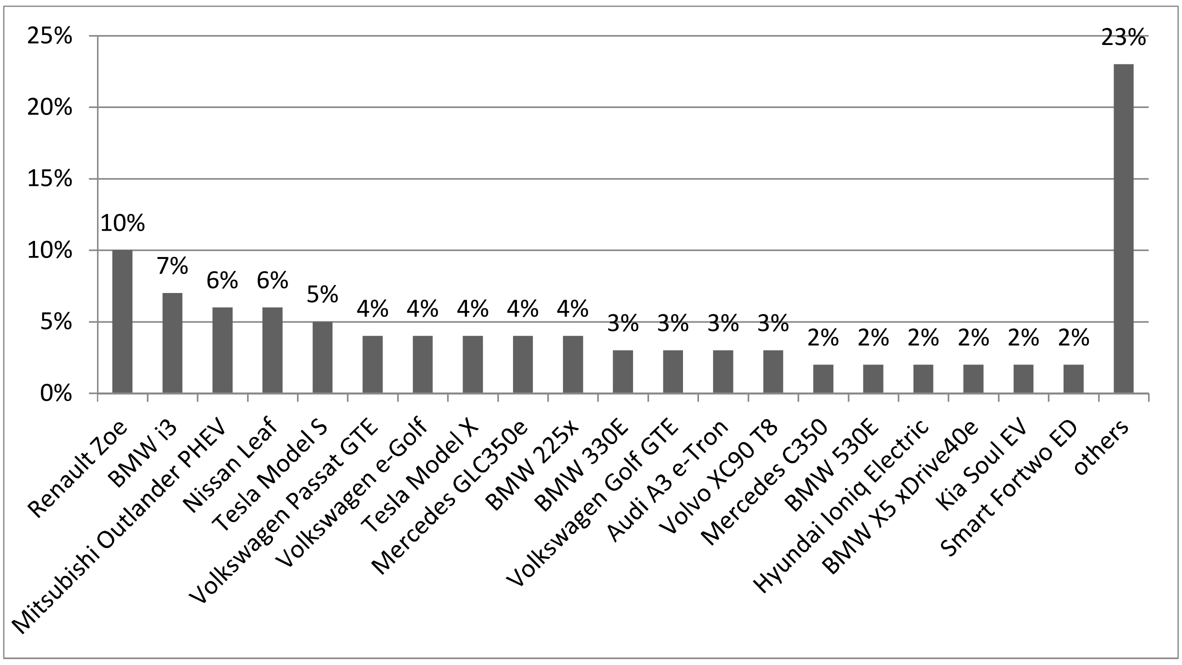
Figure 2. Primary energy production from biogas in selected EU countries



Source: Eurostat (own processing)

According to URSO statistics, 111 biogas stations with a total output of 103 MW were set up in Slovakia by the end of July 2015. Most biogas plants have installed capacity in the range of 0.9 - 1.0 MW and are aimed at generating electricity from maize silage processing. It is interesting to note that in Germany, which thanks to state support is the leader in biogas production, the average installed capacity of a biogas plant is only 0.4 MW. At the same time, a new price regulation in the electricity industry came into force at the beginning of 2014 according to the ÚRSO Decree No. 221/2013. For biogas plants, the proposed concept meant the grading of the purchase price of electricity according to their output to four groups. The most widely used type, the biogas plant above 0.75 MW, reached the lowest price category, which has become a liquidation measure for most biomass energy producers. The Directive introduces a number of key sustainability criteria to ensure that only those biofuels that are genuinely beneficial to the environment are included in the above objectives. The EU clearly defines the land on which raw material can or cannot be grown, from which any biofuel will be produced, and the no less important sustainability criterion is the question of greenhouse gas savings. In the Slovak Republic, these are mainly crops such as corn or oilseed rape. They are used as basic input materials for the production of biofuels, maize for the production of bioethanol and oilseed rape in the production of oilseed rape ester. Sustainability criteria, which the Slovak Republic should transpose into our legislation, should not affect energy crop producers significantly, because Slovakia has only a minimum of land that the directive seeks to protect. More specifically, land with high biodiversity, such as former forests or protected ecosystems. It should be added, however, that biofuels produced in Slovakia will not absorb our entire crop of maize and oilseed rape, despite the fact that there have been processors in Slovakia for a number of years, who represent considerable and especially stable sales for Slovak farmers. The period, not only in Slovakia but also in other EU countries, was thus marked by a significant increase in agricultural commodity prices. Therefore, it is not surprising that biofuels can be responsible for the rapid rise in food commodity prices. But it cannot be assumed that only biofuels will increase the agricultural product. These changes can also be caused by e.g. weak crops or bad weather, expanding the offer to crops. There may also be changes in the macroeconomic environment, including population growth, income growth, the consequences of urbanization and changes in dietary habits, changes in oil prices, changes in the monetary system, increased interest in commodity market investments that affect supply and demand. Last but not least, it is also the impact of the agricultural and trade policies of states that are usually aimed at stabilizing fluctuating prices on commodity markets. Another significant change will be the steady growth after electrified transport.

Figure 3. The Share of electric car sales in the EU in 2017



Source: Eurostat (own processing)

The infrastructure for charging stations for electric vehicles is not only very good in Slovakia but also in much of Europe. Fast charging stations are available approximately every 60km. Traveling in Slovakia and also in Europe, with the exception of Ukraine, is no problem. In particular, we owe a good network of charging stations to power stations, companies such as Tesla, GreenWay, and Nissan, or even operators of shopping centers, hotels and restaurants. Of course, the network of charging stations will grow with the increasing demand for electric vehicles, which will result in a significant increase in electricity demand. Increased production of electric vehicles, not only four-wheelers, but also electric bicycles, scooters, or other vehicles serving as a means of transport in urbanized locations will require increasing electricity production. This production of electric vehicles is also indirectly supported by legislative changes at regional levels, where eg. entering the city center with a minimum-emission motor vehicle is strictly prohibited and this trend will be rapidly increasing in the EU in the coming years. In 2017, ChargePoint Express Plus charging stations, which charge at 11 km per minute, came to the market. gain 110 km in 10 minutes. Similarly powerful chargers are being developed by various companies or alliances, including the BMW, Audi, Porsche, Mercedes and Ford carmakers. This means that there will be no problem with the number of electric car charging stations, but the amount of energy that will be consumed at high speed. This energy will need to be produced from something. A modern myth in the field of electromobility is the claim that electric vehicles do not have a more favorable ecological balance than cars with an internal combustion engine. It also mentions the greater ecological footprint they leave in their production. Since this issue is far more extensive, we do not discuss it further at work. However, it remains true that electric vehicles no longer produce additional emissions as part of their operations.

4. Conclusion

The past few years in Slovakia have caused the halt of the construction of new biogas projects. However, bioenergy remains a key component for achieving the ambitious energy and environmental objectives of the European Union. The efforts of the world's most advanced countries are aimed at protecting food agricultural commodities from the impact of biofuels, which the Slovak Republic is also adapting to. Different support systems, especially in the form of tax breaks, support the second generation of biofuels, which are made from non-food sources. This is despite estimates that it will take years for second generation biofuels to become economically attractive to investors. In practice, the production and use of biofuels is often criticized despite overall carbon dioxide savings. However, we still encounter real unsubstantiated objections that saving carbon dioxide in the use of biofuels is not sufficient if the emissions that have been produced in the biofuel production process are also taken into account. The demand for biofuels and the associated carbon dioxide savings will continue to increase, thereby indirectly supporting second generation biofuels. Those biofuels that will be made from raw materials derived from land with high biodiversity or those that do not achieve the required carbon dioxide savings will not be able to benefit from any state support. And biofuel production is economically unattractive without state support. However, Oil, as a source for the production of not just fuel, is no longer considered inexhaustible. The production and use of biofuels are most likely to influence to some extent the price level. However, it is certain that this is not the only variable that affects this problem. This is a highly unpredictable multifactor issue. It can be expected that between 2018 and 2023, the demand for renewable energy will increase just because of the rapid expansion of electrical mobility. However, so far, the overall share of renewables in transport remains small. The demanding sustainability criteria that biofuels placed on the market will have to meet must guarantee their environmental benefits the environmental aspect is not the only reason why countries are making so much effort. With its legislative changes, the EU is throwing away one of the best tools it already has for an energy transition, namely low carbon liquid fuels such as renewable ethanol. It is worrying that, at a time when the EU is actually retreating from the decarbonisation of transport, the European Commission wants to limit the definition of sustainable biofuels to second generation technology. It is important to say that first-generation crop-based biofuels that do not cause deforestation are still important. Indeed, in all decarbonisation scenarios, the European Commission strategy will require a massive increase in both first and second generation biofuels to achieve the desired energy and environmental objective. It is important to have as many solutions that exist now.

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LINK BETWEEN THE BUSINESS SCALE AND THE LAND IMPROVEMENT INVESTMENTS

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Annotation: The aim of this paper is to assess the value of land improvements with regard to the size of enterprises. The sub-objective is to determine development and impact of depreciation of land improvements on the intensity indicators. The data set is based on the panel data of the FADN system for the period 2005 – 2017). The value of investments (soil amelioration, drainage, and fixed irrigation systems) will be evaluated based on the variant approach according to the business, to the business scale of enterprises, and the respect of the owned, and the rented area of land. A production function will be monitored the effects of depreciation on vegetable sales, fruit and wine sales. Other inputs to the production function will be performance consumption and labour costs. Research shows: According to the FADN (2005 – 2017) the "biggest soil investors" are farmers with the land up to 50 hectares. The average depreciations for the last five years largely are from the 1.2 EURO/ha (farms 5 – 50 ha) to the 153 EURO/ha (farms up to 5 ha). The corporate companies farm on the rented land (approx. 80 % of the total land area) and thus they have minimal investments to land quality. A positive relationship exists in all variables of the production function model. The statistically significant relationship (production, investments) has not been proved.

Key words: agricultural land, land improvements, irrigation, production, sales, correlation and regression

JEL classification: Q 15

1. Introduction

The aim of this paper is to assess the value of land improvements with regard to the size of enterprises. The sub-objective is to determine development and impact of depreciation of land improvements on the intensity indicators. To meet the stated objectives, there were stated following research questions:

1. Are the land improvements used mainly by big companies, which can benefit from economies of scale, despite that the share of their own land is low?
2. Do the investments into the land improvements positively affect sales from crop production (fruit, vegetables and grapes) for companies, which were identified as the biggest land investors?

Large companies farming on 50 or more hectares represent only 7 % from the total number of farms in the EU. But they control 68 % of farmland. In the Czech Republic large-scale farms control 92.5 % of the total agricultural land, and in Slovakia 92 %. The Czech Republic is at the first place regards the average utilized agricultural area per holding (130 ha), but lags behind in the effectivity and modernization (Eurostat, 2018). The analysis of the Czech farms effectivity shows that the economies of scale are present only for companies farming on the area from 1,000 to 1,500 hectares. In the other observed groups, this advantage was not present or the negative impact has been recorded (IAEI, 2011). The lower value of ratio "net value added/annual work unit" in comparison with EU15 countries is offset by three times (approx.)

lower labour costs (IAEI, 2011), and by the 1.5 – 5 times lower land price (MoA CR, 2016). These facts and the potential economies of scale for large-scale farms represent the main comparative advantage of the Czech agribusiness regards to the EU15 countries. The attitude of farmers to the land is getting worse (Hlaváček et al., 2012). The irrigation systems belong between the potential land investments. They contribute to the agricultural production intensification in developed countries, and they are also used as a part of measures reducing the poverty and hungry in developing countries. In the most countries the irrigation consume approximately 70 % of demanded sweet water. In parched semiarid areas this consumption reach up to 90 % (Molden, 2007). The water management and planning are crucial all around the world. Precise estimation of water demand in agricultural sector is one of the key needs for water management (Bergez, et al., 2007). For instance the irrigation plays the key role for economic viability of many farms with high production capacity which are situated in the areas with the lack of water in the southern Europe (Tarjuelo et al., 2015). Replacing the systems of surface irrigation by the systems of pressurized irrigation systems (sprinkler and drip irrigation systems) represents a way how to improve the effectivity of irrigation. This type of irrigation significantly decreases the water consumption, but increases the requirements on investments and energy consumption (Playan and Mateos, 2006). These financial requirements led to the development of innovations, as the micro irrigation (Mateos et al. 2018). The discussion about the efficiency of micro irrigation, and its role for small farmers (evaluation of the system capability to save water, evaluation of small farmers' needs, energy consumption are environmental costs), is a current topic. Even in the Czech Republic the area of arid land is increasing. The average rainfall pattern in 2018 corresponds only to the 76 % of normal for period 1981 - 2010 which was 522 mm/year (CHI, 2019). The usage of irrigation systems decreased in the Czech Republic after their privatization in 1997. It is because the state stopped their financing. In 1989 the large-scale farms used irrigation systems for 75 - 80 % for agricultural land. In 2015 it was only 25 - 30 % of agricultural land. The irrigation is used only for crops, which cannot be grown without it (vegetable, vineyards, hop gardens, potatoes, etc.) (TGM WRI, 2015). The irrigation investments are subsidized from the Czech government resources. These subsidies are allocated to the small-scale farms as well, as to the corporate (large-scale) companies. There is a lot of bureaucracy related with the building permits to transport the water to the given location across the owned and rented land. This fact makes the possibility of the state support quite complicated (MoA CR, 2018).

2. Materials and Methods

The following FADN data (2005 – 2017) are used

a) The land investments are improvements, which permanently increase the production capacity. Thus the costs on plowing and fertilizers cannot be classified as the land investments. This information is reported as an item of Gross fixed capital formation (GFCF or investments) in aggregate agriculture account (AAA). It includes irrigation, drying, and the flood protection (Regulation EC No. 138/2004). According to the regulation of European parliament about AAA are land improvements part of the other buildings in the item GFCF and it is not possible to separate them. Thus the land investments data were used in alternative form represented by depreciations of land improvements CZK/ha (FADN). The depreciation period for liquid spray machines is 3 years. Waterworks for irrigation and draining are depreciated for 30 years (appendix no.1 to act no. 586/1992). Only the owners of these investments are allowed to apply depreciation.

b) Crop, vegetable, vine and grape, flower, and fruit production, production costs, and labour costs (CZK/ha). FADN reports the microeconomic data based on sample survey. The production value is reported in market prices.

c) The extent of farm land, taking into account the proportion of owned and rented land (in %).

d) The data are gathered for farms according to their size. The observed groups are 5 - 50 ha, 50 - 100 ha, 100 - 300 ha, and above 300 hectares for natural persons and up to 50 ha, 50 – 1,000 ha, 1,000 – 2,000 ha, and over the 2,000 hectares for corporate bodies.

e) Will be used exchange rate 25.54 CZK/EUR. This rate was valid until 29 December 2017, i.e. the date of the last year of research in this paper.

The data about the land investments (based on depreciation) are gathered, analyzed, and compared for each single year from 2005 (a year after the Czech joining to the EU) to 2017 according to the a) farm size (natural persons and corporate bodies), b) property rights to the land.

Production function modelling:
As determinants affecting the vegetable production (PRODV) are chosen fundamental production factors: labour; represented by the labour costs (LC), capital represented by the depreciations of fixed assets (DEP), and production costs (PC).

The variables are described by algebraic records in linear form (1), and non-linear form - Cobb-Douglas production function (2). The chosen form allows to transfer the data by using the logarithmic method from the powered form to the linear one, which is stated for econometric model (3) and can be estimated by linear approaches.

$$PRODV_{it} = a + bPC_{it} + cDEP_{it} + dLC_{it} + \varepsilon u_{it} \quad \textbf{(1)}$$
$$PRODV_{it} = aPC^{b}{}_{it}DEP^{c}{}_{it}LC_{it}{}^{d}u_{it}{}^{\varepsilon} \quad \textbf{(2)}$$
$$ln\,PRODV_{it} = lna + b\,lnPC_{it} + c\,lnDEP_{it} + d\,lnLC_{it} + \varepsilon lnu_{it} \quad \textbf{(3)}$$

where:

$PRODV_{it}$	…	vegetable production in CZK/ha
PC_{it}	…	production costs in CZK/ha
DEP_{it}	…	land improvements depreciations in CZK/ha
LC_{it}	…	labour costs in CZK/ha
u_{it}	…	random variable, residuals
a, b, c, d, e, ε	…	structural parameters
ln	…	logarithm of variable

i = 1…3 groups of farms divided according to the farmland.
t = 1…13 number of years

Power models, whose regression coefficients represent the elasticity, are used to determine the order of significance of the exogenous variables. They are able to indicate relative representation of structural parameters. The models are specified as fixed effects models and they are estimated in SW Gretl.

The fixed effects model uses for distinguish business specifics only the parameter "constant", which includes all omitted factors in time invariant. Due to the individual constants, it is possible to detect the heterogeneity of data (Cipra, 2008).

The statistical verification is needed for estimated model. The individual parameters are checked by t-test and the model significance is tested by F-test. The other characteristic is the coefficient of determination, which indicates the level of coincidence for observed data and the model outcome. The econometric verification involves Wald test of heteroscedasticity, test of residuals autocorrelation (Durbin-Watson test) and the test of residual distribution (JB test).

3. Results and Discussion

There were some issues with the data (see data: land improvements investments above). The needed information, which could be used as an explanatory variable is "the share of irrigated land per farm according to the farm size". This information is officially offered by FADN, but the data are not available for the Czech farms.

Based on available data it was found that the biggest "land investors" (2005 - 2017) are mostly natural persons (NP) farming up to the 50 hectares (table 1). These farms don't reach any taxable profit (FADN, 2005 - 2017) and the depreciation of land improvements were recorded between 100 CZK/ha to 3,900 CZK/ha (4 EURO/ha to 153 EURO/ha) of agricultural land. The value of deprecipations was stabilized in the interval 3,200 – 3,900 CZK/ha (125 – 153 EURO/ha) since 2010. If the depreciation period is considered the investment correspond to the amount from 90,000 to 120,000 CZK/ha (3,500 – 4,700 EURO/ha).

Table 1. Land Improvements depreciation according to the area and legal entity in CZK (2005-2017)

	Natural Persons			Corporate bodies		
Depreciation of land improvements/ha/year	Up to 5 ha	5-50 ha	50-100 ha	50-100 ha	100-2000 ha	Over 2000 ha
2005	216.55	0.28	0	2.57	10.31	7.70
2006	121.29	0.23	0	1.81	14.39	6.97
2007	134.0	0.09	0	3.05	13,11	6.06
2008	190.66	0.87	0	4.18	11.35	6.42
2009	108.08	9.37	3.12	4.32	16.33	8.55
2010	3,227.10	24.80	3.81	6.74	16.57	6.34
2011	3,001.00	18.60	4.76	1.07	14.84	6.38
2012	2,675.00	31.20	3.55	8.37	13.50	7.11
2013	3,280.60	35.40	3.90	7.46	12.99	6.82
2014	3,982.80	39.73	15.88	7.60	15.60	7.77
2015	3,683.56	33.86	16.75	8.00	14.05	6.21
2016	3,816.71	27.54	23.03	8.14	13.05	6.58
2017	3,903.90	27.57	23.69	6.65	12.32	5.99
Own land (2017, %)	85.40	56.20	43.80	14.30	17.60	20.70
Depreciation / own land (2017, CZK/ha)	**4, 570.24**	**49.03**	**54.15**	**46.44**	**69.88**	**28.98**

Source: Authors based on FADN 2005-2017, © 2019

Note: The companies represented by natural persons over the 100 hectares and corporate bodies up to the 100 hectares were excluded from the sample, because of minimal investments.

For corporate bodies the amount of investments is in lower dozens of CZK per hectare. According to IAEI (2011) the companies, belonging to the group of farms with area 1,000 – 1,500 ha, have the highest comparative advantage related with the economies of scale. Table 1 shows that this group spent the highest amount for land investment but only in comparison with the other corporate bodies.

Possible reasons why the companies, which benefit from economies of scale (more than 1,000 ha), do not invest into the land.

The property rights: Corporate bodies farming on more than 50 hectares often rent a land (the share of rented land is in average from 80 to 85 % of the farm area). The form of investments and their settlement is usually specified in rent contracts. However these investment are not carried out in the most of companies, neither on the owned land (Table 1). The big share of rented land from the big number of owners represents an obstacle for business development on farmland in the Czech Republic (MoA CR, 2016). Němec (2005) claims that this situation was caused by low motivation of farmers to buy the farmland in the period before the joining EU, when the farmland rents were very low. Leased land is often highly fragmented (a large number of ownership interests in a small area of farmland that are often striped). Farmland owners often do not have proprietary parts (stripes) in individual blocks, but their land is scattered into a larger territorial unit. There are registered more than three millions owners, who own more than four millions hectares of farmland (COSMC, 2019).

Administration obstacles for irrigation construction: The farmers who want to build irrigation systems are obliged to get zoning and the building permit, agreements of all concerned landowners, solve the easements and face up to the other administration requirements (own research, 2019).

Subsidies: The long drought periods will be probably more common (not only in the Czech Rep.) in the following years or decades. The effective and economical irrigation systems are crucial for agriculture, especially for fruit and vegetable production. The financial requirements can be partly subsidized from the EU budget (e.g. Programme 129 310). But these programmes are usually announced for dates which are tough to be fulfilled (programme is announced in October and the applications are accepted until the end of March of following year, MoA CR, 2018). If the preparations for these investment are not carried out in advance (usually couple of years) it is very complicated to obtain a subsidy and the investors have to use loans or leasing (Authors, based on the previous results, 2019).

The most irrigated areas are fields with vegetable, strawberries, hop gardens, orchards, potatoes, vineyards, and sugar beet. The table no. 2 illustrates the relationship between the land investments (CZK/ha) and chosen crops.

Table 2. Fixed Effects Model Estimation in linear form

	Coefficient	Std. Error	t-ratio	p-value	
const	99963.7	23801.5	4.2000	0.0002	***
PC	0.0260	0.0579	0.4501	0.6556	
DEP	31.3513	16.6170	1.8870	0.0680	*
LC	1.7110	0.9770	1.7510	0.0892	*
Joint test on named regressors	p-value <0.000				
Adjusted R-squared	0.7792				
Durbin-Watson	1.1741				

Source: Authors in SW Gretl

*Note: * $t_{\alpha} = 0{,}1$, *** $t_{\alpha} = 0{,}01$*

According to the table 2 there is obvious positive influence of production factors on the vegetable production for small farms. In terms of economic verification the model is in accordance with the economic theory. The parameters of depreciation and labour costs can be considered as statistically significant. The issue of the estimated model is the residual distribution (there is no normal distribution), and the residual heteroscedasticity. This issue is partly solved by the power model, which was estimated by using robust standard errors to eliminate the heteroscedasticity and potential autocorrelation of residuals. The results are described by the table no. 3.

Table 3. Fixed Effects Model results for powered form

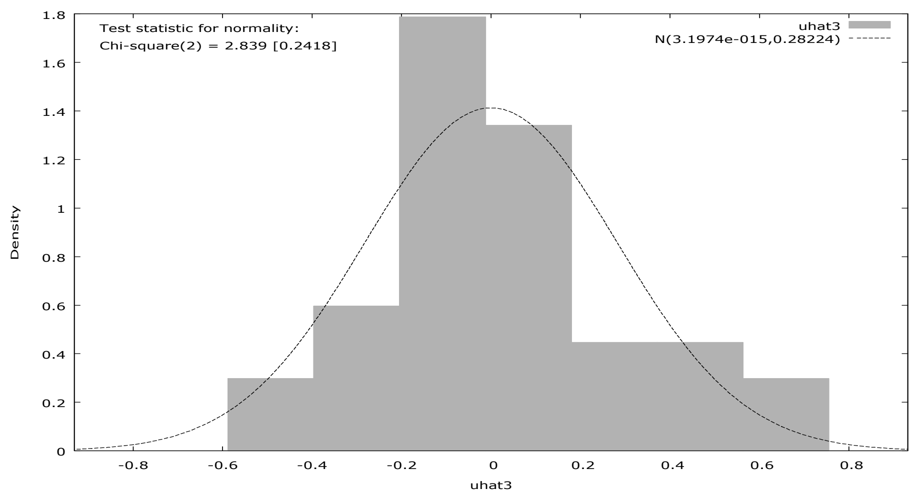
	Coefficient	Std. Error	t-ratio	p-value
const	4.1279	4.5523	0.9068	0.3720
l_PC	0.1301	0.3187	0.4083	0.6860
l_DEP	0.0710	0.0538	1.3180	0.1977
l_LC	0.4332	0.2783	1.5570	0.1303
Adjusted R-squared	0.4697			
Durbin-Watson	0.8480			

Source: Authors in SW Gretl

*Note: * $t_{\alpha} = 0{,}1$, *** $t_{\alpha} = 0{,}01$*

The estimated model fulfill the requirement of normal residual distribution (fig. 1) but in this case the individual parameters are not statistically significant.

Figure 1. Jarque Berra normality test



Souce: Authors in SW Gretl

Generally it is not possible to apply the results. The main reason is the data aggregation in FADN. The results of individual production variables are converted to the unit for the whole farm (CZK / ha). The share of production for individual crops is not considered. Thus the relevant results of vegetable production (CZK / ha) are observed only for the farms up to 5 ha where the share of crop production on the total production is from 60 to 85%. The individual survey can be recommended as the following phase of the research.

4. Conclusion

The land improvements do not have to be only the irrigation system, but also the draining systems and the other buildings or constructions, which can increase the soil quality (or can prevent the soil from the external natural or anthropogenic factors). The land improvements are mostly used by small farmers (area up to 5 hectares). Large-scale farms benefit from the economies of scale (see the review above). But they do not sufficiently use this comparative advantage to protect the farmland. These big companies rent about 80 % of farmland. This fact complicate the adoption of irrigation systems or other land improvements, because it requires cooperation of the large number of landowners. There was found positive impact of production factors on the crop production (e.g. vegetable production) for small farmers, this relationship was not been proven as statistically significant (see data aggregation problem).

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THE ROLE OF SMALL AND MEDIUM-SIZED ENTERPRISES IN ECONOMIC DEVELOPMENT OF TURKEY

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Annotation: Small and medium-sized enterprises (SMEs) take an important role in economic growth entrepreneurship and new job creation and they are accepted worldwide as the drivers of economic development. SMEs are dynamic and engaging elements of Turkey's economy as well as other countries. Considering that the share of SMEs in total enterprises is 99, 89% and its share in total employment is 59, 83%, it can be said that it is not possible for the whole economy to develop without the development of SMEs. In this study, we have been tried to determine the increasing importance of SMEs in recent years after considering the advantages and disadvantages of such enterprises and to detect advantages of benefiting from SMEs in economic development by using the collected data from The Organization for Economic Co-operation and Development (OECD), Small and Medium Industry Development Organization of Republic of Turkey (KOSGEB), Turkish Statistical Institute (TUIK) and other researches. The collected data was analyzed by combining qualitative and quantitative approach methods. Findings of the study indicate that in the new economic formation, SMEs need to achieve a competitive edge in the global dimension in order to survive. And this requires flexible and market-oriented production, specialization in production, increased productivity and a global management philosophy.

Key Words: Business scale, SMEs, Economic development, Economic growth, Turkey

JEL Codes: R11, O10

1. Introduction

SMEs are companies that are open to all innovations in the technology, production methods and market and they perceive the market as the whole global market. And therefore SMEs give the great importance to the knowledge of global market and accept the level of competition as the basis of its existence. SMEs can be established with less fixed capital investments, have flexible production facilities, adapt to demand changes in less time and contribute to national income.

As the G20/OECD High-Level Principles of SMEs Financing states, in high income economies, SMEs undertake the majority of private economic activity, accounting for more than 60% of employment and 50% of GDP. In emerging economies, SMEs contribute on average to more than 50% of employment and 40% of GDP. In low-income developing countries, SMEs contribute significantly to broadening employment opportunities, social inclusion and poverty reduction (G20/OECD, G20/OECD, 2015).

SMEs, which are one of the cornerstones of the national economy, have a number of advantages over large firms thanks to the features they possess. The entrepreneur, who has a small or medium business, has two main advantages in competition with large enterprises. These are; to be in a closer relationship with customers and employees and to be more flexible in marketing, production and service. SMEs provide more production and product diversity with less investment, respond more quickly to demand changes and have less damage in economic fluctuations thanks to their flexible structure.

SMEs have some disadvantages besides their advantages. They cannot work in high efficiency due to their small scale, their export potential is low because they cannot produce according to the standards, they have difficulties in obtaining resources due to their inability to institutionalize and their technical and sectoral knowledge is insufficient. As a result of all these reasons, they aren't as competitive as large firms.

There wasn't a standard definition of Small and Medium Sized Businesses in Turkey until 2005. KOSGEB, Halk Bank, Eximbank, Undersecretary of Treasury and Undersecretary of Foreign Trade were acting different definitions of SMEs and it was causing problems in the practice and statistical data. The difficulties caused by the lack of a standard definition have been overcome by the relevant regulation published on 18.11.2005. In accordance with the EU regulation, the decision of the Council of Ministers issued on 18 November 2005 defines the Small and Medium Sized Enterprises (Regulation on the Definition, 2015). The definition and classification of SMEs in Turkey was made from the definition of European Union by using the number of employees, balance sheet and sales size as criteria. Thus, a common definition has been provided for all institutions and organizations. According to this regulation; “enterprises which has less than 250 employees and annual net sales revenue or financial statements not exceeding 25 million TRY are defined as SMEs." (KOSGEB, 2015).

The table showing the classification of enterprises according to the regulation is given below.

Table 1. Classification of Businesses by SME Definition Regulation

Number of Employees	Scale	Financial Balance Sheet Value(TRY)	Annual Net Sales Revenue (TRY)
0-9	Micro	1,000,000	1,000,000
10-49	Small	5,000,000	5,000,000
50-249	Medium	25,000,000	25,000,000
≥ 250	Large	≥ 25,000,000	≥ 25,000,000

Source: Resmi Gazete, Regulation: 2005/9617, Article 5 (a,b,c), 2005

The definition and qualifications of Small and Medium Sized Enterprises has been revised twice and the new definition was announced on 30.04.2018 by publishing the new regulation. With the new regulation, upper limit of annual net sales revenue and financial balance sheet for medium sized enterprises have been raised from 25 million TRY to 125 million TRY, for small sized enterprises from 5 million TRY to 25 million TRY and for micro sized enterprises from 1 million TRY to 3 million TRY (TOBB, KOBİ Tanimi Değişti, 2018).

The table showing the classification of enterprises in Turkey according to the new regulation and also in European Union is given below.

Table 2. Classification of SMEs in Turkey and EU

	Number of Employees	Scale	Financial Balance Sheet Value	Annual Net Sales Revenue
Turkey[1]	0-9	Micro	≤ 3,000,000 TRY	≤ 3,000,000 TRY
	10-49	Small	≤ 25,000,000 TRY	≤ 25,000,000 TRY
	50-249	Medium	≤ 125,000,000 TRY	≤ 125,000,000 TRY
	≥ 250	Large	≥ 125,000,000 TRY	≥ 125,000,000 TRY
EU[2]	0-9	Micro	≤ 2,000,000 EUR	≤ 2,000,000 EUR
	10-49	Small	≤ 10,000,000 EUR	≤ 10,000,000 EUR
	50-249	Medium	≤ 43,000,000 EUR	≤ 50,000,000 EUR
	≥ 250	Large	≥ 43,000,000 EUR	≥ 50,000,000 EUR

Source: [1]Resmi Gazete, Regulation: 2018/11828, 2018, [2]European Commission, The New SME Definition, 2008

2. Materials and Methods

The study was carried out with descriptive research approach from quantitative research models. "The descriptive research approach is a basic research method that examines the situation, as it exists in its current state. Descriptive research involves identification of attributes of a particular phenomenon based on an observational basis, or the exploration of correlation between two or more phenomena." (Williams, 2007).

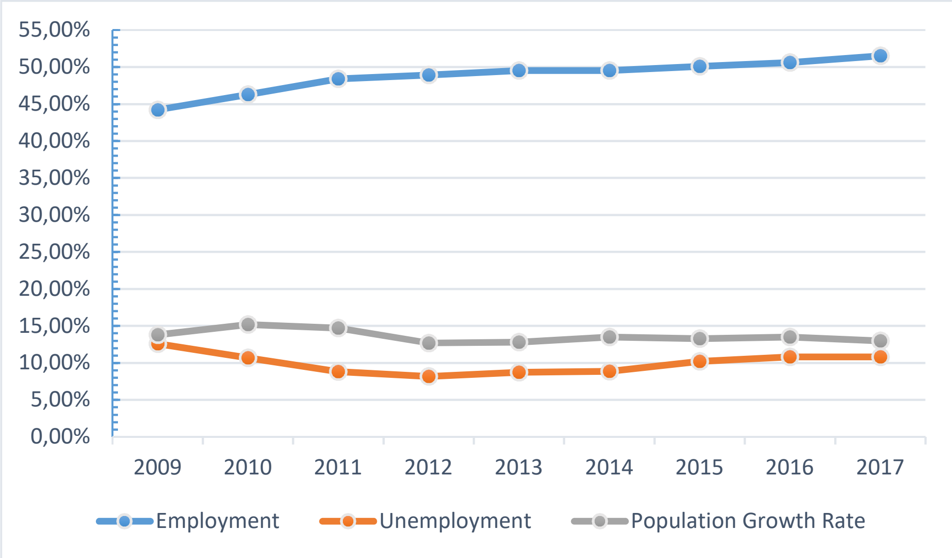
In this study, a few base criteria of many others has taken into consideration which has an impact on the economy in order to understand the impact of SMEs on Turkey's economy. These criteria are import, export, employment and unemployment.

Some of the used data was available in databases only from 2009 to 2014. We were only able to use data for import and export from 2009 to 2014 due to the lack of officially published data about Turkey.

Economic growth is defined as a positive change in the level of production of goods and services and the economic growth is good for job creation. According to the study which was published by The International Labour Organization (ILO) and the German Agency for International Cooperation (GIZ); "more than 50% of total employment creation in the formal business economy can be attributed to the smallest size classes (enterprises with 5 to 99 employees). This seems to be the case for the majority of all developing and emerging countries." (Kok, Deijl, and Essen, 2013),. We have tried to understand the impact of SMEs over the economic development in Turkey by comparing the rate of employment/unemployment in Turkey and employment of SMEs.

According to the founded data, average population growth rate of Turkey is 0.136. As a result of it, working age (15-64 years old) population growth rate is 1.2% (TUIK, 2017). On the other hand, unemployment rate in 2009 was 12.58% and the rate went below 10% between 2011 and 2014 as it is shown in Figure 1. In 2017, unemployment rate went up over 10% again and it was reached a peak of 10.8%. When the data was studied, it was seen that there was a continuous increase of the employment rate from 2009 to 2017. While it was 44.22% in 2009, it reached to 51.5% in 2017.

Figure 1. Employment, unemployment and population growth rate in Turkey



Source: The Organization for Economic Co-operation and Development, 2017

In order to understand whether the number of SMEs has an impact on the increase in employment in the country, the number of enterprises that are classified as SMEs and the number of employees of these enterprises are examined by using statistical data from 2009, 2014 and 2017. Table 3 shows that while the total number of SMEs in 2009 was 2.401.028, 7.311.440 people were employed by those enterprises. In 2014, the number of SMEs increased by 246,627 and their number of employment increased by 2,981,730. In 2017, the number of SMEs increased by 189,495 compared to 2014 and provided employment was increased by 763,790.

Table 3. Number of SMEs and number of employee in Turkey in 2009, 2014 and 2017

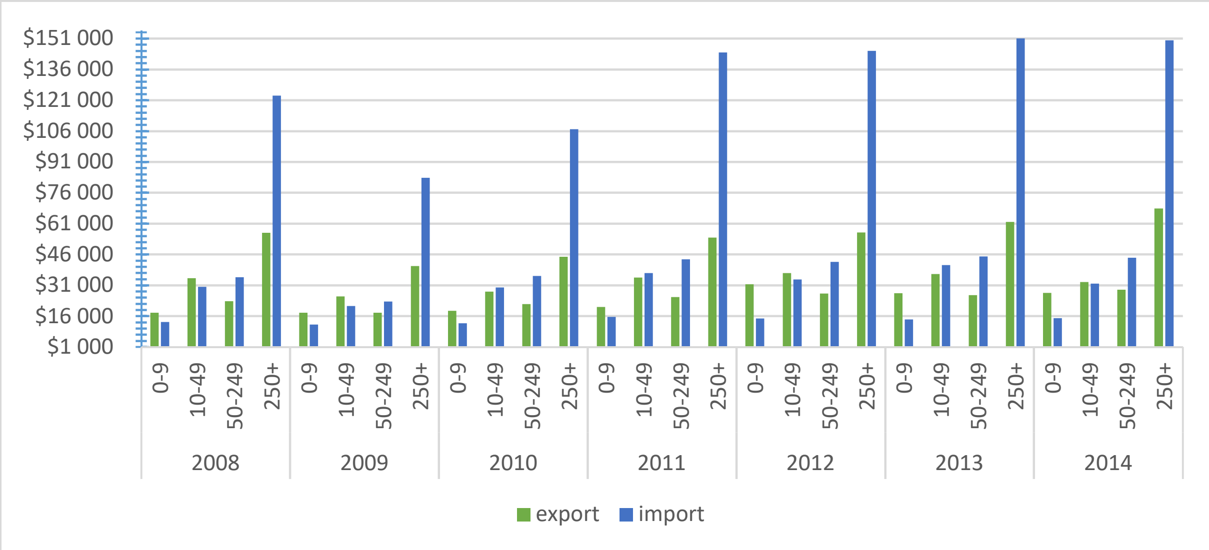
		2009		2014		2017	
		Number of Business	***Number of Employee***	***Number of Business***	***Number of Employee***	***Number of Business***	***Number of Employee***
Size of Enterprises	**0-9**	2.288.910	3.889.550	2.474.280	4.851.180	2.651.930	5.230.430
	10-49	97.503	1.946.820	148.779	2.977.100	158.325	3.131.950
	50-249	14.615	1.475.070	24.596	2.464.890	26.895	2.694.580
	250+	2.741	2.089.870	4.475	3.367.470	5.018	3.895.120

Source: The Organization for Economic Co-operation and Development, 2017

Another factors which has impact on the development of the country's economy were also analyzed. These factors are imports and exports. In Figure 2, total value of imports and exports of SMEs in Turkey from 2008 to 2014 were compared with large-sized enterprises in Turkey to understand the place of SMEs in the international market. When the data was analyzed, it was seen that the imports made by the large-sized enterprises are more than twice the export volume. On the other hand, it was seen that value of exports of SMEs were more than large-sized enterprises every year.

While the trade value of export of the SMEs in 2009 amounted to 60,675 million dollars, it was increased to 88,575 million dollars in 2014. On the other hand, while the trade value of imports in 2009 were 55,824 million dollars, this value was increased to 91,211 million dollars in 2014. When these values were taken into consideration, it is understood that there was a serious increase in imports as well as exports.

Figure 2. Export and import of enterprises by business size in Turkey (million US dollars)



Source: The Organization for Economic Co-operation and Development, 2014

3. Results and Discussion

When the data obtained from the available statistics are interpreted, SMEs in Turkey are providing much more employment than the large-sized enterprises. This situation seems like to be advantageous for the economy of the country. "In times of economic crisis and stagnation, companies chose to downsize (depending on the decrease in production) by reducing the number of people it employs in order to reduce costs." (Uzay, 2001). For developing countries which has unstable economy such as Turkey, this situation can become a disadvantage in this case of any economic crisis. Even EU which has the wealthiest and largest economy in the world was faced with this disadvantage during the European debt crisis. "In 2009, the worst crisis year, small companies witnessed the most sizable employment decrease, 3.4% against 2.7% for SMEs as a whole. Large companies fared slightly worse, with a 2.9% decrease in employment. The year 2010 saw a further decrease of 0.9% in SME employment, compared to a 0.6% decrease for large companies, which still meant a loss of more than 823,000 jobs in SMEs in the EU as a whole." (Gijsbers and al., 2012).

According to study which was done by Piskinsut E., "'According to the given statistics in 2011 by Turkstat (Turkish Statistical Institute), for the year 2008, SMEs have provided 78% of total employment level, 59% of total export (it is 60,1% in 2011)." (Piskinsut, 2011). As it is shown in our data, SMEs have provided 81% of employment and 56.4% of export in 2017. Although this situation shows that the number of employment has increased during years, it shows that SMEs couldn't reach an adequate level in foreign trade markets.

On the other hand, when we compare the export and import of SMEs with large-sized enterprises; it is observed that export of SMEs is more than large-sized enterprises. However, in order to understand the contribution of SMEs to the economy by their value of exports, it was compared with their imports. As a result, it was observed that the imports made by the SMEs were generally higher than the exports and they are not able to catch the expected profit margins.

4. Conclusion

When the data obtained from the available statistics are interpreted, the contribution of SMEs in terms of Turkey's economy and social development cannot be underestimated. SMEs has an importance in Turkey beside the large-sized enterprises in terms of number. It is observed that SMEs perform in many areas better than large firms. However, their share in exports is quite low. SMEs play a very important role in employment, the industrialization of the country, the development of economy and production.

Regulations should be made to improve the competitiveness and efficiency of SMEs in order to increase Turkey's competitiveness and the efficiency. The Government should be focusing on helping SMEs for reaching the world standards and take their places in the foreign trade by supporting financially and educating them. Small and medium-sized enterprises should be directed and informed about the loans provided by the European Investment Bank and the European Union funds. Entrepreneurs who do not have sufficient initial capital but has knowledge and entrepreneurial skills, should be encouraged.

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INDUSTRY CONCENTRATION AND COMPETITIVE ADVANTAGE: EVIDENCE FROM THE EU DAIRY INDUSTRY

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Annotation: The main aim of this paper is to investigate the relationship between industry concentration and competitive advantage of the dairy industry in the EU countries. The research was based on data of the European Statistical Office (Eurostat). Descriptive analysis, correlation analysis and panel data analysis were employed in the research. The time frame for the analyses covered the years from 2008 to 2016. The impact of market concentration on competitive advantage of the EU dairy industry appeared to be ambiguous. On the one hand, it was noticed that the higher industry concentration is observed, the more positive trade balance is recorded. On the other hand, correlations based on the fixed effect and trend adjusted data, as well as results obtained using dynamic panel models suggest a negative relationship between concentration and comparative advantages. The EU dairy policy implemented in 2008-2015 seems to have disturbed the nature of the examined relationship.

Key words: industry concentration, market power, competitive advantage, dairy industry, European Union

JEL classification: L66, Q13, Q17

1. Introduction

Trade liberalisation and economic integration affect decisions of enterprises on where to locate their operations and where to sell their products. Therefore, significant changes in the geographical location of production and processing, together with changes in market structures are observed on agri-food markets. The structure of industries changes in two major ways. Some external factors, such as mergers and acquisitions, as well as a firm's rate of internal growth influence industry concentration. Since the early 1980s, an extensive merger activity has taken place both in the food processing industry and the retail sector, making them more and more concentrated (Rogers, 2001; Clarke et al., 2002; McCorriston, 2002; Dobson, Waterson and Davies, 2003).

Classic theories of imperfect competition suggest that high industry concentration contributes to market power of large enterprises, resulting in lower competition, higher prices and welfare losses (Cf. Clarke, Davies and Waterson, 1984; Blažková, 2016). Basically, market power is defined as the ability of a firm or a group of firms to raise the price of a good or service above the competitive level (Kutlu and Sickles, 2012). As it was observed by Morrison (2001), concentration allows firms remaining in the industry to take advantage of their market position – to use their market power to depress prices to input suppliers, or elevate prices to consumers of the final product. To determine this situation Swinnen and Vandeplas (2010) used the term "double market power". The existence of a positive relationship between food retail prices, profits, price-cost margins and concentration was proved by Lamm (1981) and Aalto-Setälä

(2002). The results of these studies are consistent with Bain's (1956) considerations that high concentration implies fundamental market inefficiencies.

However, a greater industry concentration does not necessarily mean high market power. When leading to the use of economies of scale and having a positive impact on productivity, costs of the enterprises, and consumer prices, higher concentration may improve welfare and raise the competitive position of a particular industry (Cf. Blažková, 2016). A positive concentration-efficiency relationship across industries was proved by Clarke et al. (2002), while Gaudin (2018) showed that higher concentration of food retailing markets does not always have to be associated with higher prices. Also Porter (1990) presented statements in line with the efficiency theory. According to Pulak and Neha (2012), it means that mergers and acquisitions are executed to reduce costs by achieving scale economies and to enhance productive efficiency through a better allocation of resources leading to lower prices and hence greater allocative efficiency.

As Porter (1980) mentioned, agribusiness becomes more competitive through cost leadership and/or product differentiation. More specifically, technologies affecting the productivity of labour and capital, input costs, production economies, product quality and enterprise differentiation, advertising and promotion, along with some external factors are the primary sources of competitiveness on domestic and foreign markets (Harrison and Kennedy, 1997). Competitiveness of the food industry and its individual sectors may be simply defined as the ability to achieve profitable gain and market share in domestic and export markets, in which the industry is active (Wijnands et al., 2008). It can also be said that the competitive food industry has the ability to profitably sell its products on the international market (Brinkman, 1987). This viewpoint is consistent with the opinion by Krugman (1994), who indicated that measuring competitiveness on foreign markets does not make sense if the activity of a given industry focuses almost entirely on the domestic market. When measuring international competitiveness, trade related indicators, including export market share, trade balance or revealed comparative advantage, are typically ex-post measures, useful to demonstrate the competitive position of a country or a sector of the national economy.

Due to some degree of market failure or abuse of market power, manufacture of dairy products is one of the most unique industries within the EU food processing sector. The dairy industry plays a crucial role in the EU agri-food economy, accounting for 17 % of the turnover and 9 % of the number of employees in the total food industry in 2017 (Eurostat, 2019). The EU is also a key player in the world dairy market. In 2016 it produced a quarter of the world's available milk and had a 27 % share in global dairy exports (Eurostat, 2019). Only in part the EU holds this position due to the EU dairy policy regime aimed at supporting dairy producers and protecting the Single European Market (SEM) through trade barriers. Increased participation in the world dairy market is also connected with the expansion of EU milk production after the March 2015 quota abolition encouraging the export of the surplus supply of dairy products outside the EU (Mach, Hošková and Thompson, 2017). Having this in mind, the question arises what is the level of concentration in the EU dairy industry and whether it affects the competitiveness of this industry in the SEM framework. A previous study on market power in the European dairy industry by Čechura, Žáková Kroupová and Hockmann (2015) was based on a mark-up model and the application of the stochastic frontier methodology. The results showed that the abuse of oligopoly market power is not large and since the mark-up distribution is skewed toward lower values, a majority of milk processors are characterized by only a small or almost no degree of market power. However, there are some companies (around 10 %) that reach a considerably high mark-up. In this context, the main aim of this paper is to investigate the relationship between industry concentration and competitive advantage of the dairy industry in the EU countries using aggregate country data.

2. Materials and Methods

The research was based on data of the European Statistical Office (Eurostat). In accordance with the statistical classification of economic activity in the EU (NACE), manufacture of dairy products includes the operation of dairies and cheese making, and manufacture of ice cream (NACE C105). The time frame for the analyses was determined by the availability of comprehensive, internationally comparable data and thus covered the period 2008-2016.

To estimate a competitive advantage in the EU dairy industry we used the following measures: export/import ratio (Ex/Im), revealed comparative advantage index (RCA), relative import advantage index (RMA), revealed symmetric comparative advantage index (RSCA) and trade balance index (TBI). More details on the construction and interpretation of the above-mentioned indexes can be found in Benesova et al. (2017). Due to the lack of country data on concentration ratios (CR) or Herfindahl-Hirschman Indexes (HHI) we applied two simple indicators to measure concentration in dairy industry. The first one was the share of large companies (employing over 250 people) in the total turnover of dairy industries (C1). The second one was the share of large companies in the total employment of dairy industries (C2). Both types of variables constitute an unbalanced panel data frame.

To study relationships between competitive advantage and concentration levels descriptive analysis, correlation analysis and dynamic panel models were employed in the research. Due to autocorrelation problems related with the lack of reliable control variables and persistence of economic phenomena a dynamic linear panel model was applied. It can be represented as follows:

$$y_{it} = \alpha y_{i,t-1} + X_{it}\beta + \eta_i + \varepsilon_{it} \tag{1}$$

where y_{it} is the observation on the dependent variable for cross-sectional unit i in period t, X_{it} is a 1×k vector of independent variables, β is a k×1 vector of parameters, α is an autoregressive parameter, and ε_{it} is an error term specific to unit i in period t. To estimate equation (1) a two-step difference estimator (GMM-DIFF) of Arellano and Bond (1991) with finite-sample corrections of Windmeijer (2005) was applied.

3. Results and Discussion

Table 1 presents an average concentration and competitve advantage measures in the manufacture of dairy products in the EU countries in 2008-2016 (a selected set of countries was determined by the availability of data). The greatest concentration of economic activity was observed for the dairy industry in Finland, Sweden, Lithuania and Croatia, where the share of large companies (employing over 250 people) in the total turnover of dairy industry amounted to at least 80 %, while their share in the total employment of dairy industry ranged between 68 % and 85 %. Dairy enterprises in Germany and the Netherlands ranked next. Among the above-mentioned countries only Lithuania and Germany showed the comparative advantage (RSCA>0) and kept a positive trade balance (TBI>0 and Ex/Im>1). Finland reached comparative advantages; however, it did not run export specialisation (TBI<0 and Ex/Im<1). A relatively high both comparative advantage and trade surplus accompanied by an average level of concentration measures were reported for Ireland, France, Austria and Latvia. The lowest concentration of economic activity in the manufature of dairy products was recorded in Bulgaria and Italy. These countries had no revealed comparative advantage (RSCA<0) and they were net importers of dairy products (TBI<0 and Ex/Im<1).

In the light of information available in Table 1 it can be noted that countries with a higher level of concentration are characterized by a slightly higher level of comparative advantages in trade. This is reflected in the positive correlations between variables representing the level of concentration and the level of comparative advantages (Table 2). Such a relationship may be spurious and results from other factors related to, among other things, the inability to demonstrate comparative advantages when faced with the milk quotas binding. To overcome potential spurious relationships the correlation coefficients were calculated for data corrected for fixed effects with the use of Least Square Dummy Variables (LSDV) and for trend corrected data with the use of 1st differences. Now it can be noted that the increase in concentration is accompanied by deterioration of comparative advantages (Table 2). Similar observations in the Indian manufacturing sector were made by Pulak and Neha (2012), while Porter (1990) already mentioned that lower concentration can be conducive to improving export competitiveness through innovation.

Table 1. Average concentration and competitive advantage measures in the manufacture of dairy products in the EU countries in 2008-2016

Country	C1	C2	Ex/Im	RCA	RMA	RSCA	TBI
Bulgaria	0.21	0.14	0.50	0.36	0.86	-0.47	-0.34
Italy	0.30	0.23	0.51	0.86	1.30	-0.08	-0.33
Spain	0.54	0.54	0.43	0.30	0.30	-0.54	-0.40
Greece	0.54	0.53	0.45	1.03	1.57	0.00	-0.39
Belgium	0.55	0.59	0.88	0.91	1.28	-0.05	-0.07
Latvia	0.57	0.39	1.24	1.41	0.66	0.17	0.11
Romania	0.59	0.41	0.19	0.18	0.66	-0.69	-0.68
Ireland	0.60	0.64	2.44	1.87	0.93	0.30	0.41
France	0.61	0.61	1.53	1.25	1.25	0.11	0.21
Portugal	0.63	0.39	0.39	0.64	0.85	-0.23	-0.44
Austria	0.63	0.55	1.40	1.32	0.77	0.14	0.17
Poland	0.66	0.58	2.19	0.83	0.51	-0.10	0.35
United Kingdom	0.68	0.61	0.37	0.78	0.85	-0.12	-0.46
Hungary	0.69	0.59	0.80	0.42	0.77	-0.41	-0.11
The Netherlands	0.72	0.64	1.56	0.67	0.93	-0.20	0.22
Germany	0.72	0.72	1.29	1.42	1.42	0.17	0.12
Croatia	0.81	0.68	0.12	0.23	0.76	-0.63	-0.79
Lithuania	0.83	0.78	1.83	1.51	0.71	0.20	0.28
Sweden	0.84	0.82	0.29	0.49	1.01	-0.35	-0.55
Finland	0.85	0.85	0.49	2.01	2.01	0.33	-0.35

Source: EUROSTAT, 2019; own calculations

Table 2. Correlation coefficients between concentration and competitive advantage measures in the manufacture of dairy products in the EU countries in 2008-2016

Transformation	Levels		LSDV		1st diff	
Variables	**ln(C1)**	**ln(C2)**	**ln(C1)**	**ln(C2)**	**ln(C1)**	**ln(C2)**
ln(Ex/Im)	0.068	0.182	-0.230	-0.286	-0.121	-0.140
ln(RCA)	0.134	0.237	-0.110	-0.155	-0.087	-0.139
ln(RMA)	-0.028	0.065	0.021	-0.065	0.080	-0.019
RSCA	0.151	0.246	-0.112	-0.157	-0.106	-0.164
TBI	0.115	0.220	-0.263	-0.305	-0.130	-0.150

Source: EUROSTAT, 2019; own calculations

In the next step several versions of dynamic panel models were estimated. The dependent variable was the level of comparative advantages (Ex/Im or TBI) and the independent one constituted the concentration level (C1 or C2). In addition, two control variables were taken into account as explanatory variables, which apparently should be of key importance for foreign trade in dairy products. The first one was domestic demand represented by the disposable income of households. The second one were milk procurement prices, which, as we know, are to a large extent derived from the prices of processed products (no information was available on industry prices). Attempts to estimate models with fixed effects failed, because model residuals showed a significant autocorrelation. Therefore, dynamic panel models were used, in which the delayed dependent variable represents the effect of omitted variables and the lack of immediate adjustments in the sector. Estimated models (Table 3) can be considered correct ones, as indicated by the absence of second-order autocorrelation (AR2) and validity of the instruments applied (Sargan test).

Table 3. Panel model estimation for selected competitive advantage measures in the manufacture of dairy products in the EU countries in 2008-2016

Dependent variable: ln(Ex/Im)								
Independent variables	**Coeff.**	**p-val.**	**Coeff.**	**p-val.**	**Coeff.**	**p-val.**	**Coeff.**	**p-val.**
Const.	0.007	0.203	0.012	0.102	0.001	0.720	0.003	0.660
ln(C1)	-0.282	0.000	-0.325	0.000	–	–	–	–
ln(C2)	–	–	–	–	-0.409	0.027	-0.443	0.099
ln(Income)	–	–	-0.161	0.598	–	–	-0.034	0.900
ln(Price)	–	–	-0.178	0.038	–	–	-0.108	0.190
ln(Ex/Im)_1	0.862	0.000	0.806	0.000	0.848	0.000	0.833	0.000
Selected statistics								
AR(1)	-2.142	0.032	-1.900	0.058	-2.047	0.041	-1.930	0.054
AR(2)	0.572	0.567	0.455	0.649	0.863	0.388	0.813	0.416
Sargan test	15.332	0.965	11.174	0.997	13.176	0.988	12.966	0.990
Se	0.143		0.139		0.139		0.138	
Dependent variable: TBI								
Independent variables	**Coeff.**	**p-val.**	**Coeff.**	**p-val.**	**Coeff.**	**p-val.**	**Coeff.**	**p-val.**
Const.	0.002	0.276	0.006	0.024	0.000	0.964	0.002	0.282
ln(C1)	-0.099	0.010	-0.141	0.000	–	–	–	–
ln(C2)	–	–	–	–	-0.188	0.043	-0.201	0.082
ln(Income)	–	–	-0.131	0.183	–	–	-0.080	0.341
ln(Price)	–	–	-0.075	0.130	–	–	-0.051	0.178
TBI_1	0.882	0.000	0.720	0.000	0.840	0.000	0.785	0.000
Selected statistics								
AR(1)	-2.777	0.006	-2.051	0.040	-2.655	0.008	-2.479	0.013
AR(2)	-0.305	0.760	-0.625	0.532	0.129	0.898	-0.064	0.949
Sargan test	17.685	0.913	11.024	0.997	16.422	0.944	13.804	0.983
Se	0.056		0.052		0.054		0.053	

Source: EUROSTAT, 2019; own calculations

Generally, the coefficients for C1 and C2 variables were negative and statistically significant, indicating a negative influence of market concentration on the international competitiveness in dairy industries of individual countries (Table 3). The control variables had expected signs, but were usually non-significant. The lack of significance for parameters, as well as problems with finding appropriate control variables may result from the impact of milk quotas on the market. We need to bear in mind that in 2008-2015 milk quotas were being gradually eliminated, which may have disturbed the nature of the examined relationship.

4. Conclusion

The main goal of the research was to investigate the relationship between industry concentration and competitive advantage of the dairy industry in the EU countries. The review of economic theories and empirical studies does not explicitly indicate the nature of this relationship. The results of empirical research on the relationship between concentration in the dairy industry and comparative advantages are not definite. A simple analysis showed that countries characterized by a higher level of concentration in the dairy industry generate a better trade balance than countries with a lower level of concentration. Nevertheless, it may result from other factors and may be disturbed by the impact of dairy production quotation. The analyses performed with the use of data adjusted for country specific effects and trends reveal negative correlations between changes in concentration and changes in comparative advantages. The negative relationship between concentration and comparative advantages was also confirmed by results obtained from dynamic panel models. As the EU dairy policy implemented in 2008-2015 seems to have disturbed the nature of the examined relationship, a suggestion to reinvestigate this correlation in at least a mid-term perspective after the March 2015 quota abolition may be understood as a direction for future research. It is also possible that the analysis at the enterprise level rather than at the sector one would help us to verify the existence, strength and direction of the dependence in question.

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OPTIMIZATION MODEL OF FARM STAGES OF THE PORK MEAT SUPPLY CHAIN

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Annotation: The study provides DEA-ranking and benchmarking of pig meat production in 14 European countries, Brazil and USA in the period 2012 – 2017. One of the Czech SMEs involved in the pig production (named FARM), achieving excellent results, is assigned into the group for the comparison. The research concerns the analysis of the relative costs of the pig meat production and the physical performance up to farmgate level providing comparison and ranking of involved subjects and design of peer processes to improve the manufacturers' performance. The statistically significant correlation detected the links only in one case between “depreciation and finance” and “other variable costs” imputes. The DEA-excellent units are Brazil, USA and FARM, which represent peers for the other countries. The Nederland, Germany and Denmark are well ranked as well (the DEA score higher than 0.9), France, Spain, Belgian and Finland (the DEA score higher that 0.8). The EU average ranking reaches 0.85. The DEA-peer processing assigns each DEA-not-excellent country a set of peers and coefficients "λ" that enables to formulate the recommendations of the imputs´ changes in order to increase the effectiveness of the production. The results can identify the critical success factors both for the countries and for the individual producers including SMEs. DEA procedure is an excellent approach to start mutual benchmarking involving European countries.

Key words: Pork meat production, physical performance of pig production, Data Envelopment Analysis, ranking, peer, decision-making unit.

JEL classification: Q13, C22

1. Introduction

The article follows the previous research concerning evolution of pig prices on the European swine market. The univariate time series model was used to analyse the position of the Czech Republic among other five European pig producers in the period 2010 – 2018 (Smutka at all., 2018). The research proved that there are considerable differences among producers.

In this study, we analyse the imputs and outputs of pig meat production in 14 European countries, Brazil and USA in the period 2012 – 2017. One big Czech pig producer (under name “FARM”), which achieves excellent results among other Czech producers, is assigned to a group of European countries for the comparison. The Data Envelope Analysis (DEA) models are implemented to analyse the effectiveness of the pigs production in the European countries to answer the question “how to change inputs to improve the effectivity of production”. In the different geographical conditions of Europe, costs of pig meat production and productivity of the physical performance up to farm-gate level are compare and ranked.

DEA is a non-parametric productive efficiency measurement method for operations with multiple inputs and multiple outputs. DEA models help to identify efficient ”decision-making unit” (DMU) and to construct efficient production frontier. DEA models measure the relative efficiency that is the efficiency of each DMU relative to best DMUs in the sample (“peer units”). Applying DEA in evaluating performance of a set of enterprises enables to form two clusters: enterprises that comprise an efficient frontier and inefficient enterprises lying below the frontier. One of the main advantages of the DEA model is that it allows incorporating multiple inputs and outputs. However, the choice of appropriate impute and/or output is sometimes more complicated for example the question “how to treat intellectual property – as inputs or outputs?”

According to recent study by Liu et al. (2013), Yang (2018), and Anon (2018) the largest areas of reported applications of DEA are banking, health care, transportation, education and agriculture. Between 1978-2010 overall, around two-thirds of DEA papers embed empirical data, while the remaining one-third are purely methodological. The applications that have the highest growth momentum recently are energy and environment as well as finance.

The DEA literature suggests several ways of dealing with applications in which DMUs have different specialisations or publication profiles. In agriculture, the problem of specialisation of farms is ubiquitous due to large number of possible farm outputs (Davis, 2017). In the same region, there are usually a variety of different crops and livestock products each produced only by a small farms and SMEs while the big farms may produce several common outputs only. The stronger position of large companies on the market influences the prices of the agricultural products. The bigger pig producers differs from standard farming producers because their production is highly specialised and similar to the industry. Small farmers produce in a disadvantageous competitive environment and have to subsidize the realization prices of products from other sources. Antle et al. (2017) look for solution of the DMU evaluation for the farms where a large number of different crops may be produced in a particular region only a and few farms actually produce each particular crop. The authors illustrate the approach in which various outputs of the production are related to the one main output in different regions of Turkey. Kuo et al. (2014) discuss environmental conditions, which have to be put among other efficiency economic factors at the same time, and which enlarge the number of DEA factors. Thus, the DEA models should respect both people’s request for living and environment conservation. Similar study present Picazo-Tadeo et al. (2011) and Coyne et al. (2015).

DEA operates also in the stochastic environment. For example, Sharma et al. (1997) examine the productive efficiency of a sample of swine producers in Hawaii by estimating a stochastic frontier production function and the constant returns to scale (CRS) and variable returns to scale (VRS) output-oriented DEA models.

Huguenin (2015) analyses the existing SW modules and argues that there are user-friendly and easily accessible SW to practitioners and decision makers. This makes the possibility to provide evaluation using several alternative models including environmental adjustments.

The aim of the research is comparison of performance of pork producers in 14 European countries, Brazil, USA, and one Czech farm (SME), in the period 2012 – 2017. Perform manufacturers' assessments using DEA models and design peer processes to improve manufacturers' performance leading to the recommendation on costs´ reduction and/or changing the structure.

2. Materials and Methods

1. The implemented methodology:

The methodology follows the work of Avkiran and Parker (2010) investigating key dimensions underlying the progress realized by DEA methodologies. The Data Envelope Analysis (DEA) are widely known and many times described. The formulas and computations in this study follow the publication Brožová, Houška and Šubrt (2014).

2. Data search and elaboration:

Searching and processing data from 14 European countries, USA, Brazil and one Czech pig producer (in the model called "FARM"). Utilizing DEA we operate with 6-years data averages (2012 – 2017) which make possible that producers are compared on the same scale. The averages of data were elaborated from the relatively detailed description of the production characteristics available in European *InterPig and EUROSTAT* databases. The data were transformed into the same units (day, kg, Euro), statistically treated and adjusted into the calculation tables. The structure of imputes and outputs follows the *InterPIG* methodology which elaborates data with some national differences in definition, but where this has occurred, the data has been adjusted in the most appropriate way.

3. Input and output data for DEA models:

The use of the European sources of data ensures that a farm structure in one nation is only compared to another nation with a similar structure. Pig production is characterized by multiple outputs and inputs. For the purpose of efficiency analysis, output is aggregated into one category: C*arcase meat production sow/year/kg*. The imputs are aggregated into four categories, namely: *Feed costs, Other variable costs, Labour costs, Depreciation and finance costs.*

4. Processing of data:

DEA models were estimated using the program "DEA-Solver-LV 8.0" (http://www.saitech-inc.com/index.asp) including 28 clusters of DEA and enabling solve models up to 50 DMU. To check the consistency of DEA results with traditional unit ratings models CCR and BCC will calculate the efficiency scores for each country. Countries with the same or very tight ranking will be clustered into groups. The operation may reduce the number of units.

5. Input data:

Table 1. Data for DEA ranking.

	(I) Feed	(I) Other variable costs	(I) Labour	(I) Depreciation and finance	(O) Carcase meat
Countries	Euro/kg/deadweights				Sow/year/kg
AUS	0.982	0.260	0.167	0.272	2 191
BEL	1.192	0.208	0.125	0.197	2 403
BRA	1.025	0.133	0.079	0.100	2 217
DEN	0.941	0.244	0.141	0.211	2 428
FIN	0.916	0.314	0.160	0.250	2 297
FRA	0.945	0.243	0.145	0.213	2 345
GER	0.969	0.291	0.145	0.235	2 494
GB	1.077	0.265	0.162	0.210	1 844

HUN	1.006	0.289	0.148	0.229	2 072
IRE	1.146	0.250	0.133	0.202	2 095
ITA	1.284	0.235	0.166	0.229	2 586
NL	0.951	0.329	0.150	0.203	2 586
SPA	1.037	0.217	0.096	0.137	1 978
SWE	1.013	0.240	0.188	0.394	2 167
USA	0.808	0.153	0.106	0.117	2 167
EU	1.031	0.266	0.147	0.225	2 447
ČR	1.141	0.449	0.150	0.127	2 068
FARM (ČR)	0.685	0.260	0.167	0.272	2 500

Source: InterPIG, EUROSTAT, VÚZE. Own data processing. Complete data, covering the period 2012 – 2017, are available on https://cevema.pef.czu.cz/.

Table 1 presents data, elaborated for the DEA ranking procedure. Average values, covering the period 2012 – 2017, summary the financial performance: *Euro/kg deadweight for imputes (I)* and *carcase meat production sow/year/kg for outputs (O)*. The data present the relative average costs of production within each country and makes to provide an accurate comparison within 0.80 – 1.5 €/kg of deadweight. Full list of data is available on https://cevema.pef.czu.cz/.

3. Results and Discussion

First round of ranking

Efficiency scores, calculated for each individual country and the FARM, using CCR and BCC DEA models are presented in the Table 2. Models CCR(I) and CCR(O) give the same values.

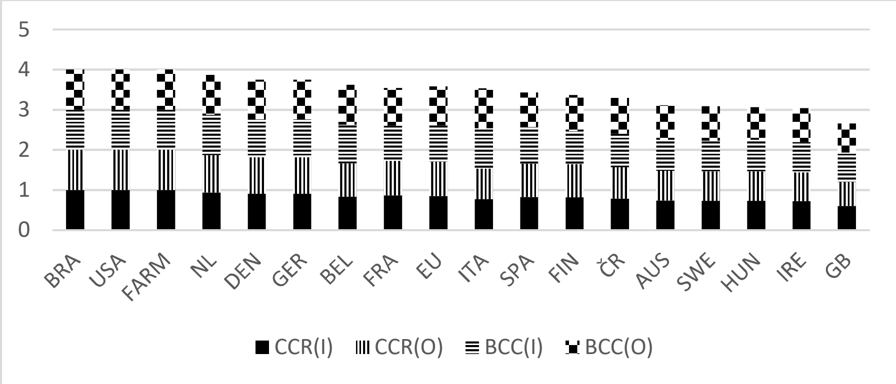
Table 2. Ranking of countries by CCR and BCC DEA models determined in < 0 – 1 scale >.

DMU		BRA	USA	FARM	NL	DEN	GER	BEL	FRA	EU
RANK GROUPS		PEERS - EXCELLENT			GOOD				AVERAGE	
CCR(I)	Score	1	1	0.9349	0.9072	0.9058	0.8309	0.8631	0.8525	0.8309
CCR(O)	Score	1	1	0.9349	0.9072	0.9058	0.8309	0.8631	0.8525	0.8309
BCC(I)	Score	1	1	1	0.9464	0.9509	0.9628	0.8708	0.9050	0.9628
BCC(O)	Score	1	1	1	0.9829	0.9834	0.9912	0.9455	0.9682	0.9912
Average score		1	1	1	0.9675	0.9359	0.9365	0.9040	0.8856	0.8946
Rank		1	1	1	4	5	6	7	8	9

DMU		ITA	SPA	FIN	ČR	AUS	SWE	HUN	IRE	GB
RANK GROUPS		AVERAGE				SUFFICIENT				
CCR(I)	Score	0.7677	0.8211	0.7828	0.7389	0.7325	0.7315	0.7211	0.6012	0.6012
CCR(O)	Score	0.7677	0.8211	0.7828	0.7389	0.7325	0.7315	0.7211	0.6012	0.6012
BCC(I)	Score	1	0.8249	0.8327	0.7742	0.7637	0.7836	0.7498	0.7276	0.7276
BCC(O)	Score	1	0.8935	0.8937	0.8594	0.8574	0.8133	0.8454	0.7250	0.7250
Average score		0.8839	0.8573	0.8402	0.8230	0.7779	0.7715	0.7650	0.7594	0.6638
Rank		10	11	12	13	14	15	16	17	18

Own data processing.

Figure 1. Distribution of ranking values among countries.



Own data processing.

The first round of CCR(I) and CCR(O) DEA procedure put into peers position Brazil, USA, and the FARM. BCC(I) and BCC(O) procedure selected into peers Brazil, Italy, The Nederland, USA and FARM. Practical experience with DEA model applications shows that BCC models give higher number of peer units and are more selective. The same is true in our case.

In DEA models, DMU with the same or very tight ranking usually are clustered into groups to reduce the number of units. Figure 1 demonstrates that score values separate countries well, are selective and there is no need to group countries into clusters.

Two CCR models and two BCC models were used to portion the countries into a subset of *DEA-efficient* and a subset of *DEA-non-so-efficient* producers in pig meat production, see Table 3.

Combining scores the ranking procedure makes enable to categorise countries into four domains, see Table 3.

Table 3. Ranking of countries into domains determined in < 0 – 1 scale >.

1	> 0.90	> 0.80	< 0.79
DEA-excellent	DEA-good	DEA-average	DEA-sufficient
BRA, USA, FARM	NL, GER, DEN, BEL	FR, ITA, SPA, FIN, ČR, EU	AUS, SWE, HUN, IRE, GB

Own data processing.

Table 3 illustrates, that among the EU countries, there were considerable differences between the highest-cost and the lowest-cost producers due to a combination of physical performance and input costs (feed, depreciation). The position of the Czech Republic among DEA-average group of DMU is worse than the excellent performance of one chosen farm.

Constituting of the reference sets for DEA-not excellent countries

DEA-peer processing assigns each *DEA-non-so-efficient* country a group of “peer countries”, which serve as benchmarking pattern for realisation of changes in organisation of imputes.

The analysis of production efficiency in each of the 17 DMU was performed separately. The computations were performed using DEA-SOLVER-LV8. *As an example*, the optimal solution for CCR(I) model presents Table 4.

The reference set contains three DEA-excellent peers: Brazil, USA and FARM (see Table 2 and Table 4) who originate the DEA excellent frontier. Other countries, being benchmarked with peers, should improve (i.e. lower) their costs to reach the efficiency frontier. Coefficients "λ" indicate the required degree of approach to assigned peer country. Computation of the new imputes is described in Brožová, Houška and Šubrt (2014).

We shall illustrate the procedure on two examples: how to improve impute costs to reach the DEA frontier and become DEA-excellent country.

1) Czech Republic is ranked as DEA-average producer. Two peers, Brazil and USA originate the DEA frontier, coefficients "λ" are 0.619 for Brazil and 0.321 for USA (Table 4). Table 1 presents Feed costs for Brazil (1.025 €), USA (0,808 €) and Czech Republic (1.141 €). The Czech Republic should *reduce Feed costs* from 1.141 € to value 0.619·1.025 + 0.321·0.808 = 0.89 €, e.g. reduce Feed costs by 21%.

Table 4. Peer reference in CCR(I) model for DEA-not excellent countries.

DMU	DEA-Score	lambda 1	Peers	lambda 2	Peers	Feed	Other	Labour	Depreciation	Carcass meat
		Reference set of peers and λ				Recommended costs				Output
AUS	0.74	0,585	USA	0,370	FARM	0.73	0.19	0.12	0.17	2 191
BEL	0.83	0,476	BRA	0.622	USA	0.99	0.16	0.10	0.12	2 402
BRA	1									
DEN	0.91	0.882	USA	0.207	FARM	0.85	0.19	0.13	0.16	2 428
FIN	0.82	0.574	USA	0.421	FARM	0.75	0.20	0.13	0.18	2 297
FRA	0.86	0.809	USA	0.236	FARM	0.82	0.19	0.13	0.16	2 345
GER	0.91	0.908	USA	0.210	FARM	0.88	0.19	0.13	0.16	2 494
GB	0.60	0.664	USA	0.162	FARM	0.65	0.14	0.10	0.12	1 844
HUN	0.73	0.784	USA	0.149	FARM	0.74	0.16	0.11	0.13	2 072
IRE	0.72	0.228	BRA	0.734	USA	0.83	0.14	0.10	0.11	2 095
ITA	0.77	0.112	BRA	1.079	USA	0.99	0.18	0.12	0.14	2 586
NL	0.93	0.884	USA	0.303	FARM	0.89	0.21	0.14	0.18	2 586
SPA	0.83	0.601	BRA	0.298	USA	0.86	0.13	0.08	0.09	1 978
SWE	0.73	0.693	USA	0.266	FARM	0.74	0.18	0.12	0.15	2 167
USA	1									
EU	0.85	0.976	USA	0.133	FARM	0.88	0.18	0.13	0.15	2 447
ČR	0.78	0.619	BRA	0.321	USA	0.89	0.13	0.08	0.10	2 068
FARM	1									

Own data processing.

2) Similarly for Hungarian producers is recommended to *reduce the Labour costs* from 0.148 € to value 0.784·0.106 + 0.149·0.167 = 0.108 €, i.e. reduce Labour costs by 27%, etc.

Similar evaluation will continue for all imputes and *DEA-non-so-efficient* countries.

4. Conclusion

This article´s main method for identifying best practises in pig production in 17 European countries and one Czech producer using DEA models is through use of benchmarking. This should be used to identify the critical success factors, over which producers of pigs and relevant other stakeholders or initiative has some control, in areas or processes which need to be to achieve the best outcomes achievements. The benchmarking tool in our methodological approach was DEA modelling. We stress that the greatest benefit of benchmarking is not the measurement of the DEA-excellence, but the learning effect of how best performance is achieved, i.e. through understanding best practices. This will be our future research.

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FARMERS BUSINESS SCALE RELATION WITH PRODUCT DIFFERENTIATION IN THE CZECH REPUBLIC

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Annotation: Two step cluster analysis was method for clustering the data, aiming to identify clusters, within examined farms, differing from the others in level of Product Differentiation and to proof, whether there is a significant relation within level of Product Differentiation, Scale of Business and Production Process & Conditions of examined farms. Primarily, data are clustered by "Business Scale", then by "Pure Effectiveness" and then, finally, by all variables. There was defined Product Differentiation in a simple way, as capability to reach higher profitability then other competitors in the same industry/conditions, without external support/subsidies. Product Differentiation validates ability to valorize product, i.e. to sell for higher price per physical unit, then competitor. It is not primarily focused inside production process effectiveness. There was developed unique performance indicator within this research, named Pure Effectiveness, aiming to evaluate Product Differentiation, i.e. effectiveness of business gross profitability, related to Total Output and to eliminate effects of subsidies on business. Primary data collected for FADN (Farmers Account Data Network CZ) represents 1 048 holding, representing 13 901 farms in the Czech Republic. Data for the research was delivered in aggregated level and after input cleaning there were 41 aggregated samples, each with 96 variables, characterizing each sample. The research results, there is not a significant relation within level of Product Differentiation, Scale of Business and Production Process & Conditions of examined farms. Higher "Pure Effectiveness" is dedicated, probably to those, who have better knowledge, skills, approach and will to succeed.

Key words: Business Scale, Product Differentiation, Effectiveness, Market Segmentation, Cluster Analysis

JEL classification: M31, Q13

1. Introduction

Prosperity and competitiveness of Czech agriculture in the European, as well as, in the global context is a significant actual and potential future problem and a challenge for individual entrepreneurs in this industry. According to the Czech Statistical Office, the estimated economic result of Czech agriculture in 2018 is a profit of CZK 16.5 billion. The result represents the third lowest business income within years 2011 to 2018 (CZSO, 2018). The industry is featured with results instability, generating increased pressure on farms, leading to search for new or more stable source of income. According to Porter (1980), cost leadership, differentiation, or focus strategies can generally be used to create sustainable competitive advantage. Niederhauser et al. (2008) states that more and more markets are demanding differentiated products. Thus, farmers and traders are looking for highly valorized products, i.e. differentiated ones, in order to increase revenues and profit. This fact is confirmed by Alvarez et al. (2018) and Baker et al. (2013) via proving of positive effect of increased Product Differentiation to increased revenue and profitability of company.

Porter (1980), Dickson and Ginter (1987), Robinson and Pearce (1988) Berkowitz et al. (2000) and Sporleder and Liu (2007) agree that Product Differentiation takes place when the product offered is perceived by the consumer to be different from the competitor. The differentiation can then relate to the features of the product itself, but also to other components of the marketing mix, that are completing product perception. Variables considered are for example price, packaging quality, labeling, branding practices (Nkari, 2016), marketing communication tools, long-term experience in entrepreneurship, etc. Dickson and Ginter (1987) document that the interdependence of market segmentation and product differentiation needs to be understood, and manufacturers must design their value chain back from the consumer by focusing on meeting their current and future needs. According to Brenes, Montoya and Ciravegna, (2014), this strategy attributes are: management quality, innovation capability, business scale, marketing capabilities and operational capabilities.

Higher product valorization, higher price per physical unit, then for competing one, is an evidence of accepting the Product Differentiation by buyer/consumer.

Iraizoz, Matthew, and Davidova (2007) states that there is significant diversity in the particular strategic approaches, executed by individual farms, and that there is poor consensus on what is cause of the point of difference and how it shall be analyzed. The most common way to understand and explain changes is to use farm typology or classification (common, generally valid EU typology, where farms are classified by type of farming, economic size classes). The rationale for farm typology will therefore depend on the ability to capture the differentiation of agricultural systems, showing the maximum amount of heterogeneity between types and achieving maximum homogeneity within each type or category (Köbrich, Rehman and Khan, 2003). Wilson, Harper and Darling (2013), McElwee and Smith (2012) and Iraizoz, Matthew, and Davidova (2007) agree on the need for a specific approach to farm segmentation, in order to provide information for potential policy recommendations and to lead to positive changes.

There are companies achieving significantly better economic results than the industry average, in contemporary agricultural sector. Question to analyze is whether these companies have some common features and how they differ from the others. The aim of the text is to identify segments of different farmers achieving above-average profitability in the given sector through product differentiation.

2. Materials and Methods

The research is based on 2017 FADN (Farm Account Data Network) data for the Czech Republic. A unique, tailor made output from the total FADN data had been executed. The sample does not statistically represent situation in the Czech Republic, nevertheless, the data represents 1 048 holding, representing 13 901 farms in the Czech Republic. Data for the research was delivered in aggregated level and after input cleaning there were 41 aggregated samples, each with 96 variables, characterizing each sample.

Two step cluster analysis, executed with IBM SPSS, was method for clustering the data, aiming to identify clusters, within examined farms, differing from the others and to proof, whether there is a relation between level of Product Differentiation, Scale of Business and Production Process & Conditions of examined farms clusters.

3. Results and Discussion

Business Scale Clustering

Clustering based on business scale generated clusters, based on size of the business.

Samples were firstly segmented based on Business Scale. Total output of the sample represented segmentation criterion for this purpose. Two step cluster analysis had generated five clusters in area of business scale. Silhouette measure of cohesion and separation was 0,8 (good result, according to IBM SPSS). Clusters are described in Table 1.

Table 1. Business Scale Clusters Distribution

		N	% of Combined	% of Total
Cluster	1	2	4,90%	4,90%
	2	5	12,20%	12,20%
	3	9	22,00%	22,00%
	4	9	22,00%	22,00%
	5	16	39,00%	39,00%
	Combined	41	100,00%	100,00%
Total		41		100,00%

Source: FADN, 2018 (data), Own research

There are described centroids with basic statistical measures, i.e. mean and standard deviation, for Business Scale Clustering in Table 2.

Table 2. Business Scale Clusters Centroids

		Total Output (CZK per Farm)	
		Mean	Std. Deviation
Cluster	1	37 130 200	66 241
	2	24 845 581	2 800 928
	3	15 769 496	2 355 094
	4	8 551 735	1 652 656
	5	2 020 654	943 653
	Combined	10 968 533	9 979 649

Source: FADN, 2018 (data), Own research

Pure Effectiveness Clustering

Clustering based on Pure Effectiveness (definition in the text bellow) generated clusters of farms with similar Product Differentiation.

Prior to subsequent analysis, it was helpful to define Product Differentiation in a simple way. It was defined as capability to reach higher profitability then other competitors in the same industry/conditions, without external support/subsidies. Product Differentiation validates ability to valorize product, i.e. to sell for higher price per physical unit, then competitor. It is not primarily focused inside production process effectiveness. There was developed unique performance indicator, named Pure Effectiveness, aiming to evaluate Product Differentiation, i.e. effectiveness of business gross profitability, related to Total Output and to eliminate effects of subsidies on business. Equation is hereunder.

$$\text{Pure Effectiveness} = \frac{\text{Gross Farm Income} - \text{Balance Current Subsidies \& Taxes}}{\text{Total Output}}$$

Table 3 helps to more precise understanding of the performance indicator.

Table 3. Structure and Flow of FADN Data

<table>
<tr><td colspan="4">Total Output</td><td colspan="4" rowspan="2">Balance Current Subsidies & Taxes</td><td></td></tr>
<tr><td>Output Crops & Crop Products</td><td colspan="2">Output Livestock & Livestock Products</td><td>Other Output</td><td></td></tr>
<tr><td colspan="2">Intermediate Consumption</td><td colspan="6" rowspan="2">Gross Farm Income</td><td></td></tr>
<tr><td>Specific Costs</td><td>Farming Overheads</td><td></td></tr>
<tr><td></td><td></td><td colspan="2">Depreciations</td><td colspan="4">Farm Net Value Added</td><td>Balance Subsidies & Taxes on Investment</td></tr>
<tr><td></td><td></td><td></td><td></td><td colspan="3">External Factors</td><td colspan="2" rowspan="2">Family Farm Income</td></tr>
<tr><td></td><td></td><td></td><td></td><td>Wages</td><td>Rent</td><td>Interest</td></tr>
</table>

Source: FADN, 2018

Pure Effectiveness was segmentation criterion for another cluster analysis, using method of two step cluster analysis. Silhouette measure of cohesion and separation was 0,7 (good result, according to IBM SPSS). Clusters are described in Table 3.

Table 3. Pure Effectiveness Clusters Distribution

		N	% of Combined	% of Total
Cluster	1	11	26,83%	26,83%
	2	19	46,34%	46,34%
	3	6	14,63%	14,63%
	4	4	9,76%	9,76%
	5	1	2,44%	2,44%
	Combined	41	100,00%	100,00%
Total		41		100,00%

Source: FADN, 2018 (data), Own research

There are described centroids with basic statistical measures, i.e. mean and standard deviation, for Pure Effectiveness Clustering in Table 4.

Table 4. Pure Effectiveness Clusters Centroids

		Pure Effectiveness	
		Mean	Std. Deviation
Cluster	1	0,29	0,02
	2	0,23	0,03
	3	0,03	0,05
	4	-0,14	0,05
	5	-0,33	
	Combined	0,17	0,16

Source: FADN, 2018 (data), Own research

Final Clustering

Subsequently, clustering, based on 96 variables, featuring Production Process & Conditions of farms, generated segments with similar Production Process & Conditions.

All variables were segmentation criterions for final cluster analysis, using method of two step cluster analysis. Silhouette measure of cohesion and separation was 0,4 (fair result, according to IBM SPSS). Clusters are described in Table 5 (there are not centroids and cluster distribution for Final Clustering in the text, due to limited size of the text).

Table 5 Pure Effectiveness Clusters Centroids

Final Cluster	Type of Farming	Cluster Output Size	Cluster Pure Effecti-veness	Region	LFA	Total Output (CZK per Farm)	Pure Efecti-veness
1	Grazing Live-stock	5	2	Mid-Bohemia	not mountain	1 050 921	25,85%
			3	SouthWest	mountain	1 295 259	4,91%
					not mountain	2 164 490	6,99%
				Mid-Moravia	mountain	2 855 751	1,85%
				NorthWest	not mountain	1 402 936	-0,27%
				NorhEast	not mountain	991 595	-3,76%
			4	Moravia-Silesia	not mountain	3 314 612	-10,11%
				SouthEast	mountain	1 693 478	-9,28%
					not mountain	976 548	-15,46%
				NorhEast	mountain	1 061 867	-20,87%
			5	Mid-Moravia	not mountain	1 988 333	-33,28%
1 total						1 708 708	-4,86%
2	Field Crops	4	1	NorhEast	not in LFA	6 535 208	31,99%
				Mid-Bohemia	not in LFA	10 135 466	28,11%
				Moravia-Silesia	not in LFA	9 754 924	27,63%
				NorthWest	not in LFA	8 299 105	27,34%
			2	Mid-Moravia	not in LFA	10 598 267	23,63%
		5	1	SouthEast	not mountain	2 333 729	29,31%
			2	NorhEast	not mountain	1 673 314	24,33%
				SouthWest	not mountain	3 728 589	24,31%
				Mid-Bohemia	not mountain	2 105 908	23,36%
				SouthEast	not in LFA	3 693 142	21,61%
2 total						5 885 765	26,16%
3	Mixed	3	1	Moravia-Silesia	not in LFA	15 855 173	33,69%
			2	SouthEast	not mountain	15 227 144	24,70%
				Mid-Bohemia	not mountain	17 843 198	23,40%
					not in LFA	13 111 709	24,95%
		4	1	NorthWest	not in LFA	6 215 095	26,75%
			2	NorhEast	not mountain	8 662 544	22,05%
				SouthWest	not mountain	9 804 889	16,26%
					not in LFA	6 960 119	22,70%
3 total						11 709 984	24,31%
4	Mixed	1	1	Mid-Moravia	not in LFA	37 083 360	29,44%
			2	Mid-Moravia	not mountain	37 177 039	18,07%
		2	2	NorhEast	not in LFA	21 879 412	25,09%
				SouthEast	not in LFA	23 327 045	23,03%
			3	Moravia-Silesia	not mountain	29 323 444	10,56%
4 total						29 758 060	21,23%
5	Milk	2	1	NorhEast	not mountain	25 184 707	29,16%
			2	Mid-Bohemia	not mountain	24 513 299	25,67%
		3	1	SouthEast	not mountain	18 498 455	30,07%
				SouthWest	mountain	13 899 112	26,86%
			2	Mid-Moravia	mountain	12 997 411	26,16%
				NorhEast	mountain	15 042 961	25,69%
				SouthEast	mountain	19 450 298	24,42%
5 total						18 512 320	26,86%
Total						10 968 533	17,00%

Source: FADN, 2018 (data), Own research

Final clustering, based on all variables, lead to clusters, characterized by Type of Farming, i.e. common Production Process & Conditions. This fact is in-line with Iraizoz, Matthew, and Davidova (2007) and general farm segmentation framework (McElwee and Smith, 2012).

Table 6 shows centroids of Pure Effectiveness within each cluster defined by Final Clustering, i.e. based on particular Production Process & Conditions. There is high value of standard deviation, comparing to mean of each cluster. I.e. there are significant differences of Pure Effectiveness within each cluster, representing farms with similar Production Process & Conditions. This fact is in-line with Iraizoz, Matthew, and Davidova (2007).

Table 6. Centroids of Pure Effectiveness within Final Clusters

		Pure Effectiveness %	
		Mean	Std. Deviation
Cluster	1	-4,86	15,72
	2	26,16	3,21
	3	24,31	4,90
	4	21,23	7,24
	5	26,86	2,04
	Combined	17,00	16,01

Source: FADN, 2018 (data), Own research

The same result is valid for Business Scale, i.e. there is not a significant effect of Business Scale on level of Product Differentiation within analyzed farms.

Based on this evidence, there is not a significant relation within level of Product Differentiation, Scale of Business and Production Process & Conditions of examined farms.

This statement is in line with Iraizoz, Matthew, and Davidova (2007) stating, that there is significant diversity in the particular strategic approaches, executed by individual farms, and that there is poor consensus on what is cause of the point of difference and how it shall be analyzed and Brenes, Montoya and Ciravegna (2014) stating, the strategy attributes, leading to product differentiation are: management quality, innovation capability, business scale, marketing capabilities and operational capabilities.

4. Conclusion

There was defined Product Differentiation in a simple way, as capability to reach higher profitability then other competitors in the same industry/conditions, without external support/subsidies. Product Differentiation validates ability to valorize product, i.e. to sell for higher price per physical unit, then competitor. It is not primarily focused inside production process effectiveness. There was developed unique performance indicator within this research, named Pure Effectiveness, aiming to evaluate Product Differentiation, i.e. effectiveness of business gross profitability, related to Total Output and to eliminate effects of subsidies on business.

Variables, leading to identify segments are related to production conditions. I.e. final clusters internal homogeneity end external heterogeneity is based on Type of Farming. Nevertheless, within each identified segment, there is wide spread of Pure Effectiveness standard deviation in the clusters, from 2,04% up to 15,72%, leading to fact, there is not a significant relation within level of Product Differentiation, Scale of Business and Production Process & Conditions of examined farms.

In fact, it means, Type of farming and concrete environmental conditions of the farm does not limit the potential for Product Differentiation development. Higher effectivity is dedicated, probably to those, who have better knowledge, skills, approach and will to succeed.

There will be conducted following research for better and concrete understanding this situation in The Czech Republic.

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THE MOTIVATIONAL PROFILE OF QUINOA CONSUMERS IN MODERN METROPOLITAN LIMA, PERU

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Annotation: Peru is one of the main producers of quinoa in the world. Over the years, there has been a perceived growth in demand for this grain throughout the country, especially in Modern Metropolitan Lima. The identification of reasons for consuming quinoa besides the sensory and psychological aspects can help to understand from another perspective the decision-making behavior of the consumer. This understanding would provide better knowledge of the demand for quinoa in order to boost the level of the quinoa crop, which would benefit the economy in general, as quinoa production is mainly carried out by smallholders. Therefore, a questionnaire about the reasons for quinoa consumption was conducted with 458 respondents. Cluster analysis based on a five-factor result using an EFA with PCA method identified three consumer profiles: health concerned consumer, convenience oriented consumer and core consumer behaviour. Outcomes of the study can help to improve the marketing strategies developed by the Peruvian Government and the food companies.

Key words: Quinoa, consumption, motivational profile, EFA-PCA, Cluster Analysis, one-way ANOVA, Lima-Peru

JEL classification: Q13, M31

1. Introduction

Quinoa is a food grain that originated in the Andean region of South America and has now become popular worldwide due to its healthy image (IICA, 2015). In the Peruvian national market, the quinoa marketing chain is complex due to the intermediate agents (producers, collectors at different levels, local and regional retailers, local fairs, etc.) (IICA, 2015). However, quinoa production is predominantly an individual smallholder's activity, with no collective group, and these farmers struggle to meet stricter buyer demands for product quality, volume and timeliness of delivery across a range of agri-food sectors (Donovan and Poole, 2014). Therefore, it is imperative to determine the quinoa consumers' needs in order to boost supply. In recent years, the Peruvian consumer has shown great interest in Andean grains, mainly because of their multiple nutritional factors. In 2014, the domestic demand for these grains was more than 70 % of national production (Gestión, 2015). From 2000 to 2014, the per capita consumption of quinoa among the Peruvian population increased around 129 %, from 1.10 kg/person to 2.54 kg/person, respectively (MINAGRI, 2015). In the past, quinoa has generally been consumed in the Peruvian Andean zone; however, there has been a dramatic change in the distribution of consumption. For example, in 2013 in Lima, the Peruvian capital, and Callao, 85.4% of households declared that they consume quinoa (Andina, 2013).

Studies related to food choice reveal that non-sensory aspects have an impact on consumption decision-making (Carrillo et al., 2010; Rozin, 1996). The Theory of Planned Behavior (TPB) points out that intentions are assumed to capture the motivational factors that influence behavior, while the motivational factors reflect the willing of the person to perform the behavior (Ajzen, 1991). Thus, it is important to identify and understand the reasons behind quinoa consumption in order to design appropriate policies that target specific types of consumers and expand internal demand. The objective of this study is to determine the motivational profile of quinoa consumers in Modern Metropolitan Lima.

2. Materials and Methods

Primary data were collected through a survey carried out near specialized stores and supermarkets located in Modern Metropolitan Lima between April and September 2017. The sample involved 458 respondents who were approached randomly. The questionnaire consisted of questions about motivational factors for quinoa consumption measured on five-point Likert scales from 1 ("Totally disagree") to 5 ("Totally agree"). A review of previous studies related to food consumption was carried out in order to formulate the items used in the questionnaire (Verbeke and Vackier, 2005; Verbeke, Vermeir and Brunsø, 2007; Ragaert et al., 2004; Sveinsdóttir et al., 2009; Steptoe et al., 1995). The scales were obtained from the relevant literature in English and then translated to Spanish.

First, an Exploratory Factor Analysis (EFA) using Principal Component Analysis (PCA) method with Varimax orthogonal rotation was used to obtain the main factors that influence quinoa consumption. Then, an analysis of hierarchical clusters (HCA) with Euclidean distances and Ward's method was undertaken. Finally, a one-way Anova was carried out to compare the means among the different groups.

3. Results and Discussion

Food choice is defined by Johansen, Næs and Hersleth, (2011) as a complex process that is influenced by factors related to the product, the consumer and the context of consumption. In terms of the consumer, it includes knowledge, attitudes and beliefs. Thus, the motivations for consuming a particular food product, in this case quinoa, can be different among consumers. The TPB postulated by Ajzen (1985) was used for the analysis. The theory points out that the stronger the intention to carry out a certain behavior, the more likely it will happen, which assumes intention is a proxy for prediction of behavior and captures the motivational influences for performing the behavior (Ajzen, 1991).

In order to identify what motivates quinoa consumption, 24 Likert items were included in the EFA, obtaining a five-factor solution. The descriptive statistics as well as the factor loadings of the items are shown in Table 1. The Kaiser-Meyer-Olkin (KMO) statistic is 0.899 and the Bartlett's measure test's approximate chi-square is 4926.798 (df. 276; p-value <0.01). The Cronbach's alpha (α) test measures internal consistency, indicating how closely related a set of variables are as a group (Field, 2009), and all of the constructs present an α value higher than 0.6 (Table 2). The five constructs together explain 60.553% of the total variance.

Table 1. Varimax rotated component matrix for PCA

Items	Mean	Communalities	Health	Past Experience	Personal Norm	Convenience	Social Norm
Eating quinoa makes me strong	3.762	0.580	**0.767**	0.082	0.220	0.088	0.040
Eating quinoa stimulates the development of bones	3.998	0.653	**0.754**	0.194	0.135	-0.053	0.114
Eating quinoa reduces the risk of developing cancer	3.747	0.591	**0.742**	0.133	0.051	0.020	0.093
Eating quinoa stimulates brain development	3.825	0.640	**0.727**	0.142	0.122	-0.125	0.114
Quinoa contains many vitamins and minerals	3.948	0.536	**0.682**	0.205	-0.052	0.201	0.128
Eating quinoa reduces the risk of heart disease and coronary diseases	4.172	0.594	**0.657**	0.108	0.174	0.347	-0.009
Quinoa is good for my skin / teeth / hair / nails, etc.	4.070	0.535	**0.630**	0.092	0.202	0.297	0.015
Quinoa contains many proteins	3.762	0.567	**0.622**	0.118	0.354	0.055	0.085
I know that quinoa is healthy for me	4.175	0.590	**0.526**	0.070	0.455	0.317	0.019
I am familiar with preparing quinoa	3.234	0.699	0.126	**0.795**	0.213	0.073	0.016
I know a lot of quinoa species that can be prepared	2.987	0.676	0.068	**0.787**	0.099	0.147	0.143
I have much experience in buying quinoa	3.094	0.603	0.182	**0.718**	0.189	0.124	0.056
I am well informed about quinoa	3.162	0.562	0.203	**0.714**	0.025	-0.052	0.082
I can make several varieties of food based on quinoa	3.400	0.432	0.152	**0.509**	0.289	0.233	0.107
It is easy to prepare quinoa	3.618	0.544	0.174	**0.494**	0.408	0.319	0.039
To give my family a nutritious meal, I buy quinoa	3.620	0.517	0.220	0.240	**0.814**	0.100	0.179
To give my family a healthy meal, I buy quinoa	3.908	0.772	0.264	0.248	**0.763**	0.100	0.221
I buy quinoa to offer my family a varied meal	3.967	0.812	0.272	0.408	**0.523**	0.044	0.039
It can be bought in shops close to where I live or work	3.618	0.695	0.086	0.143	0.092	**0.809**	0.064
It is easily available in shops and supermarkets	3.913	0.681	0.126	0.095	0.078	**0.797**	0.120
It is easily accessible for me to buy quinoa	3.797	0.562	0.155	0.348	0.437	**0.469**	-0.073
My mate/close friend thinks that I should eat/buy quinoa	3.271	0.676	0.141	0.121	0.111	0.035	**0.792**
My friends thinks that I should eat/buy quinoa	3.269	0.561	0.140	-0.047	0.131	-0.017	**0.722**
The food industry encourages me to eat/buy more quinoa	2.969	0.457	0.023	0.187	0.020	0.139	**0.634**

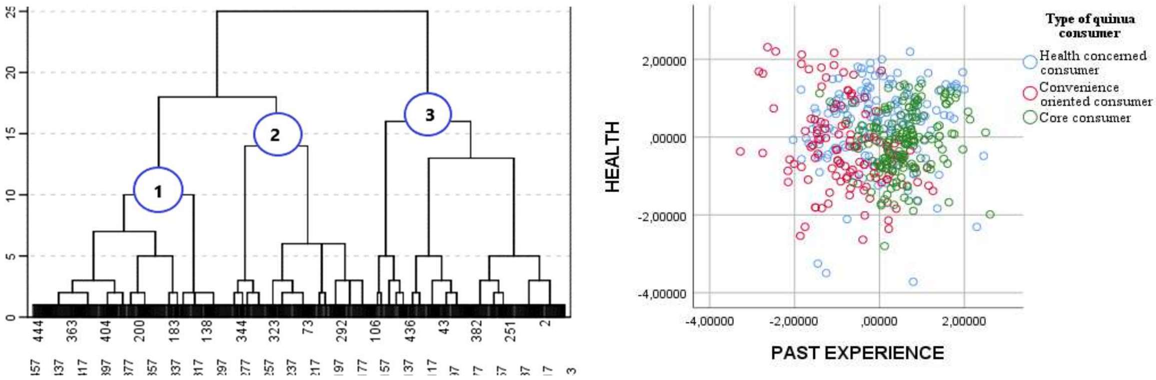
Source: Own elaboration based on primary data

Studies about food and food-related issues mention that product healthiness is one of the key factors in consumer perceptions (Niva, 2007). In addition, Pula, Parks, and Ross (2014) point out that health is a psychological motive that underlies everyday food choices. Therefore, the first factor obtained was labeled "Health" (α = 0.89). It includes items related to disease prevention and mental and physical benefits, as well as awareness of the relationship between food and health (Carrillo et al., 2011; Ragaert et al., 2004). The second factor "Past Experience" (α = 0.84) refers to the experience in preparing and buying quinoa. Theoretically, it means the way in which one can facilitate conditions that influence a certain behavior and encompasses related items of both quinoa preparation and quinoa knowledge (Verbeke and Vackier, 2005). Hence, the strong relationship between past behavior and motivation to repeat a behavior may be due to the belief that the past behavior was a reasonable action. If this behavior is well practiced, it is likely to be repeated, as it can be performed quickly and relatively effortlessly (Ouellette and Wood, 1998).

The third factor is "Personal Norm" (α = 0.70). This factor is one of the aspects within the concept of subjective norms of the TPB and refers to personal feelings of moral obligation or responsibility to behave or not in a certain way (Ajzen, 1985). An individual's internalized moral values are crucial for the decision-making process (Doran and Larsen, 2016). Quinoa consumers seem to feel responsible and committed to what they are feeding their family. In order to act according to their values, they are going to select a product that fulfils the characteristics of what they consider to be good for them, which is a nutritious, healthy and varied quinoa meal. The fourth factor is "Convenience" (α = 0.82) or accessibility, and is driven by a lifestyle where saving time in the preparation of food is valued (Carrillo et al., 2011). Moreover, Pula, Parks, and Ross (2014) found that convenience and familiarity are important factors for those people who have a relatively strong prevention focus. This factor implies, for instance, the availability of stores selling quinoa close to the places where consumers live or work. Finally, the last factor is "Social Norm" (α = 0.60), which includes social pressure to perform a behavior or not (Ajzen, 1991; Verbeke and Vackier, 2005). Quinoa consumers seem to care about what others say and how the opinions of others influence their consumption decisions (Doran and Larsen, 2016). The influence of family, friends and the food industry seems to play an important role in that final consumption decision.

Segmentation allows marketers to identify distinct market opportunities that can be exploited through effective marketing strategies that influence buying behavior (Dibb and Simkin, 1991; Peltier and Schribrowsky, 1997). Hence, profiling quinoa consumers into clusters is important for carrying out programs that target the specific requirements and needs of each segment. Thus, the factor scores obtained from the EFA were subjected to a hierarchical cluster analysis with the Ward method. Figure 1 shows the quinoa consumers grouped into three segments through the dendrogram (left) and according to the factors of Health and Past Experience, respectively (right).

Figure 1. Hierarchical Cluster Analysis Dendrogram (left) and quinoa consumers according to the factors Health and Past Experience (right)



Source: Own elaboration based on primary data

Subsequently, a one-way Anova analysis was used to determine if there are differences between consumers with respect to their main reason for consuming quinoa (Table 2).

Table 2. Profile of quinoa consumers based on their motivations

Factors	**α value**	**Profile of quinoa consumers**			**F**	**Welch (1)**	**Brown-Forsyth (1)**
		Health concerned consumer (35 %)	**Convenience oriented consumer (27 %)**	**Core consumer (38 %)**			
Health	0.89	4.05	3.79	3.94	5.11***		
Past Experience	0.84	3.15	2.78	3.68		63.92***	53.83***
Personal Norm	0.70	3.78	3.78	3.92		1.69 N.S	1.28 N.S
Convenience	0.82	3.44	4.05	3.89		24.80***	25.42***
Social Norm	0.60	2.53	3.37	3.63	110.94***		

Source: Own elaboration based on primary data
*Significance: ***p≤0.01, N.S. Non-significant*
(1) Welch and Brown-Forsyth procedures were reported because the assumption of homogeneity of variance was violated for certain variables (Field, 2009).

The first group of consumers is called the "Health concerned consumer" because it presents the highest value related to the health factor for consuming quinoa (mean = 4.050) than the other groups. It has the lowest value for the convenience factor (mean = 3.444) and social norm factor (mean = 2.526) of the three clusters. For these health concerned consumers, disease prevention is very valuable. Marketing campaigns aimed at this group should reinforce the idea of wellbeing and wellness for them and their family. The second group, "Convenience oriented consumer", are consumers who are mainly interested in an easy-to-prepare food and also in access to stores or places close by that sell quinoa. The convenience factor has a mean score of 4.048. The least important factor is past experience (mean = 2.779), which has the lowest score of the three clusters. For these convenience consumers, it is important to find quinoa products in supermarkets, markets and shops. Easy-to-cook quinoa food as pre-prepared food should help them to cook quinoa at home by heating it up in a microwave. Additionally, ready-to-eat quinoa snack bars can be attractive to these consumers, who can enjoy quinoa meals right away. Finally, the third group is the "Core consumer", who has experience and is familiar with quinoa food. This group particularly has high values for all factors. Marketing programs focused on core consumers should reinforce their innovative approach to consuming quinoa. New recipes and attractive products based on quinoa can help these core individuals to continue consuming quinoa in different innovative forms.

As quinoa is an important Peruvian native crop, the government should promote the attributes of quinoa among all Peruvian consumers, for instance, through social programs such as Qalli

Warma (the national food school feeding program especially designed for children who belong to the lower socioeconomic levels of the population) to prevent illnesses like anemia in children. Furthermore, industrial companies involved in the commercialization chain should develop communication strategies to promote quinoa meals and focus on each type of segment in the most efficient way. Also, entities related to food must carry out research to find innovative ways of offering the quinoa product (with regard to packaging, ready-to-eat meals and easy-to-cook food), while highlighting its nutritional characteristics and its Andean origin.

4. Conclusion

As quinoa production is carried out mainly by smallholders who need to be able to increase supply for their overall economic improvement, it is necessary to carry out actions that increase consumer demand. The study identified three profiles of quinoa consumers in Modern Lima based on their motivations and attitudes (health concerned consumers, convenience oriented consumers and core consumers). These results provide insights that the government and the industry could take into consideration in order to promote quinoa consumption.

The Peruvian Government should promote the attributes of quinoa to Peruvian consumers, especially the most vulnerable population who suffer from malnutrition. Additionally, the food industry can promote healthy, innovative and attractive ready-to-eat quinoa products as nutrition bars, quinoa porridge or quinoa-based soups and derivatives that can boost consumers' health and wellness.

Finally, even though psychological motivations are important for consumer behavior, other variables such as socioeconomic variables should be considered in future studies in order to obtain a complete profile of the quinoa consumer. It would also be interesting to analyse quinoa consumers in different geographical areas to broaden the scope of this particular study.

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TECHNIQUES OF ACCOUNTING AND EVALUATION OF FINAL PRODUCT MANUFACTURING IN MINOR AND MEDIUM-SIZE AGRICULTURAL COMPANIES AS EXEMPLIFIED BY RUSSIAN AGRICULTURAL COMPANIES

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Annotation: The article is aimed to analyze different cost accounting techniques of final product manufacturing in order to define and analyze some economic factors of agricultural company's efficiency. The following four techniques of final product evaluation are suggested: by incomplete (alternate) production cost, by total production cost, by standard production cost and by fair value net of sale costs.

An agricultural company has a right to choose one of suggested techniques independently and utilize it in its accounting procedure and practical accounting without modifications during one year. The abovementioned techniques were tested with data from medium-size agricultural companies of the Russian Federation.

Advanced and the most reasonable technique of all abovementioned ones is the last - evaluation of final product by fair value net of sale costs. Implementation of this technique combined with cost accounting system by direct production cost (direct-costing) allows identification and analysis of marginal and operating income from output of final products at production stage.

Evaluation of final product by fair value net of sale costs provides the most reasonable identification of such factors as workforce productivity, labor consumption etc.

Key words: managerial accounting, final agricultural produce, biological assets, fair value, cost accounting system, profit

JEL classification: M41,M11, Q12, Q14

1. Introduction

Agriculture has an important role in the national economy. It is a basis for food security and national health. However current condition of Russian agricultural companies is far from ideal. Such condition might be caused by poor climate conditions in different regions, insufficient financing and human recourses issues. Problem of efficient management of agricultural production was studied by some authors (Smutka et. al., 2016, Benesova et.al., 2017).

Correct assessment of final product manufacturing by agricultural companies is extremely important for making adequate management decisions. Inappropriate calculation technique leads to incorrect information in outer and inner accounting records of the company.

According to IFRS 41 "Agriculture", Agricultural produce is the harvested produce of the entity's biological assets. Biological assets are living plants and animals i.e. agricultural plants and animals. Gathered (obtained) agricultural produce in biological assets of plant and animal breeding are subdivided into main, related and secondary products in accounting to calculate production cost. These products are also subdivided by utilization into biological distributed stocks (fodders, bedding, seeds and planting stock and organic amendments) and final agricultural produce (grain, potato, milk etc.) Biological distributed stock is utilized in plant breeding production (seeds, planting stock and organic amendments) and animal breeding production (fodders and bedding). Final agricultural produce is sold to some customers except for small amount for companies' internal needs. (Brookfield, 2018).

Managerial accounting is aimed to analyze some cases, make decisions and research customer's request for information. It designates utilization of resources, generation of production cost and analysis of divergences from cost standards etc. Managerial accounting became production optimization tool. There are some points of view concerning realization of managerial accounting and its components (Alborov, Khoryziy and Kontsevoy, 2017, Lorinczova and Valder, 2015). Direct costing is one of some popular ways (Mowen, Hansen and Heitger, 2014). It is the most popular in Europe and the USA.

The key point of direct cost accounting system (direct costing) is that production cost comprises only direct costs which depend on production volumes and in the end of accounting period (month) fixed cost (for example managerial cost) is marked off the credit of the account «General business expenses» to debit side of the account «Sales». Output of final product is evaluated by incomplete (alternate) production cost and it is visible on the debit side of account «Final product» in correspondence with credit of the account «Production work». Accounting policy and practical implementation of direct cost accounting system (direct costing) and final product evaluation technique by incomplete «alternate» production cost help decrease labor consumption of cost accounting as distributed indirect overhead cost is reduced. Implementation of this policy also provides an opportunity for marginal analysis, production breakeven point establishing and optimization of sale prices of obtained final agricultural product.

Another method of managerial accounting i.e. total production cost system is quite popular in the Russian Federation, (Kontsevoy, 2015).

Total production cost system is the traditional system which states that both fixed and alternate components of production cost are included into total production cost of obtained product and being included for accounting purposes. This product is evaluated by total production cost. In case of total production cost accounting the account «Production work» is debited and the account for special items of cost (wages, materials, depreciation, suppliers, general business expenses). So the account «Production work» contains alternate and fixed production costs. Output of final product is evaluated by total production cost on the debit of the account «Final product» in correspondence with credit of the account «Production work».

Managerial accounting also represents information processes that helps inform finance management and control, strategy, and risk management.

The article is aimed to analyze different cost accounting techniques of final product manufacturing in order to define and analyze some economic factors of agricultural company's efficiency.

The abovementioned techniques were tested with data from medium-size agricultural companies (integrated agricultural production company "Kolos") of the Russian Federation.

2. Materials and Methods

We suggested different techniques for production cost evaluation of final product output.

Final product which was obtained and included for accounting purposes might be evaluated by :

A) direct (alternate) production cost,

B) total production cost,

C) standard production cost,

D) fair value net of sale costs.

Final product evaluation technique A) (by direct/alternate production cost) is implemented together with direct cost accounting system (direct costing) in accounting policy of the company. Agricultural companies use it very seldom as it requires subdivision of costs into constant and direct ones. Common accounting practice in the Russian Federation does not do this subdivision.

When the company has cost accounting system by total production cost the technique B for evaluation of final product is utilized. This type is used in agricultural companies quite often. It is easy but less informative.

The last two techniques C and D might be used for fair value cost accounting system in agricultural companies. The technique C was used in the USSR and post-Soviet time very often. The company establishes valuation prices and keeps them for a long time. The produce is received and given for a warehouse by these prices. When all costs are generated and value of interprocess stock is known they calculate difference between planned and actual production cost in the end of the month.

The technique D by fair value net of sale costs will be decided later.

However in this case accounting of final agricultural product should be made with the account «Product (work, service) release» and the following accounting records should be left (Table 1).

Table 1. Debit and credit side effects

№	**Debit**	**Credit**
1	Final product	Product (work, service) release by fair value net of sale costs
2	Product (work, service) release	Production work
3	Sales	Product (work, service) release

Source: Authors' construction

1) output of final agricultural product is included by fair value net of sale costs: debit of the account «Final product», credit of the account «Product (work, service) release»;

2) actual production cost of final agricultural product is calculated and recorded by the end of accounting period: debit of the account «Product (work, service) release», credit of the account «Production work»;

3) revealed divergence at the account «Product (work, service) release» is written off as profit (positive divergence) or cost (negative divergence): debit of the account «Sales», credit of the account «Product (work, service) release» - reversing entry, profit over the period, debit

of the account «Sales», credit of the account «Product (work, service) release» - cost over the period (Alborov, Khoryziy and Kontsevoy, 2017).

Advanced and the most reasonable technique of all abovementioned ones is the last D i.e. evaluation of final product by fair value net of sale costs. Implementation of this technique combined with cost accounting system by direct/alternate production cost (direct-costing) allows identification and analysis of marginal and operating income from output of final products at production stage (Kontsevoy, 2015).

We suggested following economic factors for analyzing of agricultural company efficiency – profit margin, operation profit (loss), total revenue of final agricultural product, net operation income, workforce productivity.

Combination of fair value technique with direct/alternate production cost accounting system (direct costing) provides an opportunity for calculation and analysis of profit margin and operating profit from output of this product at production stage by formulae:

$$PM = FV - DPS \quad (\mathbf{1})$$

Where FV – fair value net of sale cost of final agricultural produce, thou. RUB,

DPS – direct production cost of final agricultural produce, thou. RUB;

PM – profit margin (gross profit) from production of final agricultural produce, thou. RUB;

$$OP(L) = PM - FPS \quad (\mathbf{2})$$

Where FPS – fixed production cost of final agricultural produce, thou. RUB.;

OP(L) – operating profit (loss) from production of final agricultural produce, thou. RUB

Combination of technique D) with traditional total production cost accounting system allows calculating and analysis of such economic factors as total revenue and net operating income. The following formulae are used for calculation of these factors:

$$TR = FV - MC - BC \quad (\mathbf{3})$$

Where MC – material cost of final agricultural product, thou. RUB.;

BC – biological cost of final agricultural product, thou. RUB.;

TR – total revenue of final agricultural product, thou. RUB.;

$$NOI = TR - SC - FCEP \quad (\mathbf{4})$$

Where SC – cost for salary of the staff involved into production of final product, thou. RUB.;

FCFP – financial cost of final product, thou. RUB.;

NOI – net operating income of final product, thou. RUB.

Evaluation of final agricultural product by fair value net of sale expenses (evaluation technique D) provides the most reasonable calculation of such economic factors as workforce productivity, labor consumption etc. Workforce productivity of final product manufacturing (WFP) is calculated by the following formula:

$$WFP = FV : DLS \quad (\mathbf{5})$$

Where DLS – direct labor cost of final product manufacturing, thou. man-hour.

As it is abovementioned final agricultural produce might be evaluated in some ways. The first three ways are classic and described in some sources in details. This article is focused in the last way «fair value net of sale cost» which is relatively new and is not described in sources well.

3. Results and Discussion

Agricultural company has a right to choose one of suggested techniques independently and utilize it in its accounting procedure and practical accounting without modifications during one year. Formulas (1) and (2) were used for profit margin and operation profit (loss) with fair value modification.

Example: in integrated agricultural production company «Kolos» production of grain is 175957 hwt, fair value net of sale costs – 169305 thou. RUB, potato 28608 hwt fair value net of sale costs – 19527 thou. RUB, milk 191314 hwt, fair value net of sale costs – 414255 thou. RUB. Total gross output FV = 169305 + 19527 + 414255 = 603087 thou. RUB. Direct cost for total final product DPS = 302649 thou. RUB, fixed cost for total final product FPS = 62911 thou. RUB. According to this data profit margin PM = 603087 – 302649 = 300438 thou. RUB, operating profit (loss) OP(L) = 300438 – 62911 = 237527 thou. RUB.

Formulas (3) and (4) were used for total revenue of final agricultural product, net operation income with fair value modification.

Example: in abovementioned company material cost of grain production is 40138 thou. RUB., biological cost – 5675 thou. RUB., cost for salary of the staff – 13129 thou. RUB., financial cost – 800 thou. RUB., fair value of obtained grain net of sale expenses– 169305 thou. RUB.

According to this information total revenue of grain production is TR = 169305 – 40138 – 5675 = 123492 thou. RUB., net operating income NOI = 123492 – 13129 – 800 = 109563 thou. RUB.

Formula (5) was used for direct labor cost of final product manufacturing.

Example: in integrated agricultural production company «Kolos» direct labor cost of production of grain, potato and milk is DLS = 446 thou. man-hour. Hence, workforce productivity is WFP = 603087 : 446 = 1352,2 RUB.

The advantage of the proposed methodology in the article is that this method allows analyzing and evaluating the profit margin and operating profit (loss) from the agricultural produce at the production stage. It allows making production stage optimization just in time.

Reciprocal factor of workforce productivity is labor consumption of final product manufacturing. This formula help calculate workforce productivity per one person by dividing fair value net of sale expenses by staff headcount involved into manufacturing of final product. All presented formulae might be used for calculation of all abovementioned factors for both total revenue and its specific types and groups.

Nevertheless necessity of managerial accounting implementation in agricultural companies is discussion question.

In the Russian Federation managerial accounting is not necessary so the vast majority of agricultural companies, especially minor- and medium-sized companies, do not implement it. More than that according to a research of Chinese companies Bhimani et al. (2018) where managerial accounting is the subject to compulsory implementation, its efficiency is extremely low if its targets do not coincide with company's targets. As for Russian companies their accounting system is very complicated so its data can hardly be used to take efficient managerial decision. Nevertheless managerial accounting must be utilized for taking efficient decisions.

The main issue is that fair value net of sale costs is quite difficult for calculation (Asadulina and Slastihina, 2008). It states in IFRS that fair value net of sale costs is probable value of asset sale. However in order to define this value it is necessary to study a lot of information. It makes accountant's work difficult and obtained information might be incorrect due to market monopoly. Specificity of accounting in the agricultural company also complicates calculation of fair value net of sale costs (Ostaev, Alborova and Kontsevoy, 2012). To calculate fair value net of sale costs of fodders and fertilizers etc. it is necessary to get a lot of information such as feed unit content in 1 ton of fodders or content of primary nutrients in 1 ton of fertilizers. So the choice of evaluation technique by fair value net of sale costs or by classic technique depends on the agricultural company and its priorities.

4. Conclusion

Presented evaluation technique by fair value net of sale expenses suits to minor- and medium-sized companies. It is quite easy and does not require special software or skills. Unfortunately only agricultural holdings have enough resources to hire high skilled personnel and pay for special managerial accounting programme.

Utilization of the «fair value» concept provides the opportunity for calculation and analysis of profit margin, operating profit (loss) for production of different kinds of products and direct labor cost of final product manufacturing at manufacturing stage. Suggested values might be used by the company in general or by definite types of production and group of products. The example provided in the article concerns evaluation of grain for sale in the integrated agricultural production centre Kolos.

Further researches might be devoted to development of detailed technique of workforce productivity evaluation in minor- and medium-sized agricultural companies.

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THE DEVELOPMENT, STRUCTURE AND CHANGES IN DIRECT SUPPORT AFTER EU ACCESSION IN THE CZECH REPUBLIC AND POLAND

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Annotation: Public support is inseparably connected to the Europe Union Common Agriculture Policy. Over the years it developed and transformed toward environmentally oriented policy. In relation to Brexit and new EU challenges (security, border protection), CAP support is discussed to be reduced. According to the most recent proposals, the largest farmers shall be capped at a certain support level. The main aim of the contribution is to define, how has changed the importance of public support (direct payments) within agriculture and how direct support effects gross value added generation in the Czech Republic and Poland. Macro data (Eurostat), as well as microdata (EU FADN), are used for the period 2004-2016. Results indicate that in both countries public support is curtailed for the whole sector, as it contributed to gross value added formation by 40-50% in Poland and by 50-60% in the case of the Czech Republic. If proposed Common Agricultural policy (e.g. CAP) changes of the CAP are implemented, loss in direct support income shall result in farmers' strategies reconsideration. The loss of income at the level of larger farms, if seen as an opportunity, may results into higher value-added production strategies, leading to higher profitability with positive effects on the public budget through tax collections in the long-term perspective.

Key words: Poland, Czech Republic, direct support, EAGF, EAFRD, agriculture, value-added, CAP

JEL classification: Q18, H25

1. Introduction

After the EU accession in 2004, new member countries received the possibility to enjoy being a member of the Common Agricultural Policy (e.g. CAP) but also being members of the single market of the European Union. The entrance to the European Union was considered to be the second transformation phase entries agricultural systems. The first large transformation process was related to change from a centrally planned economy to market economy after the year 1989. Fifteen years after this significant change, the Czech Republic and Poland were accepted to be EU members and their agriculture sectors were opened to EU competition. Becoming a member of the EU's CAP is related to inflow of financial means in several forms, among those following could be included: (i) direct de-coupled support; (ii) direct coupled support, (iii) common organization of the markets and (iv) rural development measures. The amount of finance provided within abovementioned measures differed over the years, as three multiannual financial frameworks were applied (2004-2006; 2007-2013 and 2014-2020 still in progress). However, at the moment all stakeholders participate in a serious discussion on the new financial period (2021-2027) and in the discussion on CAP reform. Position of individual countries differs in relation to specifics of the agriculture sector. The Czech Republic and Poland could be examples of two countries with relatively similar production focus but with different structure of agricultural holdings. While the average Polish farm is of about 10 ha, the average size of the Czech farm is 130 ha in 2018 (EU, 2018).

The CAP is constantly developing since its introduction. The changes were implemented before the 2004 accession, before the financial period 2007-2013 and also before the financial period 2014. The last reform provided the possibility of choice to member states for implementation of the new direct support system. Countries could apply for coupled payments at a very different level, redistribution towards smaller farms was introduced in a voluntary form, also regime for small farmers was available and "green payments" shall lead to better and more sustainable agricultural practices (European Parliament, 2018). During the mid-term "omnibus" reform, mostly technical and administrative simplification was applied. Other improvements concerned: action of producer organisations; income stabilisation and agricultural insurance; green payment and young farmer payment rules and the very flexible definition of 'active farmer' (EUR-LEX: Regulation (EU) 2017/2393).

The May 2018 proposal of CAP reform propose (i) budgetary cuts from 38 to 28% of the budget spending due to the UK leave and other EU priorities such as migration, external border protection, transport, digital economy; (ii) reduction of payments above EUR 60 000 and compulsory capping at proposed level of EUR 100,000 per beneficiary and (iii) the new green payment architecture being more flexible to needs of individual member states (European Parliament, 2018).

The problem of European subsidies is widely discussed by many researches from many various perspectives. Some argue how subsidies (Prášilová et al., 2011) effects small and large farmers, Mala et al. (2014) stated that direct payments have a negative effect on the production of businesses while the finance increase demand for agricultural land and profitability of producers. Also, Náglová and Šimpachová (2019) investigated the negative impact of the subsidies on production efficiency in the whole food industry, while in meat processing industry the subsidies have a positive effect on technical efficiency (Rudinskaya and Náglová 2018).

Based on the information reached, the character of European support is constantly under stress as the whole system undergoes serious discussion about its sustainability and necessity under current budgetary expenses. Also food is becoming an important political topic and therefore number of EU countries search for possibilities on how to provide further agricultural support outside of the CAP (for example through employment policies, social security policies) or how to increase internal protectionism via (i) retargeting consumer demand, (ii) promotion of local products (iii) limiting economic activities of local companies (Grochowska and Ambroziak, 2018) or (iv) via exhaustive border check and escalated food security affairs (Lopatka, 2019).

Among studied literature, no information was found on the importance of the subsidies in the Czech and Polish system before the policy reform. Therefore the main aim of the article is to compare the development, structure and changes in direct support (first pillar) provided to agricultural producers in Poland and the Czech Republic. Based on the FADN average farm sample, authors assess the real importance of non-investment subsidies on farms income. Also, the article investigates the significance of subsidies in relation to generated gross value added at the level of the whole agricultural sector.

2. Materials and Methods

The methods applied are based on the data from various resources and of various kind. The time period of the data is related to the accession to the EU (2004) up to the most recent data available. In the beginning, the review of direct support measures will be compared. Due to the size limitation, decoupled support is presented since the EU accession, while presented coupled support reflects only EU programs implemented within the last financial framework (2014+).

Financial statements of EAGF expenditures are available for years 2007 – 2017. Per unit values of direct support are known for the support provided in Poland and the Czech Republic also for 2018. Financial information on EAFRD also reflects time period 2007 and 2017. Both EAFRD and EAGF information are reached from official EU budget expenditure statistics. The indicator evaluating the importance of financial support on national gross value added (EUROSTAT) was calculated as follow: budget expenditures / GVA in current prices.

Results of the abovementioned indicator express to what extent financial support (through 1 and second pillar of CAP) is crucial for the performance of the national agriculture sector.

The second part of the contribution is based on EU Farm Accountancy Data Network non-investment subsidies values (FADN, SE605) reached from EU official sources. Subsidies received does not include investment subsidies. Subjects compared are an average CZ and PL farm. Data are available for the time period from 2004 to 2016. FADN data are used for calculation of the following indicators: Average output (per ha), Tax paid (per ha), Redistributive balance (per farm), Share of support on gross farm income (per farm).

First, a basic set of data is defined within the scope of the survey, where the average Czech farm is 10 times larger than the Polish farm. Nevertheless, it is important to mention, that the farm sample is biased; the average farm is not exactly mirroring the real average farm situation. While FADN average farm size is equal to 19 and 208, the Eurostat average size equals to 10 and 130 for the Czech Republic and Poland. This particular aspect eliminates reached results from generalization. As samples are biased toward larger farms, results can be only applied to the sample itself. On the other hand, results may express some national wide tendencies and patterns.

3. Results and Discussion

Over the last 15 years, the CAP support in new member countries was reformed according to policy priorities of the community leading to higher environmental benefits. Just after the EU accession, per hectare direct support was top-upped by national payments, in CZ up to 2011 and in Poland up to 2013. Since 2013 Polish farmers do not receive any direct per hectare payment from national resources, while CZ farmers receive small additional per hectare payment. The important change happened in 2014 when the new CAP reform was applied. Single payment (in CZ 236 and in PL 196 EUR per hectare in 2019) was adjusted according to EU priorities in (i) 'greening payment'; (ii) additional support for young farmers and in (iii) voluntary redistributive payments. The redistributive payment was not introduced in the Czech Republic due to large farming entities, while in Poland this support was aimed at smaller and middle farms. For each hectare between 3 and 30 (that means for maximum 27 hectares), farmers could apply for redistributive payment in value of 40 EUR/hectare (Table 1). Also, for the young farmer, the Polish payment is applicable only for a maximum of 50 ha.

Table 1. Decoupled per hectare payment (SAPS and TOP-UP) in the Czech Republic and Poland

EURO/ha		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Single area payment scheme	CZ	57	71	89	101	125	147	165	189	214	236	218	130	130	130	132
	PL	45	57	70	80	100	120	141	161	178	196	218	107	107	107	107
National payment (TOP-UP)	CZ	46	78	79	64	54	47	21	0	20	10	7	7	7	7	6
	PL	62	72	79	78	79	84	82	62	52	33	not provided				
Total per hectare payment	CZ	**103**	**150**	**168**	**165**	**179**	**194**	**186**	**189**	**234**	**245**	**225**	**137**	**137**	**137**	**137**
	PL	**107**	**129**	**148**	**158**	**180**	**204**	**223**	**224**	**230**	**229**	**218**	**107**	**107**	**107**	**107**
Greening	CZ	**Not provided**											71	71	71	73
	PL												72	72	72	72
Young Farmer	CZ												33	33	32	66
	PL												61	54	50	41
Redistributive payment	PL												40	40	41	42

Source: Ministry of Agriculture of the Czech Republic (2004-2017); ARiMR (2019)

The member states received relatively free capacity to support sensitive commodities according to their own preference. Most states (except Germany) did use the opportunity and implemented coupled payments option with very different rates (European Parliament, 2019) and to different commodities (Table 2). In Poland and the Czech Republic voluntary coupled support (VCS) is similarly applied to milking cows, beef and veal, hops, starch potatoes, protein crops and sugar beet. For all mentioned commodities, but sugar beet, the Czech support is higher. Besides that, the Czech Republic provides VCS also for ware potatoes, fruit and vegetable with low and high labour intensity. Additionally, flax, hemp, tobacco, strawberries (since 2017), soft fruits (up to 2016), tomatoes, were supported by VCS in Poland. Among those, there is some limitation with respect to the maximal amount of units. Coupled support for cattle and milking cows is applicable for farmers with more than 3 and less than 20 pieces. Coupled support for sheep and goat is available for farmers with more than 10 ewes or 5 does respectively.

The constant total value of finance provided through the European Agriculture Guarantee Fund (EAGF) had an increasing trend over monitored 11 years. The only exception was 2015 when the new program for 2014-2020 financial period was applied. Finance provided by the EU has still increasing position and increasing share on gross value added. Table 3 reflects the only situation with respect to the EU support provided to member states and their farmers. Information up to the year 2011(for CZ) and 2013 (for PL) is not reflecting the complete situation, as European direct support was toped-up by local resources. Since 2014, the direct support is financed in the case of Poland from EU resources only, while in the Czech Republic national direct support creates about 3% of all direct support. Data available from the EU (2019) and Eurostat (2019) indicates that Czech agriculture is more dependent on support, while direct support is equal to more than 50% of Gross Value Added, while in Poland share of EAGF payments on GVA fluctuate between 30 and 40% since 2015.

Table 2. Coupled voluntary support (VCS) in the Czech Republic and Poland after 2014

Payments after 2014	CZ	2015	2016	2017	2018	PL	2015	2016	2017	2018
Milking cows (min. 2)	CZ	135	136	138	143	PL	74	75	86	87
Beef and veal (LU)	CZ	368	345	329	338	PL	62	59	68	69
Goat, Sheep (per one LU, min 2 LU)	CZ	135	130	131	138	PL				
Sheep (per LU)	CZ					PL	270	260	240	240
Goat (per LU)	CZ					PL	180	160	140	130
Hops	CZ	638	636	614	605	PL	545	536	511	498
Starch potato	CZ	633	602	529	532	PL	327	298	270	249
Sugar beet	CZ	290	275	252	255	PL	504	452	363	350
Protein crops	CZ	137	120	125	86	PL	98	100	not provided	
Leguminous crops (not for more than 75 ha)	CZ					PL	not provided		141	169
Leguminous crops (payment above 75 ha)	CZ					PL	not provided		90	84
Fodder plants (not for more than 75 ha)	CZ					PL	not provided			103
Ware potato	CZ	199	181	184	185	PL				
Fruit species with very high labour intensity	CZ	505	513	498	469	PL				
Fruit species with high labour intensity	CZ	349	314	306	312	PL				
Vegetable species with very high labour intensity	CZ	485	446	441	456	PL				
Vegetable species with high labour intensity	CZ	135	185	157	140	PL				
Tomatoes	CZ					PL	1,007	712	384	776
Soft fruits	CZ					PL	219	209	not provided	
Strawberries	CZ					PL	not provided		260	246
Flax	CZ					PL	97	67	87	114
Hemp for fibre	CZ					PL	135	127	70	54
Tobacco - Virginia type (EUR/kg)	CZ					PL	1.0	1.0	0.9	0.8
Tobacco – other than Virginia type (EUR/kg)	CZ					PL	0.7	0.7	0.6	0.6

Source: Ministry of Agriculture of the Czech Republic (2004-2018); ARiMR (2019)

Table 3. Share of support from EAGF and EAFRD on total Gross Value Added in Czech Republic and Poland

Mil. EURO	EAGF[1]		EAFRD[2]		Gross value added at basic prices		% of direct support on GVA		% of all support on GVA	
	CZ	PL	CZ	PL	CZ	PL	CZ	PL	CZ	PL
2007	353.6	1,216.2	359.1	1,897.3	1,208.3	8,221.1	29%	15%	40%	25%
2008	404.7	1,460.8	246.6	1,084.4	1,237.4	8,020.2	33%	18%	58%	39%
2009	499.3	1,734.2	366.7	1,043.8	723.7	6,760.6	69%	26%	90%	38%
2010	615.5	2,073.4	441.3	1,572.0	966.4	8,235.8	64%	25%	90%	34%
2011	671.7	2,407.2	452.3	1,809.1	1,441.1	8,955.8	47%	27%	73%	41%
2012	771.0	2,849.6	419.0	1,996.5	1,351.6	9,131.2	57%	31%	83%	46%
2013	839.3	3,208.7	370.8	1,821.0	1,426.5	9,398.1	59%	34%	83%	52%
2014	893.4	3,216.9	283.3	1,707.9	1,485.6	8,141.1	60%	40%	81%	62%
2015	736.3	1,462.3	304.3	1,501.5	1,423.4	7,858.1	52%	19%	83%	63%
2016	860.7	3,595.1	343.9	1,097.9	1,690.3	8,613.9	51%	42%	62%	34%
2017	865.2	3,482.7	259.4	573.6	1,677.4	10,658.6	52%	33%	72%	44%

Source: European Union (2019), Eurostat (2019)

Note: [1]European Agriculture Guarantee Fund: chapter 2.0.1 [2]European Agriculture Fund for Rural Development: chapter 2.0.1.

The following part focus on the FADN sample of Average farms. Size of average farm is in the CZ about 10 times larger than the Polish farm. Over the monitored period, the average sample size of Czech farm changed from 228 to 205 ha (- 10%). In the case of Poland, the average size increased from 16 ha up to 19 ha in 2016 (+18%). Limitation of the sample, which is biased toward larger farms, is stated in the methodology.

Table 4. Average output (EUR per one hectare), Average farm

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
CZ	1,044	1,035	1,092	1,249	1,321	1,029	1,176	1,431	1,465	1,453	1,514	1,487	1,502
PL	1,200	1,186	1,249	1,503	1,502	1,193	1,422	1,576	1,621	1,606	1,583	1,528	1,398

Source: own processing base on European Commission – EU FADN (2019)

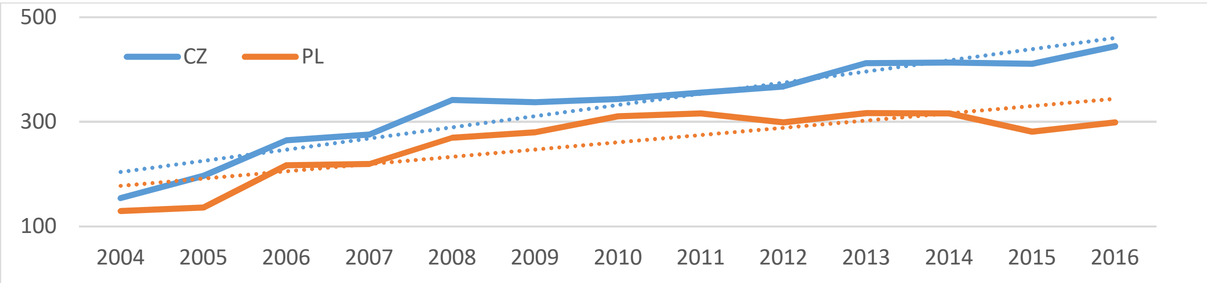
The result in Table 4 evinces, how similar tendencies are in Poland and the Czech Republic from the perspective of average output. Between 2004 and 2008 total output increased from 1,044 EUR up to 1,321 EUR and 1,200 up to 1,502 in the case of the Czech Republic and Poland respectively. In 2009 total output decreased (-21%), in relation to the situation on world markets (also observable in Table 3 - Gross Value Added). Over the period, with 2016 exception, Polish farms performed higher per hectare outputs.

Table 5. Share of subsidies on gross farm income (%), Average farm

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
CZ	36%	45%	54%	47%	57%	72%	61%	50%	50%	54%	52%	55%	57%
PL	20%	22%	30%	26%	35%	43%	36%	35%	33%	36%	37%	35%	38%

Source: own processing base on European Commission – EU FADN (2019)

Figure 1. Paid non-investment subsidies (EUR/ha) at the average FADN farm

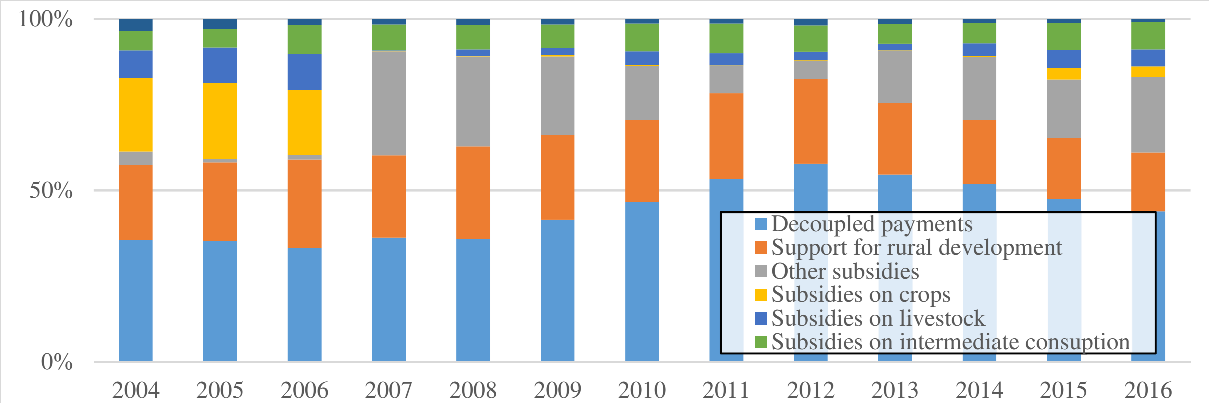


Source: own processing base on European Commission – EU FADN (2019)

As mentioned in the text above, Czech farmers are more dependent on operational support than smaller polish farmers. The values from FADN (Table 5) corresponds to the values in Table 3. It means that Czech farmers, although receiving higher per hectare subsidies (Fig 1) are not able to take advantages of additional finance for increasing their Gross Farm Income with higher dynamics to Polish farmers. Over time, values evince growth tendencies with higher dynamics in the Czech Republic. In 2004 the average Czech farm subsidy was 154 EUR per hectare, while in 2016 the value was close to 445 euro (+289%). In Poland, payments received by farmer per hectare were always lower (129 in 2004 and 299 in 2016). The difference was as high as 145 EUR/ha for 2016.

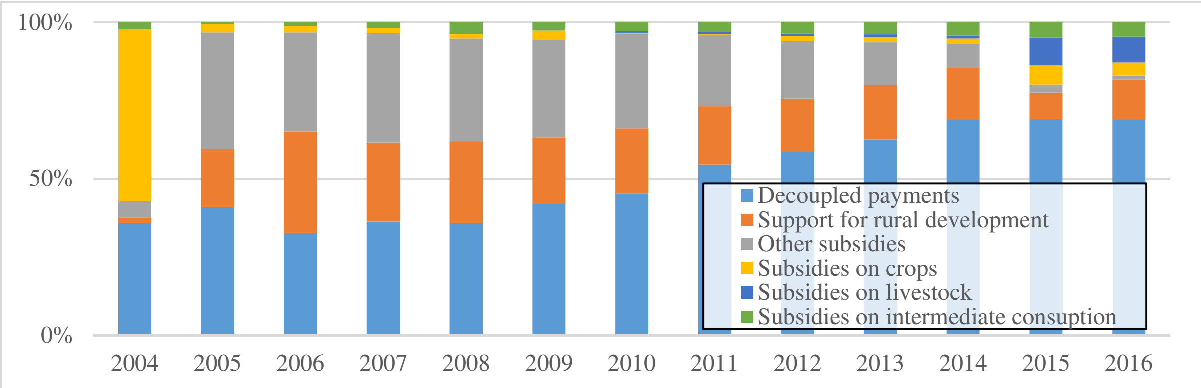
The FADN data also provide information about the type of payment (Figure 2 and Figure 3). While in the Czech Republic (Figure 2), 80% of final payment is compiled by 3 important sources (Decoupled payments, SE630, 42%; Support for rural development, SE624, 17%; Other subsidies, SE699, 22%), in Poland (Figure 3) about 80% of finance is sourced by farmers from Decoupled payments (68%) and from Rural Development (13%). In Poland, the share of rural development payments decreases (32% in 2006) while direct payments increases. In 2016, total payments accounted to about 5,600 EUR in Poland, while in the Czech Republic total payments accounted for 91 thousand EUR. Other subsidies (SE699) gained on importance in the Czech Republic after 2012, while in Poland the other subsidies have no significance in Poland after 2015.

Figure 2. Structure of subsidies at the average Czech farm (2004-2016)



Source: own processing base on European Commission – EU FADN (2019)

Figure 3. Structure of subsidies at the average Polish farm (2004-2016)



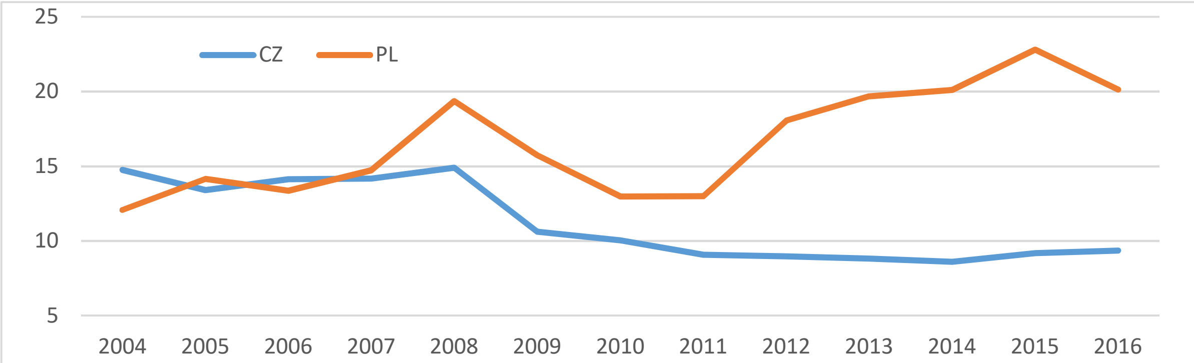
Source: own processing base on European Commission – EU FADN (2019)

Note: Total subsidies on crops (SE610), Total subsidies on livestock (SE615), Total support for rural development (SE624), Other subsidies (SE699), Subsidies on intermediate consumption (SE625), Decoupled payments (SE630)

The revenues from public support (SE605) and tax paid (SE309) results in redistributive balance. In both countries the balance is positive, therefore farmers receive more than they contribute to the state budget, although the balance is higher in the case of Czech farmers due to their scale, (net redistributive balance equalled 87,630 EUR in 2016). Polish farm evinced redistributive balance in about 5,500 EUR. Figure 3 presents the paid tax recalculated per one hectare. The development is comparable among both countries up to the year 2007. Since 2008 the tax duty has been higher among Polish farms and after 2011 the opposite dynamics is observed. While Czech per hectare equalled 9.4 EUR in Poland the duty paid equalled to 20.1 EUR/ha with an increasing trend.

In this respect, results confirm the fact, that Polish FADN farms reach higher profitability. Figure 4 leads to the conclusion, that the higher profitability does not only have an impact on the individual farmers, but it also has society-wide effects. Through paid taxes, farmers contribute to the governmental budget and decrease the redistributive balance. Therefore there should be a clear public interest in sectoral transformation into higher value-added production which would lead to increased tax revenues.

Figure 4. Tax paid (SE309) per hectare (S025), Euro/ha



Source: own processing base on European Commission – EU FADN (2019)

4. Conclusion

With the discussion on the reform of the CAP after the year 2020, both Agriculture related funds (EAGF, EAFRD) are expected to be reduced and capped. With this implication, also the financial support available for farmers could be reduced, the main reduction is expected to be at the level of large farms. Czech farmers are expected to be affected the most by the reduction as the average size of Czech farms is the largest in the whole EU. The data analyses and own calculations supported the idea, that reduction in payments may reduce the income mainly in the Czech Republic as subsidies generate about 50% to 60% of industry gross value added (gross farm income). In Poland, the share of subsidies is lower, they contribute by about 40 to 50% to GVA formation. National differences in support programs and support values (allowed by the EU), together with increasing internal national protectionism may lead to unfair competition on the single market and further to erosion of the single market idea. The total amount of support provided, as well as sectoral support allocation, are going to play an important role in agricultural sector development. At the moment it is obvious, that the Czech agricultural sector enjoys economies of scale based on generous support, while the Polish system is more focused on supporting middle-size farms, increasing their productivity, output and profitability. It results in a lower share of subsidies to generated Gross Value Added. If proposed changes of the CAP are implemented, loss in direct support income shall result in farmer strategies reconsideration. The loss of income, if seen as an opportunity, may results in higher value-added production strategies, leading to higher profitability with positive effects on the public budget through tax collections.

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TAX REVENUES FROM AGRICULTURAL SECTOR AFTER RUSSIAN IMPORT BAN: EVIDENCE FROM RUSSIAN REGIONS

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Annotation: Russian import ban has affected to different extent agricultural enterprises of all sizes, and on both sides of import ban. Increase in revenues of domestic agricultural enterprises should be the one of the expected impacts of import ban, and this should lead to increase in tax revenues for the state. However, there is a limited evidence in current literature on the impact of Russian import ban on tax revenues from agriculture. This paper focuses on changes in tax revenues as a result of import ban by comparison changes in tax revenues from agriculture with tax revenues from other sectors with the support of difference-in-differences approach. Data used for the research covers eight-year period of 2010-2017. Results of analysis show that growth of tax revenues from agricultural sector after import ban has been significantly higher than growth of tax revenues from other sectors. Before import ban, growth of tax revenues from agriculture underperformed growth of tax revenues from other sectors by -10.22%, while overperformed by 9.5% after the import ban. Opportunities for further research are highlighted as well, as it is required to allocate these dynamics between effect of import ban and increases in effectiveness of fiscal administration.

Key words: Russian Federation, agricultural sector, tax revenues, import ban.

JEL classification: Q18, F51, E62.

1. Introduction

Problems of agricultural enterprises taxation in Russian Federation has been considered by different authors. Recent article of Nugaev et al. (2018) considered advantages and disadvantages of agricultural enterprises taxation system in Russia and concluded that it is not optimal and should be modified. Sabitova et al. (2016) pointed out that economic inequality of Russian regions is declining insignificantly, and this inequality causes differentiation of the taxable capacity and fiscal capacity of budget system of Russia. An evidence provided by Malkina (2017) supported the positive influence of economic diversification on the Russian regions' tax system stability, while tax yield rate is negatively related to it.

More literature sources are concerned with influence of tax diversification on tax revenue risk and volatility on the example of different countries. Carroll (2009) examined whether tax revenue diversification leads to greater instability as represented by revenue volatility, and whether revenue complexity produces fiscal illusion as represented by increased public expenditures. Study has been done on the dataset covering municipal governments in the USA for the period of 1970-2002. Results suggested, that diversified and complex tax revenue structure is linked to greater revenue volatility rather than stability. Few sources focus on influence of industrial structure of economy on characteristics of tax systems. Fenochietto and Pessino (2013) as well as Morrisey et al. (2016) claimed that sectorial composition GDP is the conventional factor expected to influence the taxable capacity of a country. Karagöz (2013) has showed the positive influence of industrial sector and negative influence of agricultural sector shares in Gross Regional Product on tax revenues in Turkey. Alabede (2018) has analyzed the relationship between degree of economic freedom and tax revenues for sub-

Saharan Africa and has found, that economic freedom promotes tax revenue performance, while agriculture share in GDP indicates significant negative relationship with tax revenue performance. Similar results have been obtained by Ángeles Castro and Ramírez Camarillo (2014) for OECD countries, suggesting that the agricultural sector and the share of foreign direct investment in gross fixed capital formation have negative impact on tax revenue.

Albeit these papers show important examples of association between agricultural sector and tax revenue, similar evidence for Russian Federation after introduction of import ban has not been showed. Russian import ban has affected to different extent agricultural enterprises of all sizes, and on both sides of import ban, however there was not much attention given in current scientific literature to the problem of changes in tax revenues from agricultural enterprises as a result of import ban. Paper attempts to analyze changes in tax revenues from agricultural sector in regions of Russian Federation after Russian import ban. Research question is formulated as: how have tax revenues from agricultural sector changed in the period of 2010-2017 and in 2014-2017 in comparison to other tax revenues in Russia? What regions benefited in terms of tax revenues from Russian import ban?

2. Materials and Methods

Data used for the research covers eight-year period of 2010-2017 and is received from Russian statistical office (Rosstat). Eight year period has been chosen due to availability of comparable data, four years after import ban and four years later. Data contains time series of tax revenues from agricultural sector, tax revenues from other sectors, and is separated into time series for Russian regions (8 federal districts).

Data is analyzed using the methodology tools of descriptive statistics and index analysis. Analysis is done by calculating values of median, average, chain index, fixed base index of tax revenues from agricultural sector and tax revenues from other sectors. Difference-in-differences approach is used to compare tax revenues from agriculture ("treatment" group) and all tax revenues excluding agriculture ("control" group). Calculations are done for Russian Federation and for individual regions of Russian Federation (federal districts).

3. Results and Discussion

Preliminary results show increase by 14.6 percentage points in year-on-year growth rates of tax revenues from agricultural sector in Russian Federation. Average growth rate of tax revenues from agricultural sector was 5.9% in 2010-2013, while it grew to 20.6% in 2014-2017. Average growth rate of all tax revenues excluding agriculture was 16.16% in 2010-2013 and declined to 11.1% in 2014-2017. From this perspective, tax revenues from agriculture overperformed other tax revenues by 9.5% in 2014-2017 after import ban. This might be caused by two reasons. First, farmers might get higher incomes because of Russian import ban. Second, Russian fiscal administration might become more effective in closing fiscal gap, or in other words the difference between actually collected tax revenues and tax revenues that are possible to collect under current fiscal policy.

As a background, incomes of farmers-payees of single agricultural tax had average growth rate of 26.54% in the period of 2010-2013, then it changed to the level of 23.21% in 2014-2017, while average growth of tax revenues was 24.43% in 2014 and 38.04% in 2015. Higher growth rate of incomes was observed only in 2008, when it totaled to 43.08%. Year 2008 was when the effects of global financial crises did not fully impact Russian economy yet, therefore incomes were still under influence of stronger economic conditions of relatively stable years.

Decrease of 3.33% of average growth rate between 2010-2013 and 2014-2017 is mainly caused by relatively lower income growth rate in 2017, where it was only 10.12%, which is significantly under the average growth rate of 26.69% for 2008-2017 and it was the lowest year-to-year growth for the last ten years.

Russian regions show controversial dynamics of incomes of farmers-payees of single agricultural tax as it is shown on the Table 1.

Table 1. Incomes of farmers-payees of single agricultural tax, year-on-year growth rates

Region	**Average 2010-2013**	**Average 2014-2017**	**Change**
Russian Federation	26.541%	23.215%	-3.326%
Central Federal District	29.195%	22.455%	-6.740%
North-Western Federal District	26.991%	25.713%	-1.279%
North Caucasian Federal District	21.438%	23.102%	1.664%
Southern Federal District	19.229%	26.760%	7.530%
Volga Federal District	28.858%	21.563%	-7.295%
Ural Federal District	27.238%	18.715%	-8.523%
Siberian Federal District	25.685%	19.483%	-6.202%
Far Eastern Federal District	23.451%	20.077%	-3.374%

Source: Russian Statistical Office (Rosstat), own calculations, 2019

Only two federal districts, North Caucasian and Southern Federal Districts, have shown the positive change in average growth rates of incomes. All other federal districts have shown decrease in income growth. Average growth rate in 2014-2017 are under significant pressure from 2017 data, where incomes have slowed down the growth dynamics. This can be considered as a sign of end of import ban effect, but this statement can be criticized by the fact, that farmers' incomes were growing several years before import ban.

The effect of the import ban on changes in tax revenues can be estimated by difference between growth rate of agricultural tax revenue and growth rate of all other tax revenues, i.e. by simply deducting one growth rate from another. The results of these estimations are shown on the Table 2.

Table 2. Differences in growth rates of agricultural tax revenues and all other tax revenues in Russian Federation, growth rates

Region	2010	2011	2012	2013	2014	2015	2016	2017
Russian Federation	8.086%	-26.459%	-23.252%	0.728%	33.406%	17.091%	2.673%	-15.161%
Central Federal District	9.641%	-21.573%	-58.742%	71.928%	79.725%	19.485%	-24.362%	-6.850%
North-Western Federal District	5.617%	-38.651%	-21.792%	-31.427%	72.847%	5.770%	0.155%	-14.102%
North Caucasian Federal District	0.000%	2.200%	10.092%	-6.991%	8.688%	-9.251%	31.736%	-8.928%
Southern Federal District	-0.853%	-0.694%	-5.529%	-8.946%	10.960%	6.143%	1.406%	-11.958%
Volga Federal District	35.857%	-32.937%	-0.486%	-21.636%	25.862%	42.315%	2.920%	-8.387%
Ural Federal District	26.023%	-25.367%	-21.442%	-19.658%	57.390%	18.611%	-1.289%	-31.464%
Siberian Federal District	-8.754%	-37.197%	-37.908%	18.351%	22.751%	19.494%	0.677%	-22.762%
Far Eastern Federal District	158.853 %	-25.782%	-41.022%	-0.644%	-52.893%	-64.813%	232.975%	-39.410%

Source: Russian Statistical Office (Rosstat), own calculations, 2019

As it can be seen on the Table 2, in the majority of the Russian regions before 2014 the tax revenues from agriculture underperformed all other tax revenues. The situation has significantly changed after introduction of import ban in 2014. During 2014-2016 almost all Russian regions have shown increases in agricultural tax revenues, with the exception of Far Eastern Federal District. Year 2017 has shown the change of the picture in the completely opposite direction – all Russian regions have shown underperformance of agricultural tax revenues in comparison with all other tax revenues. It is important to mention, that there were no major tax legislation changes during observed period, therefore changes in tax revenues from agriculture can be attributed to changes in farmers' incomes, or to increased effectiveness of fiscal authorities in closing fiscal gap.

Another important insight on changes in agricultural tax revenues might come from comparing averages of under- or overperforming of agricultural tax revenues growth rates over all other tax revenues growth rates. Results of these calculations are shown on the Table 3.

Table 3. Excess growth rate of agricultural tax revenue vs all other tax revenues before and after import ban, growth rates

Region	Average 2010-2013	Average 2014-2017	Difference
Russian Federation	-10.224%	9.502%	19.727%
Central Federal District	0.314%	17.000%	16.686%
North-Western Federal District	-21.563%	16.168%	37.731%
North Caucasian Federal District	1.325%	5.561%	4.236%
Southern Federal District	-4.006%	1.638%	5.643%
Volga Federal District	-4.800%	15.678%	20.478%
Ural Federal District	-10.111%	10.812%	20.923%
Siberian Federal District	-16.377%	5.040%	21.417%
Far Eastern Federal District	22.851%	18.965%	-3.886%

Source: Russian Statistical Office (Rosstat), own calculations, 2019

All Russian regions, except Far Eastern Federal District, have shown excess increase of average agricultural tax revenues overperformance against all other tax revenues. Far Eastern Federal District has shown opposite dynamics, where average overperformance of agricultural tax revenues has decreased from 22.851% in 2010-2013 to 18.965% in 2014-2017. Many regions have been moved from the situation of agricultural tax revenue underperformance to the opposite situation – this is the case of all regions except Central, North Caucasian and Far Eastern Federal Districts.

Contemporary economic literature suggests, that larger agricultural sector is very likely associated with lower tax revenue, for example Karagöz (2013), Alabede (2018) and especially Ángeles Castro and Ramírez Camarillo (2014), as the last paper relates to OECD countries. Based on these findings, it is possible to assume, that growing agricultural sector should be associated with declining tax revenues – although it is not directly mentioned in literature. Russian economy after import ban does not show expected behavior. Share of agriculture in nominal GDP rose from 3.6% in 2013 to 4.7% in 2016 (Rosstat, 2019), but tax revenues continued to grow. Moreover, results provide the evidence of excess growth of tax revenues from agricultural sector in Russian Federation after import ban, and it is important to mention, that growth rates of all tax revenue were positive before and after import ban. As no major changes in tax policies have been introduced in Russia after the Russian import ban, it is possible to conclude, that overperformance of tax revenues from agriculture might be connected with increasing incomes of agricultural enterprises. However, incomes of single agricultural tax payees rose significantly slower than tax revenues from agriculture, so this hypothesis does not find solid support from current findings. The other possibility of tax revenues' overperformance might be found in more effective closing of fiscal gap, i.e. more efficient collection of tax revenue.

Both hypotheses open the broader opportunity for further research. Interconnection between increasing agricultural sector and growing tax revenue in Russia should be checked. There is a possibility, that current findings presented in economic literature is not applicable to Russia due to different trajectory of economic development. Agricultural fiscal gap is more difficult to determine, but detailed study of Russian fiscal burden might bring additional insight into the problem.

4. Conclusion

Tax revenues from agriculture have grown faster than all other tax revenues in Russian Federation after introduction of import ban. During period of 2014-2017 (after introduction of import ban), growth dynamics in tax revenues from agricultural sector have been significantly higher, than in previous period of 2010-2013. It has happened in the situation where farmers' incomes were increasing for several years before import ban, nevertheless the excess growth of agricultural revenues is significant for all Russian regions except Far Eastern Federal District. As there were no major changes in tax policies in relation to agricultural enterprises in Russian Federation after introduction of import ban, *ceteris paribus* growth in tax revenues might give an evidence of how state budget benefited from Russian import ban.

At the same time, more effective closing of fiscal gap might be influencing tax revenues from agriculture and might bias estimating the effect of import ban on tax revenues. This problem requires further elaboration in order to allocate impact of increasing effectiveness in tax collection against the impact of increasing farmers' incomes due to import ban.

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CONSUMER SUPPORT ESTIMATE: HOW CAN IT BE RECALCULATED FROM COUNTRY LEVEL TO REGIONAL LEVEL? EVIDENCE FROM MILK PRODUCTION IN RUSSIAN FEDERATION.

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Annotation: Consumer Support Estimate (CSE) helps to assess the impact of policies on producers and consumers of agricultural products and is one of the indicators that can be used to describe the economic environment of agricultural enterprises. This paper discusses the method of how CSE for milk can be recalculated to the level of separate regions in the countries with heterogenic regions, on the example of Russian Federation. Proposed recalculation method employs Tailor series approach and is convenient for those agricultural products, whose CSE only contains transfers to producers from consumers (TPC). Proposed method helps to estimate the production and price elasticity of CSE across regions of the country. Analysis shows, that regions in countries with higher agricultural production are more vulnerable in terms of regional CSE to increases in regional heterogeneity. Agricultural enterprises in regions of such countries might experience more significant influence of price change. Further opportunities of validation of proposed methodology are identified and can be done by applying proposed recalculation procedure to regions of selected country followed by subsequent comparison with results from another methodology (for example, WTO agricultural support measurement system).

Key words: Consumer Support Estimate, Russian Federation, Tailor series, milk.

JEL classification: Q18, F14, F51.

1. Introduction

OECD provides methodology to assess impact of policies on producers and consumers of agricultural products. Indicators that comprise OECD methodology are important supplements to determine policies related to agricultural enterprises, as these indicators help to obtain a picture of economic environment in which these enterprises work, as well as describe conditions and prospects of agribusiness. Producer Support Estimate (PSE) is one of the OECD indicators that are used to evaluate support to agricultural producers in the country of interest and has been used in several works. Erjavec et al. (2017) have used OECD indicators to assess the level of agricultural support in eight countries of former Soviet Union and have found that budgetary support is relatively low compared to EU and OECD averages. Kulyk and Augustowski (2018) have used Total Support Estimate (TSE) to conclude that there is an evidence of convergence of agricultural financial support among Australia, Canada, Japan, Korea, New Zealand, Turkey, the USA and the European Union. Sedik et al. (2013) has also used PSE to analyze the implications of World Trade Organization (WTO) accession for Russian agricultural policy and have found the reliance on sizeable differences between world and domestic prices to generate two-thirds of agricultural producer support and the presence of highly distortionary budget support. Authors also concluded that market price support will continue to dominate the Producer Support Estimate in Russia.

OECD indicators are not the only ones to measure support to agricultural sector. Effland (2011) has conducted comparison between two commonly agriculture support measurement systems:

OECD and WTO. The analysis has shown significant differences between measurement of support within OECD and WTO systems, especially for market price support (MPS). For example, OECD method uses the gap between two current (domestic and world) prices to calculate MPS, the amount of MPS may vary widely from year to year. When world prices are high, the gap between a supported domestic price and world price will likely be small, reducing MPS; when world prices fall, that gap will likely increase and MPS will be higher. In contrast, the MPS calculated under the WTO system compares the same fixed world reference price (the 1986-88 average) with a domestic administered price, so when the domestic administered price is stable, the WTO's MPS method will result in only slight variation from year to year based on changes in eligible production.

Imperfection of agricultural support measurement systems has been highlighted in Liefert (2009), where author has identified a limitation of OECD producer support estimate. The key assumption in OECD PSE is that changes in world prices or exchange rates are not transmitted to domestic prices. This assumption is valid when policies hold which preclude transmission, such as managed domestic prices or trade quotas, but not when policies exist which allow transmission, such as tariffs.

Several attempts have been undertaken to modify OECD indicators. He (2016), after applying OECD policy evaluation model (PEM) to China, has proposed specific changes to the measurement system in order to reflect the realities of China. Few other sources were focused on moving from macrolevel to the level of separate regions. This becomes an important issue, as significant number of agricultural enterprises do business on intraregional market and are more under influence of regional impacts of the policies, rather than aggregate impact of policies on macroeconomic level. Indicators estimated on the level of country gives very little of even incorrect information on the economic conditions, in which these agricultural enterprises work. Croser and Anderson (2010) have proposed an instrument welfare reduction index (IWRI) and an instrument trade reduction index (ITRI) to assess distortions to trade and welfare as a result of policies. Elaborating on the previous idea, Anderson and Croser (2011) have proposed TRI and WRI, which can serve to observe the changing extent of policy interventions that reduce international trade and national economic welfare.

In contrast to Producer Support Estimate, the Consumer Support Estimate (CSE) methodology helps to estimate impacts of policies on consumers. CSE, as well as PSE, is calculated on macrolevel, i.e. on the level of a country. At the same time, one might be interested in assessing impact of the policies on agricultural enterprises in separate regions. Paper attempts to close the gap between calculation of Consumer Support Estimate or CSE (OECD methodology) on country level and regional level by proposing a specific methodology applied to recalculate Consumer Support Estimates for federal districts of Russia. Research question is formulated as: how can Consumer Support Estimate be calculated for individual regions of a country based on a country Consumer Support Estimate, and how regional differences impact differences in regional Consumer Support Estimates?

2. Materials and Methods

The paper describes methodology of recalculating Consumer Support Estimate (or CSE) to the regional level by applying coefficients that capture differences in production level and producer prices. Proposed methodology assumes recalculation of CSE for single commodities, for which CSE contains only Transfers to Producers from Consumers. Coefficients are calculated based on data on Russian regions gathered from Russian Statistical Office (Rosstat) and comprise data on production and producers' prices for separate regions for the period of 2007-2017. Dataset include data on production and producers' prices of milk in federal districts of Russian Federation. Proposed recalculation formula is derived from CSE formula (OECD, 2018) using Taylor series approach for function of two variables, which helps to determine production and producers' price elasticities of CSE.

Proposed methodology assumes that reference price of commodity used in calculating Market Price Differential, an integral part of CSE, is the same across different regions. This assumption allows to apply two coefficients, one for regional production level and one for regional producers' prices, to derive regional CSE from country CSE for each commodity. In order to understand the differences in CSE between different regions, one might be interested in what variable, i.e. production level coefficient or regional producers' prices coefficient, has bigger impact on regional CSE. In other terms, production and producers' price elasticities of CSE might be of an interest to answer this question.

Elasticities of CSE can be calculated using Taylor series approach for a function of two variables. It is needed in this case to determine the basic point, about which the function of two variables will be computed. Basic point does not influence the calculation of elasticity, but it has an influence on assessing the impact of production level and producers' prices on regional CSE.

Tailor series can be described as a representation of a function as an infinite sum of terms calculated on the basis of a function's derivatives at a single point, called center point. Taylor series is one of the methods to decompose a function of two variables. In current paper, Taylor series is used to decompose regional CSE function of two variables (regional production level coefficient and regional producers' price coefficient) in order to evaluate the impact of each of the variables on regional CSE.

3. Results and Discussion

Consumer Support Estimate is calculated according to OECD methodology (OECD, 2018).

$$CSE_c = TCT_c - (TPC_c + OTC_c) + EFC_c \tag{1}$$

Where: CSE_c - consumer support estimate for commodity c in local currency; TCT_c - value of transfers to consumers from taxpayers for commodity c in local currency; TPC_c - transfers to producers from consumers for commodity c in local currency; OTC_c - other transfers to consumers of commodity c in local currency; EFC_c - excess feed cost for commodity c in local currency.

Single Commodity Transfer shows the transfers to producers that relate only to specific commodity. In case of imported commodity, it is calculated as follows:

$$consumerSCT_c = TCT_c - QP_c \times (PP_c - RP_c) - OTC_c + EFC_c \quad \textbf{(2)}$$

Where $consumerSCT_c$ - single commodity transfer to consumers of commodity c (hereafter SCT); QP_c - quantity of production of commodity c; PP_c - producer price for commodity c at farm gate; $RP_c = BP_c - MM_c$ - reference price for commodity c; MM_c - marketing margin for commodity c.

As per OECD data for milk in Russian Federation, TCT_c and OTC_c are equal to zero, while 10-year average of EFC_c adjustment represents less than 5% of SCT_c and can be omitted. In this case, SCT formula takes the form of:

$$consumerSCT_c = -QP_c \times (PP_c - RP_c) \quad \textbf{(3)}$$

In this relation, share of specific region j in country's SCT for potatoes can be expressed as:

$$SCT_{cj} = -(\alpha_{1cj} \times QP_c \times \alpha_{2cj} \times PP_c - \alpha_{1cj} \times QP_c \times \alpha_{3cj} \times RP_c) \quad \textbf{(4)}$$

where α_{1cj} - regional coefficient for QP_c ; α_{2cj} - regional coefficient for PP_c ; α_{3cj} - regional coefficient for RP_c .

SCT in different regions can be calculated according to the differences in productions quantities, producer's prices and reference prices (assuming both PP_c and RP_c are constants among regions)

$$\alpha_{1cj} = \frac{QP_{cj}}{QP_c} \quad \textbf{(5)}$$

$$\alpha_{2cj} = \frac{PP_{cj}}{PP_c} \quad \textbf{(6)}$$

$$\alpha_{3cj} = \frac{RP_{cj}}{RP_c} \quad \textbf{(7)}$$

where $\alpha_{1cj}, \alpha_{2cj}, \alpha_{3cj}$ - coefficients that reflect the differences of each indicator between regions; QP_{cj} - production volume of commodity c in federal district j; QP_c - production volume of commodity c in whole country; PP_{cj} - producer price of commodity c in federal district j; PP_c - producer price of commodity c in whole country; RP_{cj} - reference price of commodity c in federal district j; RP_c - reference price of commodity c in whole country.

It is important to mention, that :

$$\sum_{j=1}^{n} \alpha_{1cj} = 1; \quad \textbf{(8)}$$

In case there are no difference in quality between imported and domestically produced products, and no weight adjustment made, reference price is equal:

$$RP_c = BP_c \quad \textbf{(9)}$$

As prices used in calculation are adjusted to the farm gate level, the costs of transportation of imported product to country's wholesale market increase reference price, while costs of transportation of domestically produced products to the wholesale market decrease reference price. Due to the fact that reliable data on transportation costs in both directions are difficult to obtain, these costs can be omitted in majority of cases as per OECD methodology. This assumption also brings to the conclusion that:

$$\alpha_{3cj} = 1; j \in (1; n) \quad \textbf{(10)}$$

Where n – number of federal districts.

$$SCT_{cj} = -\alpha_{1cj} \times QP_c \, (\alpha_{2cj} \times PP_c - RP_c) \quad \textbf{(11)}$$

If $\alpha_{2cj} = 1$, then producer prices on regional level is equal to producer prices on federal level, and the difference between SCT_{cj} and average federal $\frac{SCT_c}{n}$ is caused only by differences in production volumes, i.e. $SCT_{cj} = f(\alpha_{1cj})$.

If $\alpha_{1cj} = \frac{1}{8}$, then production volume in each region is the same as in every other region, and the difference between SCT_{cj} and average federal $\frac{SCT_c}{n}$ is caused only by differences in producer prices, i.e. $SCT_{cj} = f(\alpha_{2cj})$.

Effectively, SCT_{cj} is a function of two variables α_{1cj} and α_{2cj}. In more conventional form, this function can be re-written as:

$$f(\alpha_{1cj}, \alpha_{2cj}) = -\alpha_{1cj}\,\alpha_{2cj}\,QP_c\ PP_c + \alpha_{1cj}\,QP_c\ RP_c \quad \textbf{(12)}$$

Impact of each of the variables α_{1cj} and α_{2cj} can be estimated using Taylor series approach about a point of $(M_1 ; M_2)$, where M_1 is median value of α_{1cj} and M_2 is median value of α_{2cj} among federal districts:

$$f(\alpha_{1cj}, \alpha_{2cj}) = f(M_1 ; M_2) + (\alpha_{1cj} - M_1)(-M_2\ PP_c\ QP_c + QP_c\ RP_c) + (\alpha_{2cj} - M_2)(-M_1\ PP_c\ QP_c) \quad \textbf{(13)}$$

In case of α_{1cj} the abovementioned equation shows the impact of regional production variation from median federal level on SCT_{cj}, while in case of α_{2cj} the equation shows the impact of regional price differences variation from median federal level. Generally speaking, $-M_2\ PP_c\ QP_c + QP_c\ RP_c$ characterizes production elasticity of SCT, while $-M_1\ PP_c\ QP_c$ characterizes price elasticity of SCT.

Impact of α_{1cj} and α_{2cj} can also be expressed in percentage. In this relation, it is important to mention, that in each year $f(M_1 ; M_2)$ will stay the same across regions, representing the median line in SCT values. Therefore, impact of α_{1cj}might be expressed as follows:

$$I_{\alpha_{1cj}} = \frac{(\alpha_{1cj} - M_1)(-M_2\ PP_c\ QP_c + QP_c\ RP_c)}{(\alpha_{1cj} - M_1)(-M_2\ PP_c\ QP_c + QP_c\ RP_c) + (\alpha_{2cj} - M_2)(-M_1\ PP_c\ QP_c)} \quad \textbf{(14)}$$

While impact of α_{2cj} might be expressed as follows:

$$I_{\alpha_{2cj}} = \frac{(\alpha_{2cj} - M_2)(-M_1\ PP_c\ QP_c)}{(\alpha_{1cj} - M_1)(-M_2\ PP_c\ QP_c + QP_c\ RP_c) + (\alpha_{2cj} - M_2)(-M_1\ PP_c\ QP_c)} \tag{15}$$

Additionally, calculated impacts of α_{1cj} and α_{2cj} sums up to 1.

$$I_{\alpha_{1cj}} + I_{\alpha_{2cj}} = 1 \tag{16}$$

Proposed methodology of recalculation brings noticeable observation. As producers' price elasticity of regional CSE depends only on country's production, regions in countries with higher agricultural production are more vulnerable in terms of regional CSE to increase in regional heterogeneity – meaning that changes in prices in these countries will lead to higher differences in CSE between regions, than in the countries with lower agricultural production.

As current paper is focused on developing theoretical basis for proposed methodology, an opportunity for further research lies in the field of validation of methodology by applying to different regions of selected country.

4. Conclusion

The paper tries to bring additional insight into the topic of agricultural policies impacts in separate regions, in order to better assess position of significant number of agricultural enterprises working on intraregional market. Analysis of the proposed methodology shows that production elasticity of regional CSE has a direct relationship to country producers' price and country's production of the commodity. Producers' price elasticity of regional CSE experiences dependence only on country's production. Thus, in countries with higher production levels, production elasticity of regional CSE would be higher, and increase or decrease of regional production in comparison to country level would cause higher changes in regional CSE. Additionally, in countries with higher production levels price elasticity of regional CSE would also be higher, therefore increase or decrease in regional producers' prices in comparison to country level would cause higher changes in regional CSE. Generally, regions in countries with higher agricultural production are more vulnerable in terms of regional CSE to increase in regional heterogeneity. Agricultural enterprises in regions of such countries might experience higher then expected influence of price changes.

Current paper suggests the theoretical framework of recalculation methodology, and validation of methodology is therefore needed. This can be done by applying proposed recalculation procedure to regions of selected country followed by subsequent comparison with results from another methodology (for example, WTO agricultural support measurement system).

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MARKETING STRATEGIES AT FARMERS' MARKETS IN CONNECTION WITH THE PURCHASE OF FISH

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Annotation: The popularity of farmers' markets in recent years is increasing. For small farmers, who are currently under the pressure of multinational food companies, farmers' markets are a so-called Short Supply Chain, which allows for the sale of goods without a middleman. Although the fish consumption increased by 6.3 percent to 5.4 kg per person, it is only a seasonal increase, which is due to the tradition of buying carp on Christmas. Farmers' markets provide direct contact with the customer and allow for sales outside the Christmas holidays. As indicated by previous research, farmers' markets are places where there is direct contact with the customer and the seller gains the ability to communicate and to capture changing customer preferences in purchase behaviour. This is potentially a very interesting channel of sales that, with the right marketing strategy, can allow producers (sellers) to increase sales directly to customers.

Key words: Consumer, Farmers´ Market, Fish Consumption, Questionnaire Survey, Short Food Supply Chains

JEL classification: M31

1. Introduction

In recent years farmers' markets have become highly popular with consumers (Byker et al., 2012). They enable them to buy fresh and local products (Balcarová et al., 2018; Schmit and Gómez, 2011; Wolf, Spittler and Ahern, 2005), and consumers have greater trust in the fact that they are healthier than foods purchased in the conventional manner in supermarkets (Martinez et al., 2010). Consumers do not shop on farmers' markets merely because of the determinants of the products themselves, but are also seeking a more personal rapport with retailers, which can then develop into a loyalty (Kirwan, 2004). Meeting retailers enables them to obtain information about the products they are buying, how they are grown or produced (Chen and Scott, 2014), and they also get a good feeling about supporting small entrepreneurs (Margarisová et al., 2017; Govindasamy et al., 1998) and reducing food miles and their carbon footprint (Birch et al., 2018). New studies (Pilař et al., 2018; Dodds and Holmes, 2017; Chen and Scott, 2014) focusing on why people shop on farmers' markets show that an important motive for consumers is the market atmosphere, the chance to meet people who share their ideals and to buy products for pleasure, such as flowers.

Farmers' markets are a form of Short Food Supply Chains (Margarisová et al., 2018), which have regained their appeal as a marketing channels in alternative food networks (Oñederra-Aramendi et al., 2018). The farmers who sell their product on farmers' markets are small producers, who grow and/or process their own products using mostly short marketing channels (Kirwan, 2004). They often tend to be excluded from classic marketing channels, as for them, selling their produce on farmers' markets is an opportunity to use direct marketing to increase their cash flow and supplement their income (Payne, 2002, Polimeni, Iorgulescu and Mihnea, 2018). Selling goods through Short Food Supply Chains also provides other environmental and social benefits (Pilař et al., 2017).

Although the consumption of fish in the Czech Republic increased by 6.3 percent to 5.4 kg per person in 2017 (Witz, 2019), in global terms it is possible to say that fish consumption is tradionally low. There is a significant seasonal surge in fish consumption at Christmas time, when the consumption of fish increases dramatically and half of all households purchase carp (ČTK, 2018).

The total consumption of fish products has increased slightly since 1989. Dofková et al. (2001) point out that the consumption of fish increased to 13 g/day/person in 1997. This increase is attributed mainly to sea fish and canned fish products. The Czech Republic is a fish importer - 39.098–43.399 tonnes were imported every year during the period 2010–2015 (Nebeský et. al, 2016). And during the years fish production is also increasing slightly. Fish production has remained steady at 20-21 tons of fish in the past ten years (Situation and Outlook Report – Fishes, 2017). Part of this production is intended for export (10.9 tons in 2016) and the rest for national consumption (2.5 tons of live fish for sale, 8.3 tons for further processing).

The aim of this paper is to identify key determinants of purchasing behaviour in the specific environment of farmers' markets in connection with purchases of fish and with regard to marketing activities aimed at increasing sales at times other than the traditional Christmas cultural period.

2. Materials and Methods

The results of the research are the partial results of the project NAKI II - Cultural traditions of Czech fishing in the light of its utilization in tourism and landscape architecture. The primary data were obtained through a questionnaire survey conducted in March and April 2019 on farmers' markets in Prague. The questionnaire contained 14 questions, 5 of which were socio-demographic (see Table 1). The target group of respondents comprised visitors and customers of selected farmers' markets in Prague. A total of 101 completed questionnaires were obtained.

To evaluate the various results of the survey, methods of descriptive statistics - absolute and relative frequency were applied. The Pearson Chi-Square and Cramer's V tests in contingency tables were used for testing hypotheses. The conditions for testing by means of the Pearson Chi-Square test in contingency tables were confirmed (no more than 80% of cells had an expected count of less than 5. If the p-value calculated by the means of the $\chi 2$ test was lower than the selected level of significance $\alpha = 0.05$, the null hypothesis about independency was rejected (Čihák, 2014). The correlation coefficient values were interpreted according to De Vaus (2002), where 0.01 - 0.09 is no dependence; 0.1 - 0.21 is low to medium dependence; 0.30 – 0.49 is medium to significant dependence; 0.50 − 0.69 is significant to very strong dependence; 0.70 − 0.89 is very strong dependence and 0.90 – 0.99 is almost perfect dependence.

The practical calculations were made using MS Excel and the statistical software SPSS version 25.

Table 1. Sociodemographic factors of the respondents in total and %

		Frequency	Percent			Frequency	Percent
Sex	Female	61	60.4%	Education	Elementary	7	6.9%
	Male	40	39.6%		Secondary	51	50.5%
Age	Up to 26	19	18.8%		University	43	42.6%
	27 - 40	36	35.6%	Small Children (up to 14 years)	Yes	32	31.7%
	41 - 60	25	24.8%		No	69	68.9%
	61 above	21	20.8%	Marital Status	In relationship	73	72.2%
					Single	28	27.7%

Source: Authors' research, 2019

The research hypotheses were as follows:

Hypothesis no.1: H_0: The respondent's age does not influence his or her perception of buying fish on farmers' markets as part of tradition

Hypothesis no. 2: H_0: The respondent's age does not influence his or her motives for buying freshwater fish on a farmers' market

3. Results and Discussion

The results (see Table 2) show that farmers' markets are a suitable marketing channel for selling fish (Carey et al., 2010), as more than 60% of the respondents addressed buy fish on a farmers' market. Purchases of fresh and cooked fish are equal (both 18.8%). The preference between Czech (i.e. freshwater) fish and sea fish are also almost equal. Freshwater fish are bought by 52.5% of respondents, sea fish and seafood by 57.4% of respondents. The most frequently purchased freshwater fish include carp and trout, while the most frequently purchased are salmon, tuna and sushi.

Table 2. Fish Purchase on Farmers´ Market total and %

	Frequency	Percent		Frequency	Percent
Yes	66	65.3%	No	35	34.7%
Yes, fresh	19	18.8%	No, expensive	18	17.8%
Yes, heat treated	19	18.8%	No, not interested	16	15.8%
Yes, boths types	12	11.9%	No, not available	1	1.0%
Only at Christmas	16	15.8			

Source: Authors' research, 2019

The results of the survey showed that the main motive for buying freshwater fish (see Table 3; the respondents could select from multiple answers) was the taste of the fish, the reason selected by 43.6% of respondents. The results for tradition (23.7%) and the nutritional value of the fish

(23.8%) were very similar, as confirmed by many previous studies (Ariño et al. 2013; Mohanty et al., 2017) and, together with taste, also appears as the main motive in the study conducted by Brunsø et al. (2009). The main reason why consumers do not buy fish is that they do not know any interesting ways of cooking it (24.6%), followed by the fact that people do not like the taste of freshwater fish (21.8%).

Table 3. Determinants of Freshwater Fishes' Purchase/Barriers of Purchase

Purchase	**Frequency**	**Percent**	**Barriers of Purchase**	**Frequency**	**Percent**
Tradition	26	25.7%	Unknowing an interesting way of heat treatment	25	24.6%
Taste	44	43.6%	I don't like it	22	21.8%
Nutritional Value	24	23.8%	Expensive	16	15.8%
			Not Available	10	9.9%

Source: Authors' research, 2019

One significant motive that leads 43% of consumers to buy greater quantities of freshwater fish is the lower price. This result is in line with the findings from Dofková et al. (2001), according to which the consumption of freshwater fish is particularly dependent on the market price. The second most significant motive is the popularisation of interesting recipes for cooked fish dishes (35.5%). According to the previous finding, unfamiliarity with fish recipes is one of the main barriers discouraging people from buying fish.

Consumers buying fish on a farmers' market would mostly like to see a greater range of fresh and cooked fish intended for direct consumption (for more, see Table 4). This supports the results of the studies by Pilař et al. (2018) and Dodds and Holmes (2017), who claim that farmers' markets are now becoming a pleasant place for people to spend their leisure time with friends, where consumers like to purchase products for immediate consumption.

Table 4. Motives to stimulate purchasing/ Interest o a larger offer of fishes on Farmers´ market

Motives to stimulate purhcasing	**Frequency**	**Percent**	**Interest in a larger offer**	**Frequency**	**Percent**
popularizing interesting recipes	36	35.6%	Yes, heat treated	20	19.8%
popularizing the health benefits	8	7.9%	Yes, fresh	7	6.9%
lower price	43	42.5%	Yes, both	29	28.7%
greater availability	21	20.8%	No	45	44.5%

Source: Authors' research, 2019

For hypothesis no. 1 H_0 was defined as follows: The respondent's age does not influence his or her perception of buying fish on farmers' markets as part of tradition. Hypothesis no. 1 was analysed using Pearson's $\chi 2$ test. 0 cells have expected counts less than 5. The minimum expected count is 6.75. The prerequisites of the test are therefore met. The results of the test are $\chi 2=19.209$; P=0.000 (see Table 5); $P < \alpha$ and therefore H_0 is rejected. Based on this analysis, we can conclude that age does have an impact on the perception of buying fish on farmers' markets as part of tradition. As the next step, we evaluated the strength of the correlation; Cramer's V=0.481, meaning this is significant dependence according to De Vaus (2002).

Table 5. Chi-Square Test of H1

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	19.209	3	0.000
Likelihood Ratio	21.838	3	0.000
Linear-by-Linear Association	18.229	1	0.000
N of Valid Cases	83		

Source: Authors' research, 2019, processed in SPSS

For hypothesis no. 2 H0 was defined as follows: The respondent's age does not influence his or her motives for buying freshwater fish on a farmers' market. Hypothesis no. 2 was analysed using Pearson's $\chi 2$ test. 16,7% cells have expected counts less than 5. The minimum expected count is 3,91. The prerequisites of the test are therefore met. The results of the test are $\chi 2$=26,26; P=0.000 (see Table 6); $P < \alpha$ and therefore H0 is rejected. Based on this analysis, we can conclude that age does have an impact on the perception of buying fish on farmers' markets as part of tradition. As the next step, we evaluated the strength of the correlation; Cramer's V=0.378, meaning this is moderate dependence according to De Vaus (2002).

Table 6. Chi-Square Test od H2

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	26.26	6	0.000
Likelihood Ratio	26.568	6	0.000
Linear-by-Linear Association	4.384	1	0036
N of Valid Cases	92		

Source: Authors' research, 2019, processed in SPSS

4. Conclusion

The results showed that purchasing fish on farmers' markets is a routine matter, which is why a farmers' market is a suitable marketing channel for small enterprises in the fisheries sector. Sea fish and seafood slightly predominate in the types of fish visitors to these markets buy. The main reason for the lower interest in traditional Czech fish is that people do not know interesting ways of cooking them. The purchasing trends on farmers' markets show that customers do not visit farmers' markets merely due to the determinants of the products offered, but also because of the market atmosphere, the chance to meet friends and also immediately consume the products they purchase. The results imply an opportunity for retailers in expanding the range of fresh products they offer to include interesting and non-traditional ideas (recipes) for cooking fish and also expanding the range of cooked products intended for direct consumption.

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THE MODELLING OF THE ENTERPRISE ARCHITECTURE IN THE ENVIRONMENTAL AREA: A CASE OF THE FULL ELECTRONIC SUBMISSION

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Annotation: The full electronic submission is a key function, which should be offered by each web portal of the Public administration bodies in whole Czech public administration as well as in environmental sector (headed by the Ministry of Environment). This web function is targeted to a wide spectrum of users from the environmental sector across the Czech Republic, especially citizens, waste producers and entrepreneurs, environmental agencies and associations. The use of Enterprise Architecture like a common language of modelling relations in sociotechnical domain, where the full electronic submission really belongs to, has been one of the strict assumptions to get the application approved by the Ministry of Interior which also acts as a national ICT Coordinator. The article addresses following research topics: Enterprise Architecture approach helps ICT managers to describe effectively the relations between all actors in environmental area, which are involved in the full electronic submission by using commonly understandable graphical language. Enterprise Architecture also structures a problem domain into levels designed for particular professionals working with business processes, applications and technology in order to get the projects approved for the implementation at the national level and supported by EU funds.

Key words: Enterprise Architecture, web portal, Public administration bodies, environmental sector, sociotechnical model, full electronic submission,

JEL classification: H7 M15

1. Introduction

Digital transformation of global society and markets has brought new technological opportunities. Since changes have crossed the borders of continents and individual states long time ago, digitalization has become naturally one of the top priorities of the European Union and its member states such as the Czech Republic. Czech government primarily focuses on removing barriers and obstacles to business, trade, government itself and public administration in order to ensure free movement of information, knowledge, goods and services in the digital as well as the physical world.

The part of digitalization within the current governmental initiatives formalized in “The Digital Czech Republic 2019” is the improvement of government services as well as services of public administration for the citizens and entrepreneurs.

The Czech Republic has developed many legislative, organizational and digital initiatives since 1990s till this time being. It resulted sometimes into positives and sometimes into negatives that have had strong impact onto daily life of citizens. However, despite the invested effort and resources, Czech eGovernment (which also contains ePublic Administration) has been progressing slowly in comparison with other Eastern European countries as it could be seen in the UN E-government Development Index (UN, 2018) and European Commission’s DESI (EC, 2018).

Table 1. Overview of eGovernment laws, recommendations and directives – result of digital initiatives since 1990s till 2019.

Heading type	The title of the law
Act No. 365/2000 Coll	Act on Public Administration Information Systems
Act No. 181/2014 Coll	Cybersecurity Act and related legislation (Cyber Security Act)
Act No. 300/2008 Coll	Electronic Acts Act and Authorized Document Conversion
Act No. 111/2009 Coll	Basic Registers Act Act on Archiving and Records Service and on
Act No. 499/2004 Coll	Amendments to Some Acts
Act No. 634/2004 Coll	Act on Administrative Fees
Act No. 500/2004 Coll	Law Administrative Code
Degree No. 496/2004 Coll	Decree on Electronic Registrars
Degree No. 194/2009 Coll	Decree laying down the details of the use and operation of the data box information system
Decree No. 364/2009 Coll.	Public Administration Contact Points Decree
Degree No. 910/2014 Coll	Regulation of the European Parliament and of the Council on electronic identification and services creating trust for electronic transactions in the internal market
Act No. 101/2000 Coll	Law on Protection of Personal Data

Adapted from Lucie Zajícová, Czech University of Life Sciences Prague, Diploma thesis, Methodological support of human resources management in public administration through ICT, 2017

Currently, the Czech Republic struggles with lack of vision, lack of centralized ICT management since many government departments act as silos with no desire to give their authority on ICT management, and lack of professionals as many of them left for higher salaries and better working and social conditions in the private sector. Therefore, the Digital Czech Republic 2019 strategy sets to address the mismanagement of ICT in the public sector by promoting the international standard TOGAF, a framework for enterprise architecture development management in order to align IT with business objectives (The Open Group, 2011), and ArchiMate, a modelling language for enterprise architecture (The Open Group, 2016). US federal government requires their agencies to have IT architecture which is defined as: '*an integrated framework for evolving or maintaining existing information technology and acquiring new information technology to achieve the agency's strategic goals and information resources management goals'* (Clinger–Cohen Act, 1996). Although most European governments do not impose such strict requirements on their agencies, exercising enterprise architecture practices has been paving its way more often in many cases (Lankhorst et al, 2018).

Enterprise architecture was firstly introduced in Czech public administration around the year 2014 as a required part of the request of projects being co-funded by the EU. The pioneer of TOGAF/ArchiMate initiative has become the Department of the Chief Architect at the Ministry of Interior of Czech Republic responsible for the coordination of e-government development according to the Czech Government Decree no. 889 from November 2, 2015.

Enterprise architecture (EA) is a well-defined practice for conducting enterprise analysis, design, planning, and implementation, using a holistic approach at all times, for a successful development and execution of strategy. Enterprise architecture applies architecture principles and practices to guide organizations as well as public administration bodies through the business process, data & information, and technology changes necessary to execute their strategies (The Open Group, 2011).

Here are some examples about how EA/ArchiMate helped to improve government ICT management:

1. EA / ArchiMate documentation is a required attachment to all IT project funding applications that request the EU co-funding and have an annual budget over six mil. CZK or 30 mil. CZK over five years. Without the filled-in form and appropriate future state (TO-BE) enterprise architecture documentation the project cannot be (Felix, Hrabě, Šedivec, 2016).

2. The Ministry of Environment applied for a project of the Enterprise Service Bus that requested EU funding, therefore the official request for funding had to be accompanied with the TOGAF enterprise architecture diagrams developed in ArchiMate. Based on that the Department of the Chief Architect at the Ministry of Interior of Czech Republic evaluated the request positively and gave approval for the project financing (Lukáš, 2016).

3. The initial sketches of the approach to ICT management in the public sector by means of TOGAF and ArchiMate were firstly published in 2013, later resulted in the development of the National Architecture Plan (Kuchař, Felix, 2015), and finally were adopted by the Czech government and incorporated in The Digital Czech 2019 strategy.

4. EA / ArchiMate concept was successfully used out in a decomposition of ICT Strategy for the Public Authority (Ministry of Environment), identification of major programs, project portfolio, individual projects, their links and related motivational factors. The selected components of ArchiMate notation were used for the description of the business and motivation layer. The need for visualization of the program portfolio and project and their quick understanding by stakeholders are essential. It is derived from the requirements for detailed decomposition of ICT strategy where more precisely defined sub-units can be controlled by conventional methods of program and project management (Lukáš, 2017),

On the contrary, a successful usage of EA/ArchiMate is not without controversies. As a recent example of it is the public tender of the Project and Enterprise Architecture Office at the General Financial Directorate (Ministry of Finance) that aims to develop organization, architectural, project and methodical conditions to replace a legacy tax management information system called Automated Taxation Information System (ADIS) with a new tax management information system called nDIS. As the ADIS vendor managed to maintain a long-term contract which is nearly impossible to revoke, and a large number of legislation amendments are needed to be approved by the Parliament in order to allow nDIS to operate, the authors of this article are rather skeptical about success of the project despite the fact that it envisions enterprise architecture and standardized approach to IT architecture management. Therefore, the authors of this paper seek to demonstrate a successful practice of using enterprise architecture for better ICT management in Czech public sector.

2. Materials and Methods

The authors of the paper conducted desk research followed by a case study modelling one particular e-government service for the environmental management. The desk research was conducted through January till March 2018. We developed a set of questions that was distributed via email to the target audience prior to face to face meetings. The target group was chosen from different internal organization units of Ministry of Environment, other departmental organization and ICT units.

The meetings were held during Spring 2018 when the authors met with the target audience representatives individually who were spread across multiple organizational units, departments and organizations. The goal of these meetings was to collect answers to 23 questions. The main focus of the survey was to understand and describe the current state (AS-IS) of information systems which collect environmentally related requests from citizens and entrepreneurs such as those who produce waste or water or air pollutants, industry companies, automotive companies, collectors of auto-wrecks, etc. After gathering responses, we analyzed the answers, segmented them and used them as a knowledge base for the design of a service operating fully electronically.

The EA diagrams describing full electronic submission service had to be developed as a precondition to an official request for approval by the Department of the Chief Architect (DCA) at the Ministry of Interior of Czech Republic. The service according to the EA notation (ArchiMate) was designed between May and June 2018. During the design, we consulted our approach with the DCA as well as with the National Architecture Plan which contains a reference model for the full electronic submission.

The team involved in this project consisted of one member from the Ministry of Environment, one member from CENIA (Czech Information Agency of Environment), and one member from a university. Team was led by the Project Manager who also served as the Enterprise Architect and is the main author of this article.

The team produced following outputs:

1) EA model of business layer of full electronic submission
2) EA model of application layer of full electronic submission
3) EA model of technology platform and communication infrastructure
4) Case study with the project timeline, budget, and SWOT and STEP analyses
5) Request of B type for the Ministry of Interior about the project alignment with the National Architecture Plan)
6) Request via EU administration system (MS2014+, ISKP2014+)

Above mentioned administrative steps were also necessary in order to apply for a grant from the Integrated Regional Operation Program (IROP) call no. IV.

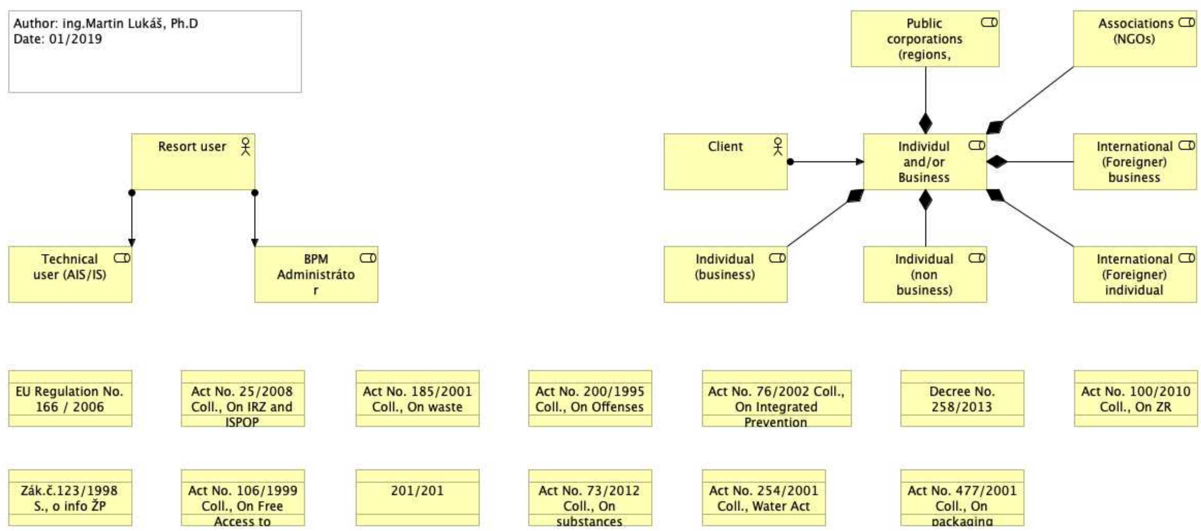
3. Results and Discussion

The results of taken steps described in the chapter above were profound for the submission of the grant application which included filling the forms in the information system. Without having all essential information at hand, the grant application would not be submitted correctly.

Figure 1 shows a real model of the business framework environment of the full electronic submission. Three sets of main elements could be seen on Figure 1: **sector user** (an actor), **client** (an actor) and several **legislation documents** (a contracts). The element of **Business Actor** is either an organizational entity (an individual working as a clerk) or a client capable of performing assigned business within one or more **Business Roles**. The **contract** is an element that determines the relationship between product associated rights to it. Typically, it is an agreement or contract to own, use, rent a product, movable or immovable property as well as specific legislative guidelines (e.g. laws, directives, etc.).

Moreover, Figure 1 captures AS-IS state and was developed in order to get an understanding of different roles for **sector user** and **client**. The elements contract covers following important documents which must be taken into consideration for application design of the full electronic submission.

Figure 1. Model of Business framework environment for Full electronic submission

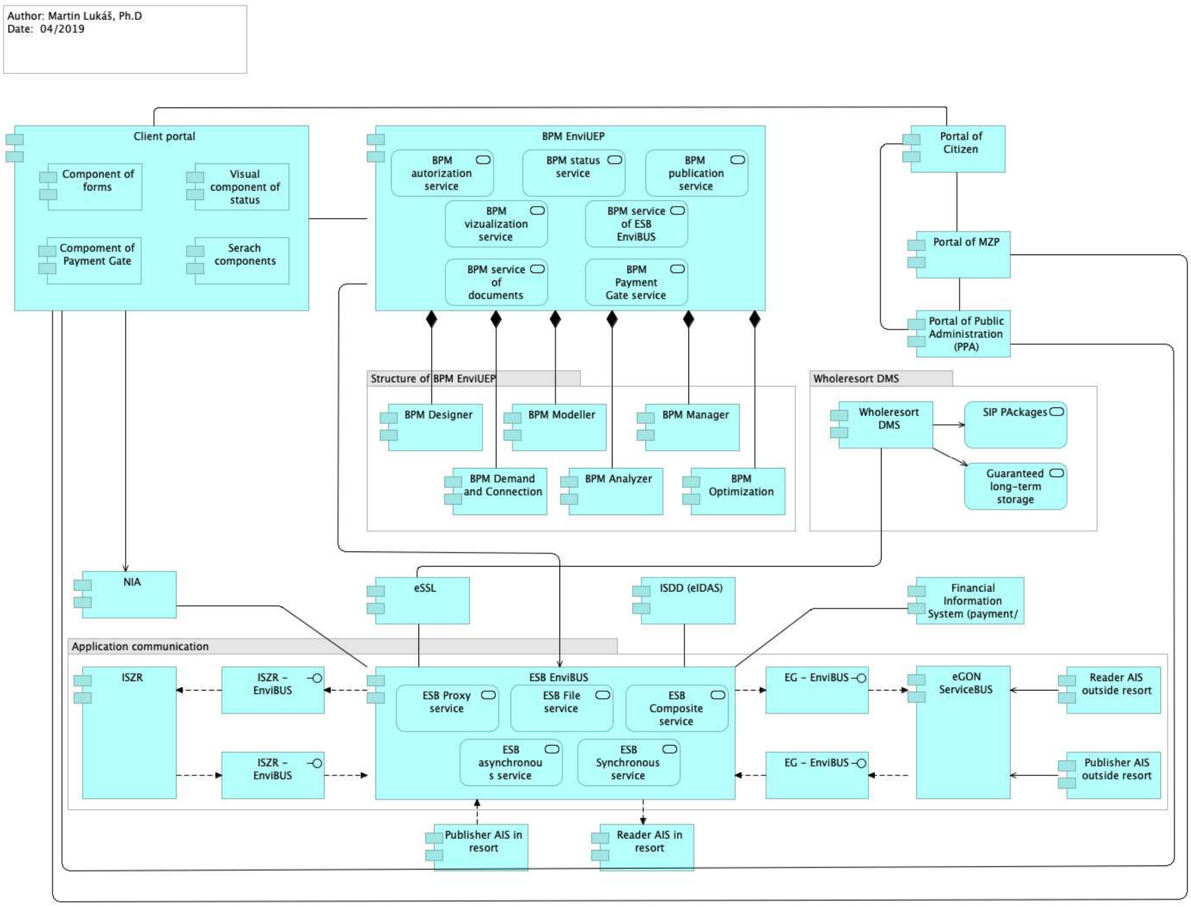


Source: Autor's ArchiMate model, 2018

The next picture - Figure 2 - is also from a real set of models drawn with ArchiMate notification; however this is the application layer. The elements show the applications, application services and interfaces. The full electronic submission is realized by the set of applications. It means that the full electronic submission as such consists of collaborative application like a client portal (Citizen Portal), Portal of Public Administration (PVS), National Authority of Identity (NIA), Portal of the Ministry of Environment, Enterprise Service Bus, EnviBUS platform (ESB) and Business Process Management platform EnviUEP (BPM Envi Full Electronic Submission). These six components are essential for all processes called electronic submission.

The role of the client portal is to promote an exhaustive set of the forms related to the environmental sector via web technology. The National Authority of Identity (NIA) allows clients to log into the portal via a unique identity provided by the Czech government agency. In reality, citizens unique identities take form of an electronic citizen ID card (eOP) and/or two-factor authentication, i.e. username, password and SMS code, which has become a standard for other web portals provided by Czech governmental agencies. The users can also log into the portal via other governmental portals such as the Portal of Public Administration (PVS), Portal of Ministry of Environment and/or via the Citizen Portal using the same credentials. as it is enabled through so-called federalization of identities between the governmental portals and web services. Other application components like eGON Service BUS and Information System of Basic Registers (ISZR) which consist of specific application services, interfaces and/or collaborating with other application components (e.g. internal electronic postal servises - eSSL, Information system of digital trust – ISDD/eIDAS) are components supporting the full electronic submission. These components are not visible for the users since they operate on the back-end. However, they role is essential for the collaboration of components on the national level. The specific users acting in different roles shown on Figure 1 are able to log into the client portal uniquely using a specific form. During the process, the form data already available in the government information systems are pre-filled, the other information is added manually by the user who then signs the form and submits it electronically.

Figure 2. Model of Application framework environment for Full electronic submission



Source: Autor's ArchiMate model, 2018

4. Conclusion

Support from the senior management and alignment with the legislation are the most important prerequisites for progressive development of the full electronic submission not just in the sector of environment, but in all government agencies. Generally, only this kind of support can help a government agency become an innovative leader in the government and to fulfill the expectations of e-government while being more citizen-oriented and transparent.

As Mr. Dzurilla (Guarantor for the area of eGovernment and Chief Digital Officer of the Government of the Czech Republic) said *"We are aware of the fact that the digital transformation will bring about a number of changes, affecting each of us, as well as the authorities themselves. Citizens and entrepreneurs, as well as their unions, are at the same time calling* *for the digitization of state administration and finally it has started to move forward.“* (Dzurila, 2019).

This article attempted to show that EA is able to assist with getting financial support from the EU funds. The effective usage of EA must be perceived in the light of wider theme of eGovernment, digital transformation and modern services of public administration because the architecture of new ICT services should be described and managed in a transparent and structured way.

To the date, in the Czech Republic, the enterprise architecture approach successfully helped to develop the information systems of basic registers, data mailboxes, CzechPOINT and the data sharing infrastructure. Further government ICT projects supported by EA on the national level are the Citizen Portal, National Identity Authority (NIA), changes in the distribution of documents, electronic stamps, electronic signature, and eIdentity cards.

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RATE OF PRODUCT DIVERSIFICATION SETTINGS DEPENDING ON CRITICAL ECONOMIES OF SCALE FOR AGRICULTURAL BUSINESS

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Annotation: In terms of management efficiency, there are two competing theories. The first of these, the economies of scale is said to be performed when more or less good or service can be generated on a larger scale, yet with less input costs. The second theory is called product diversification and is sometimes called product differentiation.The article aims to create a general identification of the agricultural business system in terms of stable (and thus sustainable) product diversification, depending on the changes in the critical quantity of economies scale. An analytical mathematical model will be used to determine the diversification and economies of scale, and the parameters will be determined using full factorial design. The result of the article is to verify the functionality, reliability, and consistency of the designed solution using selected enterprise case study. From a practical point of view, the solution represents re-settings product differentiation in terms of changing the value of the critical scale of economies and other business surrounding factors.

Key words: product diversification, business risk, critical scale, analytical solution, optimum of multiple variables function.

JEL classification: Q16

1. Introduction

In Shah (2019), Huang (2017), and Stimpert and Duhaime (1997), diversification has an implied, different effect on firm profit. Similarly, a lot of authors argue that a negative relationship exists without other variables considerations; however, some authors (Reicheneck (2019), Louida (2018) further expect that the link includes both straight and secondary effects. This explanation was firstly described by Rumelt (2002), where he showed that factor-based economies of scope and uncertain imitability. This pioneer study theory in understanding diversified profitability. Likewise, Bettis (2001) found that excellent business performance in related products diversification is correlated with the improvement and utilization of the key managerial skills. The arguments of Park (2019), Bettis (2001) and Lippman and Rumelt (2002) run parallel to those constructed by resource-based ideologists. Some, resource-based authors Toth (2019), Bielstein (2018); and Anand and Singh (2007) moved the analysis of relatedness from the product to the resource grade. For example, Chatterjee and Wernerfelt (2001) found that independent diversifications primarily rely on financial resources, had a lower performance than related diversifications utilized material, information, and HR firms´ resources. Almost identical results, supporting a positive association between diversification related at the proprietary resource-level and performance, were found in Montgomery and Wernerfelt (1998); Wernerfelt and Montgomery (1998); Markides and Williamson (2004); Anand and Singh (2007); and Hung (2019).

All of these approaches are relatively sensitive to the field of collection or the industrial segment, and the possibility of excluding the third factor (statistical evaluation) or the subjectivity of experts (fuzzy logic and multi-criteria approaches). In contrast to the instability of the validity of the detected sessions, using the above methods, the analytical solution is based on functional relationships that usually automatically satisfy the causality between dependent and independent variables. Thus, in this article, designing an analytical solution represents a time consistent and stable design with a relatively broad field of application.

In addition, the solution is derived with a detailed description of the steps for the subsequent development of the solution to other industries than food production.

Research questions

Besides the statistical estimation of the regression model is possible to find a general (or semi-general) explicit form of dependence of product portfolio diversification on microeconomic variables and business risk (described, for example, by the distribution of random variables). This analytical form of product portfolio diversification can be practically used to optimize the product portfolio regardless of the selected economic control variables (eg to maximize the total profit during the reporting period).

2. Materials and Methods

The solution design is based on finding an analytical solution to optimize product diversification in relation to reducing business risk **r**, which is negatively affecting the profit margin by reducing the benefits of scale production. Thus, diversification acts in two folds. Diversification positively affects the entrepreneur's risk of loss by dividing production capacity into revenue substitutes, but at the same time decreasing partial profit margins. The average profit margin is usually defined as the difference between the average price of one portfolio product **p** – and the average total cost of product **tc / q** (where **q** is the average quantity of production of one portfolio type of product diversification and **tc** is the total cost)).

In the absence of business risk of failure **r = 0** (generally **r ∈ ⟨0.1⟩**) it is possible to optimize the profit margin **p – tc / q** through the equation:

$$p - \frac{tc}{q} = p - \frac{fc}{q} - vc = !\,MAX \tag{1}$$

If we estimate the risk of business **r** (eg from the distribution of random variables using probability density or distribution function or the ratio of unsuccessful business plans to the total number of plans in the reporting period), we will adjust equation (1) to optimize it according to two different criteria:

$$\left(p \times r - \frac{fc}{q} - vc\right) = !\,MAX \tag{2}$$

The risk of entrepreneurship, which decreases when the production capacity is distributed into yield substitutes, can be used by the relationship for parallel business activities in the following way:

$$r = 1 - \sum_{i=1}^{k}(1 - r_i) \tag{3}$$
(1)

When determining the average risk r ̄(given eg as a weighted average risk of the whole activity portfolio), we can approximate the previous equation (3) with the following form:

$$r = 1 - (1 - \bar{r})^x \tag{4}$$

Where **x** is the number of products of a diversified production portfolio. For this variable, it is advisable to introduce the diversification x^*which is defined by the following relation:

$$x^* = \frac{x}{\sum_i q_i} \tag{5}$$

Where $\sum q_i$ is the total number of portfolio production.

By substituting (4) for (2), we obtain an implicit (exponential) expression of the number of products of a diversified production portfolio **x** in relation to the risk of r and the total average cost of the portfolio **tc (tc = fc / q + vc),** where **vc** is the average variable portfolio cost (sometimes replaced by direct costs per piece of production). Thus:

$$p \times (1 - (1 - \bar{r})^x) - \frac{fc}{q} - vc = !MAX \tag{6}$$

Since (6) is a function of multiple variables, to find the optimum number of **x** (products of a diversified production portfolio) depending on the risk and benefits of the range, we will perform a partial derivative of equation (6) by **x**, which is equal to zero. Thus:

$$\frac{\partial\left(p \times (1 - (1 - \bar{r})^x) - \frac{fc}{q} - vc\right)}{\partial x} = 0 \tag{7}$$

In order to avoid the trivial solution (0 = 0) provided by deleting the constant **p** after derivation, we first multiply the bracket in relation (6), and then this modified expression is partially derived by **x**:

$$\frac{\partial\left(p - p(1 - \bar{r})^x - \frac{fc}{q} - vc\right)}{\partial x} = 0 \tag{8}$$

It is still necessary to express the average fixed cost **fc / q** in the production portfolio x to avoid optimizing the yield component of the equation, ie the cost component is not in the form of a derivative constant. The average variable costs probably do not have an explicit effect on economies of scale (mild effect of reducing labour intensity with increasing **q** is annulled by increasing machine wear, etc). Therefore, it is advisable to let the average variable costs as a derivation constant by **x**. Thus:

$$\frac{fc}{q} = x \times \frac{\overline{fc}}{q} \qquad \textbf{(9)}$$

Where $\overline{fc}$ are the average fixed costs of one product type from the total product portfolio. Substituting equation (9) into (8) yields equation form that is adapted for differentiation with respect to **x**:

$$\frac{\partial\left(p - p(1-\bar{r})^{x} - x \times \frac{\overline{fc}}{q} - vc\right)}{\partial x} = 0 \qquad \textbf{(10)}$$

After partial derivation of the relation (10), according to the searched variable diversified portfolio of production **x**, we get:

$$-p \times (1-\bar{r})^{x} \times ln(1-\bar{r}) - \frac{\overline{fc}}{q} = 0 \qquad \textbf{(11)}$$

By separating the variable **x** on the left side of the equation, we get an explicit expression of the diversified product portfolio variable. Thus:

$$x = \frac{log\left(-\frac{\overline{fc}}{p \times q} \times \frac{1}{ln(1-\bar{r})}\right)}{log(1-\bar{r})} = \frac{log\left(-\frac{\overline{fc}}{tr \times ln(1-\bar{r})}\right)}{log(1-\bar{r})} \qquad \textbf{(12)}$$

When the domain variables are:

$$\bar{r} \in \langle 0,1 \rangle \quad p > 0 \quad q > 0 \quad and \quad p \times q = tr \quad (total\ revenue)$$

Under conditions of the variables listed below equation (12) will ensure that the second derivative of equation (10) will be affirmative, so it is not necessary to carry out for determining the kind of extreme.

3. **Results**

The first step in the factorial experiment was to detect the factors and interactions influencing the mean of the responses (Diversified production portfolio and Total profit). The results of the experiment are shown in Table 2. For the significance test, a significance level of α = 5% (0.05) was selected. Then, if the p-value was less than the significance level (0.05), then the factor or interaction was statistically significant. This experiment showed that no main effects of Diversified production portfolio; Total profit, and no interaction effect were statistically significant. Any factor or interaction effect extending past the reference line is considered significant. The calculated effect factor in the uncoded values (response factor to a change from (–1 to +1) is shown in the first column of Table 3. The second column represents the regression coefficient (half of the effect of each factor)

Table 1. Diversified portfolio variables for to maximize profit

Diversified portfolio variable	Variable description	Settings of values
$\overline{\boldsymbol{fc}} / \boldsymbol{tr}$	ratio of average fixed costs and revenues	$0 \leq \frac{\overline{fc}}{tr} \leq 1$
r	business risk	$0.01 \leq r \leq 0.99$
x	diversified production portfolio	range of values: x ∈ ⟨1,+∞)
tp	total profit	range of values: tp ∈ (−∞, +∞)

Source: Set values of our experiment (2019)

Table 2. List of process parameters for the experiment

Process para-meter	Definition domain	Low level setting		High level setting	Lower level setting (coded units)	High level setting (coded units)
$\frac{\overline{fc}}{tr}$	$\frac{\overline{fc}}{tr} \in (0, +\infty)$	0.6		0.8	-1	+1
r	$r \in \langle 0,1 \rangle$	0.1		0.2	-1	+1

Source: Set coded values of our experiment (2019)

The next tables 3 and 5 show the estimation of the coefficients to determine the predictive equations of the diversified portfolio and total profit responses.

Table 3. Coded Coefficients for *x* (diversified portfolio)

Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		16,60	*	*	*	
fc/tc(fixed cost-revenue ratio)	-6,800	-3,400	*	*	*	1,00
r (business risk)	-0,000000	-0,000000	*	*	*	1,00
fc/tc(fixed cost-revenue ratio)*r (business risk)	2,600	1,300	*	*	*	1,00

Source: Results from our analysis (2019)

Table 4. Regression Equation for ***Diversified Portfolio*** in Uncoded Units

x (diversified portfolio)	=	2,875 - 0,6750 fc/tc(fixed cost-revenue ratio) + 0,1250 r (business risk) + 0,2750 fc/tc(fixed cost-revenue ratio)*r (business risk)

Source: Results from our calculation (2019)

Table 5. Coded Coefficients for ***tp*** (total profit (million CZK))

Term	Effect	Coef	SE Coef	T-Value
Constant		16,60	*	*
fc/tc(fixed cost-revenue ratio)	-6,800	-3,400	*	*
r (business risk)	-0,000000	-0,000000	*	*
fc/tc(fixed cost-revenue ratio)*r (business risk)	2,600	1,300	*	*

Source: Results from our analysis (2019)

Table 6. Regression Equation for *Total Profit* in Uncoded Units

tp (total profit - million CZK)	=	16,60 - 3,400 fc/tc(fixed cost-revenue ratio) - 0,000000 r (business risk) + 1,300 fc/tc(fixed cost-revenue ratio)*r (business risk)

Source: Results from our calculation (2019)

The procedure for calculating the regression parameters is introduced for example, in Antony (2003).

4. Conclusion

As shown by the Pareto graph in Figure 3, as well as Tables 3 and 5, the statistical estimate of regression parameters for predicting product portfolio diversification and total production gains in the reporting period is not statistically significant. In these situations, it is useful to create an analytical solution to find the number of diversified products in a fixed cost / total revenue ratio and business risk (in addition to finding a different model - for example, polynomial). This analytical solution represents the original proposal of the authors of the article in order to eliminate the disadvantage of the statistical solution, which often (in the contrast of analytical solution) does not express the causality between control and controlled variables (here diversification of the product portfolio, risk of business activities and average fixed cost - total revenue ratio). The research question on the possibilities of finding the analytical form of diversification of the product portfolio has been proven through the relationship (12). Practical functionality of the solution was verified by the consistency of the settlement of relation (12) with tables 4 and 6.

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ECONOMIES OF SCALE AND THEIR INFLUENCE ON THE AMOUNT OF RENT FOR NATURAL AND LEGAL PERSONS

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Annotation: Based on a literature review, several findings were gained related to the impact of savings on the amount of rent. It can be stated that current knowledge is not sufficient and leads to conflicts related to managed land, corporate form, and amount of rent. The objective of this article is to fill the gap in current knowledge related to rent depending on the scale of the managed land when applying economies of scale for individual corporate forms. The results of this research has arrived at the conclusion that no direct link exists between the extent of the managed land and the amount of rent either for natural or legal persons. The advantages flowing from economies of scale are not reflected in the amount of the rent. Nonetheless, the dynamics and changes of the rent are influenced by agricultural production areas.

Key words: Economies of scale, rent, natural persons, legal persons.

JEL Classification: Q14, Q15, Q24

1. Introduction

Economies of scale can take several forms (Brčák and Sekera, 2010). Economies of scale are created in the situation when a single company is able to fully provide the supply of a given product with lower average costs than could be provided by several companies (Roest, Ferrari and Knickel, 2018). Economies of scope emerge when a farmer can use the same input(s) to produce two or more products, and lower the cost of producing them separately (Holman, 2018). Enlarging the market allows for specialization that reduces the costs of companies, and for this reason allows for the utilization of their comparative production, as confirmed by Urcola et al. (2015) in the example of small and large farms.

The above study thus presumes advantages from economies of scale that can be reflected in negotiations with participants in the market.

We can therefore understand economies of scale in general as a benefit achieved in large-scale production; this benefit can be transferred to negotiating relationships, where economies of scale can lead to lower entry costs in the form of lower rent, i.e. application of lower prices per hectare given the larger size of the managed land (volume discount – a company with greater purchasing power can agree to a better price with a landlord). Nonetheless, the opposite can be true in the sense that the greater savings per hectare and greater returns allow companies doing business on a larger scale to undertake higher rent than companies doing business on a smaller scale. The Institute of Agricultural Economics and Information (2017) pointed out that legal persons typically have a higher volume of production/a higher intensity of production per hectare of agricultural land and therefore can undertake a higher price of rent, because for them this does not constitute a share of the costs for a unit of production as large as that of a small private business.

Dürr (2016) The role of agriculture in economic development and the development politics of promoting smallholders versus large-scale agriculture have both been at the center of a long-lasting and controversial debate. Results show that smallholder agriculture has the same potential to stimulate output growth as large-scale agriculture.
The importance of tenancy has been addressed by Otsuka and Hayami (1988). For the past 2 decades the problems of agricultural tenancy have attracted a great deal of attention not only from agricultural economists but also from economists in general as a typical example of agency-principal contract relations. Despite the prolific growth of literature, both theoretical and empirical, there has been little convergence in opinions on tenancy contracts.
Nonetheless issues about economies of scale and the relationship between tenancy and crop yields has not been sufficiently charted (Vollrath, 2012). Although we have rich theoretical models and a host of empirical studies regarding tenure, this literature has not considered the long-run implications of land tenure relationships. Jin and Deininger. (2009) we are unable to assess the causal impacts of rental markets.
The objective of this article is to fill the gap in current knowledge related to rent depending on the extent of the managed land for individual corporate forms.

2. Materials and Methods

For significance testing of the differences in the levels of rentals between separate production regions and between the natural and legal persons at the same time the multi-factor variance analysis has been applied.

As Hebák, Hustopecký, Jarošová and Pecáková (2004) have put it, variance analysis presents an efficient statistical device for the research of relationships between the explained and the explanatory variables. The explained variables always are the quantitative ones, with the explanatory variables (marked as factors in variance analysis) the type does not matter. If we examine the impact of a single factor upon one or more variables explained, it is the one-factor variance analysis (or the single grouping variance analysis, too). With more factors we speak of the multi-factor variance analysis (double, triple etc., classification). With the double classification we are exploring the influence of two factors upon the dependent variable (Hendl, 2004). Specifically, the way of doing business (physical versus legal person) influence has been assessed in the paper and the impact of affiliation to a farm production area (corn, beet, potato, potato-oat and mountain production areas) upon the rental levels.

In order to find whether the Y variable (the rental) variation observed is dependent on the affiliation of the values in the groups we break the total variation down to the components corresponding to various variation sources. In a multivariate case the variation is expressed by means of matrices where the sums of squares constitute the main diagonal. The variance analysis model is a special case of the general linear model (GLM) and the hypotheses on the factors influence are special cases of the general linear hypothesis of model parameters (Hebák et al., 2013).

A correct application of the ANOVA is, according to Meloun and Militký (2004), bound to satisfying the following prerequisites:

- distribution normality of the random variables (to verify normality the rankit graphs and the Shapiro-Wilks normality test have been applied);
- statistical independence of the random errors;

- homogeneity of variances, the so-called homoscedasticity (verification of this assumption done using the Leven test whose test statistic is based on the variance analysis of absolute difference values from the group median.

The model applied in the article follows:

$$\begin{aligned} & y_{hgi} = \mu + \alpha_h + \beta_g + (\alpha\beta)_{hg} + \varepsilon_{hgi} \\ & h = 1,2,...H \\ & g = 1,2,...G \\ & i = 1,2,...r, \end{aligned} \qquad \textbf{(1)}$$

Here, y_{hgi} means a multivariate observation on the *i*-th unit with the *h*-th factor *A* level and the *g*-th factor *B* level. μ , α_h , β_g , $(\alpha\beta)_{hg}$ represent the general constant, the effects of factors and interactions. ε_{hgi} means the random components vector.

We are testing the hypotheses on the so-called principal factor effects, ie., hypotheses saying that, effects of all the given factor levels (regardless the level of the second factor) are zero:

$$H:\ \alpha_1 = \alpha_2 = \ldots = \alpha_H = 0,\ \ or,\ \ H:\ \ \beta_1 = \beta_2 = \ldots = \beta_G = 0 \qquad \textbf{(2)}$$

on the one hand,

and the hypothesis on the interaction effect:

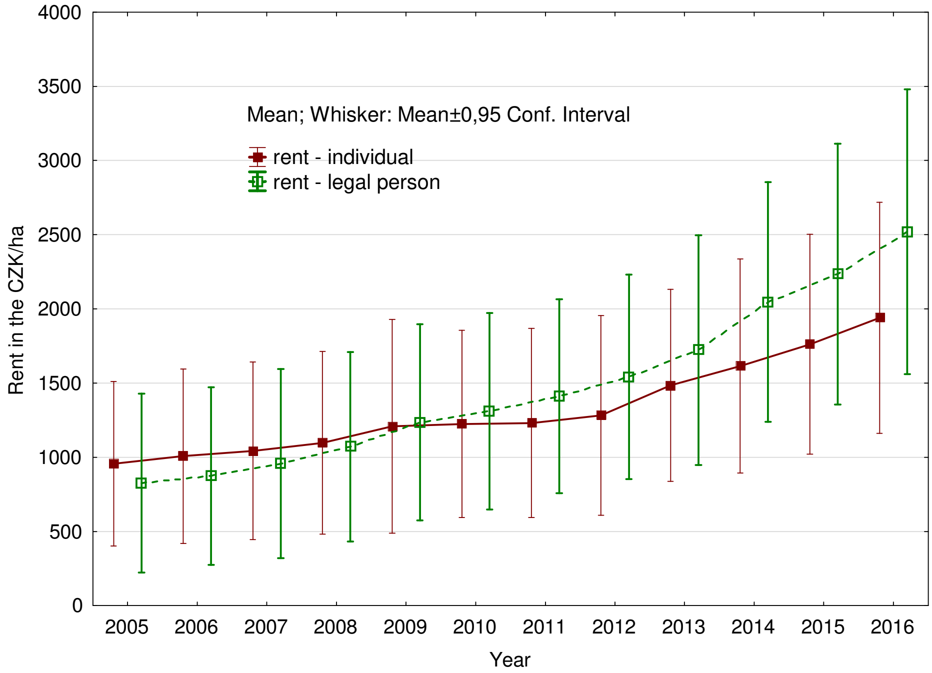
$$H:\ (\alpha\beta)_{11} = (\alpha\beta)_{12} = \ldots = (\alpha\beta)_{HG} = 0 \qquad \textbf{(3)}$$

on the other hand, which means the hypothesis assuming that, the size of the change effect of one factor level does not depend on a specific level of the second factor. A detailed theory description goes beyond this paper, in detail see Hebák, Hustopecký, Jarošová, Pecáková (2004); Hendl (2004); Meloun, Militký (2004).

3. Results and Discussion

From 2005 to 2008 the average amount of rent for natural persons was higher on average by CZK 104 per hectare. The year 2009 was the first year when the amount of rent for inidviduals exceeded the amount of rent for legal persons. From 2009 to 2016, the amount of rent for legal persons therefore exceeded the rent of natural persons, by CZK 392/hectare on average, and the proverbial shears continue to spread (see graph no. 1 and table no. 1).

Graph 1. Comparison of trends of average amount of rent of natural and legal persons in the years 2005–2016.



Source: author analysis based on Institute of Agricultural Economics and Information (2017),(2016),(2015),(2014),(2013),(2012),(2011),(2010),(2009),(2008),(2007),(2006).

The average year-on-year increase in the amount of rent for natural persons amounted in the monitored period to almost 7%, while for legal persons this amounted to 11%. The dynamics of change in the amount of rent in recent years increased particularly for legal persons. Between 2013 and 2014 a year-on-year increase in rent of 20% was recorded. The total rent for natural persons grew during the monitored period by 88% and for legal persons it more than tripled (base index = 3.09). The prediction of future trends in the amount of rent is summarized by table no. 6. The dynamics of rent increase for legal persons will be an average of 4% higher than for legal persons (see table no. 1).

Table 1. Dynamics of changes to the amount of rent in the years 2005 – 2016

Year	**Average rent - individual**	**Average rent - legal person**	**Difference**	**Growth coefficient - individual**	**Growth coefficient - legal person**
2005	1,010	874	136	-	-
2006	1,037	951	86	1.03	1.09
2007	1,156	1,041	115	1.11	1.09
2008	1,198	1,121	77	1.04	1.08
2009	1,259	1,317	-58	1.05	1.17
2010	1,272	1,421	-149	1.01	1.08
2011	1,274	1,473	-199	1.00	1.04
2012	1,324	1,630	-306	1.04	1.11
2013	1,484	1,849	-365	1.12	1.13
2014	1,620	2,219	-599	1.09	1.20
2015	1,737	2,395	-658	1.07	1.08
2016	1,900	2,700	-800	1.09	1.13

2017*	2052	3015	-963	1.08	1.12
2018*	2218	3372	-1154	1.08	1.12
2019*	2397	3772	-1376	1.08	1.12
2020*	2590	4220	-1629	1.08	1.12
2021*	2800	4720	-1921	1.08	1.12

*Estimates based on models of exponential balancing - MAPE < 4 %

Source: author analysis based on Institute of Agricultural Economics and Information (2017),(2016),(2015),(2014),(2013),(2012),(2011),(2010),(2009),(2008),(2007),(2006).

Multi-factor analysis of variance was used to test the significance of the difference between natural and legal persons. The results are summarized in table no. 2 and graph no. 2.

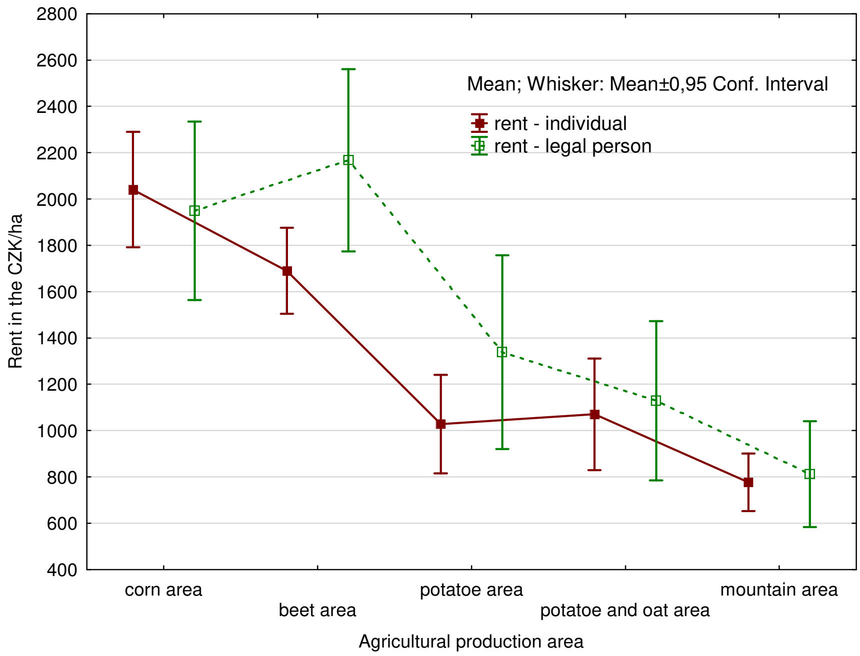
Table 2. Results of multi-factor analysis of variance

Effect	Univariate Tests of Significance for rent Sigma-restricted parameterization Effective hypothesis decomposition SS	Degr. of Freedom	MS	F	p
Intercept	235300811	1	235300811	1080,495	0,000000
agricultural production area	27286969	4	6821742	31,325	0,000000
forms of business	750817	1	750817	3,448	0,065920
Error	24825927	114	217771		

Source: author analysis based on Institute of Agricultural Economics and Information (2017),(2016),(2015),(2014),(2013),(2012),(2011),(2010),(2009),(2008),(2007),(2006).

The test did not prove any statistically significant difference in the amount of rent between natural and legal persons ($p > 0,05$), but a statistically significant difference was shown between agricultural production areas ($p < 0,001$). This resulted in the rejection of part of classical economic theory and the validation of the opinions of Roest, Ferrari, and Knickel (2018). In contrast to the premises of classical economic theory there is no clear trend towards the pursuit of economies of scale. This also led to the rejection of the opinion of the IAEI (2017), that legal persons have better negotiating power in terms of rent than natural persons as a result of their higher volume of production/higher intensity of production per hectare of agricultural land.

Graph 2. Comparison of the amount of rents of natural and legal persons in individual agricultural production areas



Source: author analysis based on Institute of Agricultural Economics and Information (2017),(2016),(2015),(2014),(2013),(2012),(2011),(2010),(2009),(2008),(2007),(2006).

However, the conclusions reached herein do not controvert or confirm the general opinion referenced in Holman (2018). The enlargement of the market allows for specialization, which reduces the costs for companies. Nonetheless, based on the research conducted the conclusion can be reached that this reduction in costs is not reflected in lower rent. Similar to the opinion of Holman (2018) is that of Brčák and Sekera (2010), who highlight economies of scale as a result of higher concentration of production, application of modern technologies, etc. Nonetheless, these factors supporting economies of scale are not reflected in greater negotiating power that could lead to a lower or higher price of rent. Rent is primarily influenced by the type of production area.

4. Conclusion

The results of this research has arrived at the conclusion that no direct link exists between the extent of the managed land and the amount of rent either for natural or legal persons. Corporate form thus plays no role in the amount of rent. The advantages flowing from economies of scale are not reflected in the amount of rent. The amount of rent is primarily influenced by production area. Further investigation will most likely focus on expanding the examination of return of individual commodities and the amount of rent, or possibly on specialization and the economies of scale thereby derived, such as was addressed by the study of Fernandez et. al. (1992), Jin and Deininger. (2009), Dramstad and Sang (2010) and Ženka et al. (2016).

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MARKETING SUPPORT FOR LOCAL PRODUCERS

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Annotation: Local producers use regional branding to inform customers about the origin of their products. The main aim of local product branding is to raise the profile of traditional regions (known, for instance, for their unspoilt nature, healthy environment, folk traditions) and to make the most of their socio-economic advantages to benefit their inhabitants, particularly traders, small and medium-sized enterprises. These brands cover the whole of the Czech Republic and are based on similar principles, e.g. certification criteria or a labelling system that is the responsibility of the coordinator[1]. One advantage of regional brands is their form of common promotion, which also includes presentations on the internet. The aim of this work is to evaluate marketing support for local producers in the Czech Republic (holders of a regional brand certificate) provided by coordinators and to identify the links between local action groups and the regional brand that comes under their territorial competence. Research studies have clearly proven the benefit of associations for the business activities of small and medium-sized enterprises. This is also confirmed by the case of the Association of Regional Brands, which acts as the national coordinator of one of the voluntary certification systems that operate within the Czech Republic. The limited resources of small enterprises in particular, either in the form of funding or intellectual capital, are compensated for by a platform for sharing experience and integrated marketing communication or other activities (e-shops, etc.). In the case of the association we can see a tendency towards the use of information technologies (social networks, etc.) far more than they are used by other regional brands, which still use traditional forms such as printed materials. As regards the types of organisation acting as regional coordinators we did not observe any significant differences between Local Action Groups and others.

Key words: Regional product, regional label, marketing communication, website, Association of Regional Brands, Local Action Groups, Small and Medium Enterprises

JEL classification: D20 General

1. Introduction

In the Czech Republic, there has been a noticeable surge in interest in local products, especially food and agricultural products, for several years now and this is expected to increase further, as in other European countries. Customers are starting to favour foods whose origin is clear and strive to support local producers and growers, whose benefit they also see as an important aspect in preserving the character of the landscape and traditional rural areas (Feldmann, Hamm, 2015; AMSP ČR, 2016; Skallerud, Wien, 2019). Consumers see foods produced by local producers as better quality and better suited to their habits and needs (Pícha, Navrátil, and Švec, 2018). Regionality builds trust – the goods were produced in an environment that local customers know, some local producers sell directly from the farm, which is based on local social ties, etc. (ARZ, 2017). However, the change in consumer behaviour is limited partly by the availability of those products (in geographical terms as well as price) and the level of awareness. Producers themselves are aware that they have to support sales of local products through more intensive marketing. The problem for small enterprises is that they tend to underestimate knowledge of the market (i.e. target customers) and, due to lack of competition, to overestimate their marketing efforts (they often do not use suitable procedures or checks); however, despite

[1] i.e. a non-profit organisation whose mission is the development of the region – Local Action Groups, destination management organisation, environmental education organisation, etc.

the evident link between the size of an enterprise and the application of effective marketing planning, small and medium-sized enterprises with varying specialisations can be seen to tend towards a market orientation (the dissemination of generated information is inadequate) and we can see the growing role of information and communication technologies (e-commerce, web presentations, social networks, blogs, e-mailing, etc.) or involvement in marketing networks (Parrott, Roomi and Holliman, 2010; Gellynck et al., 2012; Bocconcelli et al., 2018). As proven by studies conducted abroad, there is a whole range of options for associating firms in a certain region in order to share know-how, build sales channels or use shared communication channels (Wiesmann et al., 2016; Tanasă, Brumă and Doboş, 2015; Berti, Mulligan, 2016; McKitterick et al., 2016). Regional producers cannot compete in terms of pricing, but the regional origin can be considered to be a competitive advantage and used as a marketing tool. The basic prerequisite for the communication of regional, especially food, products is consumer interest in their origin and in the product as a brand, which becomes an integral part of marketing communication (Rojík et al., 2017; Jaďuďová et al., 2018). In the EU regional branding has been presented as one option to stimulate endogenous economic development in regions that are lagging behind. The most widespread Czech certification scheme is the regional branding system coordinated at the national level by the Association of Regional Brands (ARB) (Spilková et al., 2016), which encompasses 27 regions, while other thirteen similar certification systems operate independently outside the ARB. All these brands are based on similar principles – from their certification criteria through to the principles of the branding system, which is the responsibility of the regional coordinator, i.e. a non-profit organisation whose mission relates to the development of the given region, e.g. local action group, destination management organisation, environmental education organisation, etc. Branding should strengthen the image of the region and help to develop sustainable tourism, and can have a positive impact on the economic structure of rural areas; an equally desirable result is the development of local communities and, last but not least, aid to traders and small enterprises in promoting and selling their products (ARZ, 2010). The aim of the Association is to support sustainable development in the regions of the Czech Republic by developing regional brands for products (foods, agricultural and natural products – approx. 50 %, craft products – approx. 40 %), services (accommodation and catering) and experiences (ARZ, 2010). The Association strives to raise awareness of brands and their bearers on the ARB website and on its Facebook profile and on the profiles of the individual regional brands, in printed promotional materials (leaflets, catalogues of certified products, in newspapers and on the news), at events for the public, through collaboration with other organisations with a similar focus and by seeking opportunities to sell and present certified products, etc. (Čadilová, 2016).

The aim of this work is to evaluate marketing support for local producers in the Czech Republic (holders of a regional brand certificate) provided by coordinators and to identify the links between local action groups and the regional brand that comes under their territorial competence. It evaluates forms of support used in the internet environment.

2. Materials and Methods

The data for the assessment and comparison of activities involved in marketing communication, support for producers and the individual regional brands were acquired through a criterial analysis of the web presentations of the individual coordinators. A total of 40 regional brands were assessed at the micro-regional level, comprising a complete basic set. Of these 27 are regional brands that form part of the Association of Regional Brands and the remaining 13 operate independently.

10 separate criteria were defined for the structured assessment. Four different levels of fulfilment were differentiated for each of them, while each level was clearly defined to enable the resulting data to be compared. The individual criteria and definition of the individual categories for which points are awarded are summarised in the following table (Table 1.).

Table 1. Criteria and their assessment – web analysis

Criterion / points	0	1	2	3
Description of products (web catalogue)	not specified	only list of producers	contact to the producer, brief description of products, photo	contact to the producer (incl. active link to website), detailed description of the individual products, photo gallery, etc.
Stories of Brands	not specified	from the past	valid certification - for other RBs	valid certification - for the given RB
Calendar of Events	not specified	older than 2019	current 2019 - about other RBs	current 2019 - for the given RB
News	not specified	older than 2019	current 2019 - about other RBs	current 2019 - for the given RB
News / printed materials / other forms of promotion	not specified	historical versions, older articles / press releases; TV shows	leaflets about products (pdf); leaflet about RB (pdf); videos on YouTube; options for excursions / production demonstrations / workshops; banners	current 2018/2019 - news "At Home in the Region..."; product catalogue (pdf); current 2018-2019: articles in the press (e.g. local news), press releases (e.g. meetings of brand holders)
Website of brand coordinator	no info about regional products	searchable info using the keyword regional product, or name of the RB	active brand logo, or Regional Product bookmark with click-through to RB (within ARB / outside ARB)	information on regional branding and associated events, available promotional materials, articles in the news, YouTube, etc.
Partner activities	no info about regional products	searchable info using the keyword regional product, or name of the RB	active brand logo, or Regional Product bookmark with click-through to RB (within ARB / outside ARB)	information on regional branding and associated events, available promotional materials, articles in the news, YouTube, etc.
Map of the region with the producer's site	not specified	map showing location of producer	interactive map with contact to producer	interactive map with contact to producer and route planner
Retail outlets and e-shop	not specified	general information about purchasing options	info on specific retail outlets	own e-shop
Social networks (Facebook)	no FB	coordinator's FB page without info on regional products / regional brand FB page with no activity	Coordinator's FB – searchable info about RB / regional brand FB page - older info, low activity (depending on number of followers)	regional brand FB page - current info from 2019, high activity (depending on number of followers)

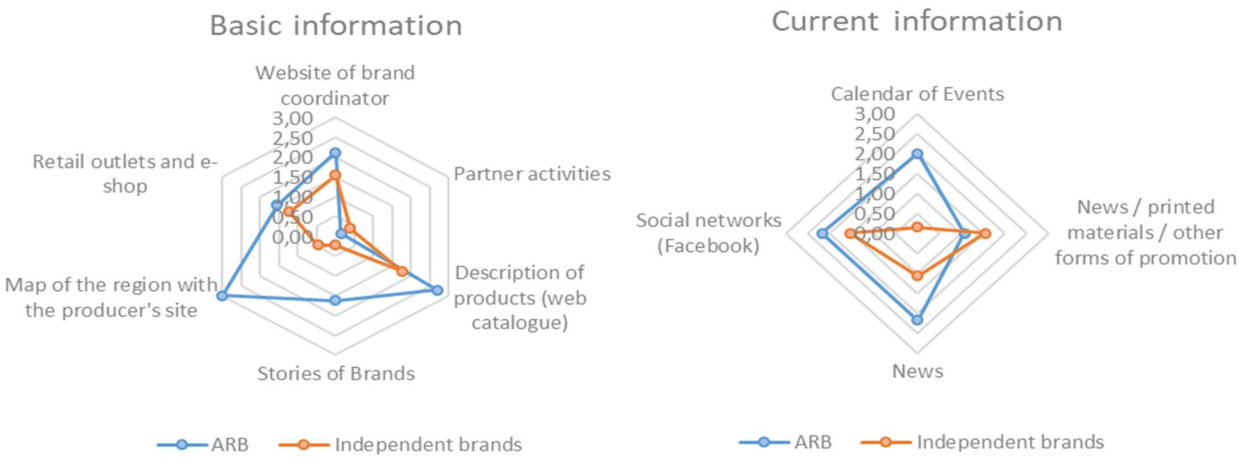
Source: Authors, 2019

3. Results and Discussion

The Association of Regional Brands encompasses 27 regions throughout the whole of the Czech Republic. The Association's main role is to coordinate activities, oversee the correct use of the brand, share experience and provide joint promotion. All the brands in the ARB have a consistent visual style and follow the same rules, although each region has its own specifics (such as historical continuity, natural conditions, tourist potential, economic conditions, etc.), which are reflected in the branding. The brands differ in the number of certificates they have been awarded and in the activities developed by the individual coordinators. Regional coordinators may be divided up, according to the type of organisation that performs this function, into local action groups, development associations, development agencies, destination agencies, nature conservation unions, ecological associations, etc. For this grouping the process of obtaining a regional brand is just one of the projects that are implemented to support the region, and from the current state and quantity of information retrieved during the analysis, there are no clear further prospects for branding, i.e. efforts focused on the future of brands for the benefit of producers or their use, e.g. in tourism or the regional economy (Spilková, 2016). The main channel of communication is the Association's website, with fully functional internal click-through links to the separate site of each regional brand. The individual microsites have a unified design with the option to feature the following bookmarks – Certified Products / Certified Services / Certified Experiences, Stories of Brands, Calendar of Events, News, News "At Home in ...", Other Printed Materials, About the Brand, About the Region, For Those Interested in the Brand, Brand Coordinator, What Has Been Written About Us, Map of the Region, Contacts. Their use and specific content varies from case to case.

The following sunburst graphs (Figure 1.) show a comparison of the results for the regional brands that form part of the Association of Regional Brands and the regional brands that operate independently. It is clear that the brands in the ARB fare considerably better in the great majority of parameters. The most marked differences can be seen in the display of a map of the region showing the individual producers, the presentation of news and updates and calendars of upcoming events where customers can find certified products. There is another clear difference in presenting the stories of interesting brands, even though neither of the groups is particularly successful in this criterion given the current trend in this area, where marketing communication makes intensive use of brand stories and emotions. The results were also poor for both of the groups in terms of the activities features on the brand coordinator's website and particularly on partner websites, where it is practically impossible to find any relevant mention of regional branding; this result is very similar for both groups.

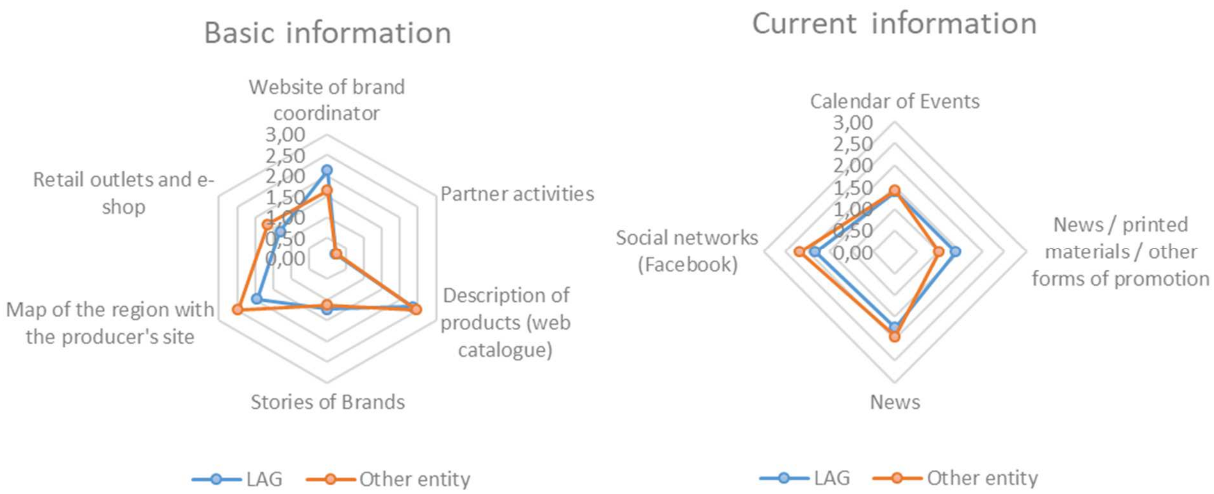
Figure 1. Criterial comparison of regional brands in the ARB and independent regional brands



Source: Authors, 2019

The next series of graphs (Figure 2.) clearly compares the results according to the status of the branding coordinator. The individual brands are divided up into two groups, i.e. those coordinated by a local action group and those that come under another organisation. No marked differences were observed here. According to the results it may be said that the type of coordinating entity has no fundamental influence on communication.

Figure 2. Criterial comparison of regional brands coordinated by a LAG and another entity



Source: Authors, 2019

4. Conclusion

In the Czech Republic, there is growing interest in local products, especially food and agricultural products. Information about producers is most often obtained via Internet (official websites of manufacturers and retailers, social networks, etc.) and within the primary reference groups, but awareness is still relatively low. Research studies have clearly shown the benefit of associations supporting the business activities of small and medium-sized enterprises. This is also confirmed by the case of the Association of Regional Brands, which acts as the national coordinator of one of the voluntary certification systems that operate within the Czech Republic. Through regional branding local producers make themselves market-oriented firms, as they are striving to satisfy the needs of consumers and ensure product quality attributes. The limited resources of small enterprises in particular, either in the form of funding or intellectual capital, are compensated for by a platform for sharing experience and integrated marketing communication or other activities (e-shops, etc.). When comparing regional brands included under the ARB and independent regional branding systems the advantages of joint promotion were evident in 9 out of 10 of the criteria assessed. The advantages of a unified concept were identified, for instance, in the case of interactive maps showing the holders of the regional brand certificate of the relevant region; there is also great potential in the stories of brands, which are in line with the current trends of raising awareness of a brand and may help to shape the identity of the region. In the case of the association we can see a tendency towards the use of information technologies (social networks, etc.) far more than they are used by other regional brands, which still use traditional forms such as printed materials. In terms of the types of organisation acting as regional coordinators no significant differences were found between local action groups and others. The main shortcoming for all of the regional brands we looked at is the provision of up-to-date information. One potential area that has so far been mostly overlooked is the involvement of consumers themselves.

Acknowledgements
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MAP CONVERSION OPTIONS FOR 3D PRINTING OF TERRAIN USING GRAPHICS API

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Annotation: Last decade has seen a significant progress in the field of 3D printing. One of the possible usages is for cartographic and land management area which is very important in regard to current draught problems. For the purpose of planning, it is necessary to visualize the terrain. The objective of the paper is to investigate and verify options for transforming map data into a format usable for 3D printing using the new Vulkan graphics API. We have developed an experimental application which transforms a specified area of the Earth's surface into 3D model. It takes the testing map data from Bing Maps. Altitude is taken from Bing Elevation API. The results show that the Vulkan graphics API is possible to be used for transformation of map data to a 3D model. After that, the model can be programmatically closed and converted to STL format. The STL file can be sliced using appropriate software and printed on a 3D printer.

Key words: graphics API, map, landscape, 3D

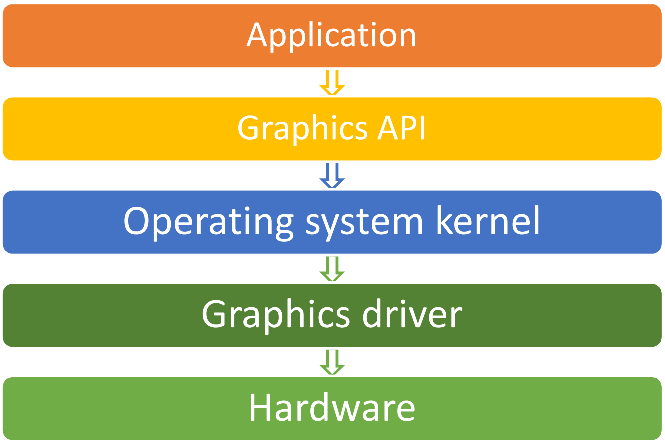
JEL classification: Q15, L86, Y91

1. Introduction

Last decade has seen a significant progress in the field of 3D printing. One of the possible usages is for cartographic and land management area (such as land planning, rural development, etc.) (Kete, 2016). Large-scale agricultural companies in Czech Republic often manage large land areas (Jarolimek et al., 2019). Taking into account current climate changes and especially drought problems, the land management is an important topic to preserve water in landscape. Currently, all agricultural companies (small-scale to large-scale) have to react to those changes and adjust their production (VÖHRINGER et al., 2019). For the purpose of planning, it is necessary to visualize the terrain (Vaněk et al., 2011). Additionally, it can be even printed (Nijhuis, 2016). The expenses for 3D printing are becoming lower and even smaller farmers and companies are able to get 3D printers (Kim, 2015). In general, 3D maps are important for any land planning (Li et al., 2019; Malinverni et al., 2017; Potena et al., 2019) and helps managers in decision making (Šilerová et al., 2016).

To be able to print anything on a 3D printer, it is necessary to prepare a 3D model. The 3D graphics is usually processed by a hardware graphic card (GPU) and processor (CPU). Graphics API is an interface standard communication between applications and graphics driver which enables a cooperation with a graphics chipset on different platforms. In general, it is a set of libraries which defines a communication between various components. A good-quality API simplifies software development by providing ready-made libraries for programmers (Niu et al., 2017). The process of graphics rendering is shown in Figure 1. Currently, there are various Graphics API. Open Graphics Library (OpenGL) is a high-level cross-platform API 2D and 3D vector graphics rendering. Alongside, there are two closed-platform APIs – DirectX and Metal API. DirectX je collection of API multimedia, game development, and video processing for Microsoft Windows operating systems. Metal API is a low-level, hardware accelerated 3D graphics API by Apple. Therefore, it is focused on macOS, tvOS and iOS operating systems.

Figure 1. The process of graphic rendering

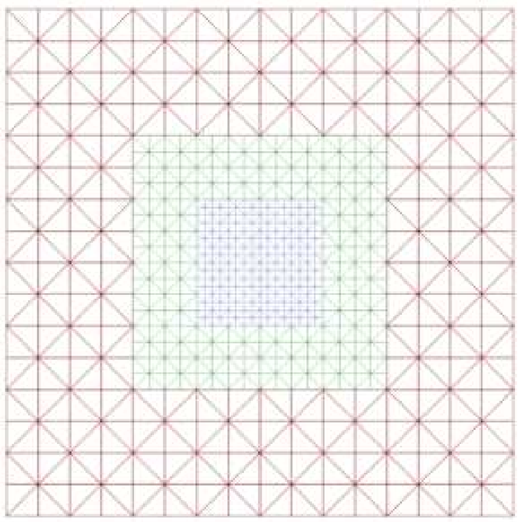


Source: own processing

Recently (in 2016), Vulkan API specification has been published. The Vulkan API is a new generation of low-level graphics API which replaces OpenGL (Kenwright, 2017). Its intention is to play a significant role on a market of Graphics API. It is cross platform and in contrast to older OpenGL, it provides better usage balancing of CPU and GPU. However, the Vulkan API needs to be compiled to Metal API using MoltenVK library. The Apple operating systems does not allow any use of other graphics APIs.

Various methods are used for rendering of a terrain. Earth's surface is most common and most suitable for the paper objective. The surface can be rendered either using perspective projection (the basis is a common point), or orthographic projection (top-down). One of the most used method for rendering is Geoclipmapping. As seen in Figure 2, the geoclipmap rendering uses a set of square "rings" around the viewpoint, where each ring is twice the size of the previous one, and so has half the spatial resolution (Kent, 2013).

Figure 2. Geoclipmapping algorith



Source: (Kent, 2013)

This results in approximately consistent screen space resolution of the terrain at all distances. The innermost (highest resolution) ring has its center filled in, becoming a simple square grid of triangles. The geometry clipmap caches the terrain in a set of nested regular grids centered about the viewer. The grids are stored as vertex buffers in fast video memory and are incrementally refilled as the viewpoint moves. This simple framework provides visual continuity, uniform frame rate, complexity throttling, and graceful degradation. Moreover it allows two new exciting real-time functionalities: decompression and synthesis. (Losasso and Hoppe, 2004). Modern graphics API, including Vulkan, uses a tessalation method, which allows the rendering computation using GPU, instead of CPU. The latest generations of commodity hardware components are capable of the implementation using the preferred methods.

Rendering of the Earth's surface requires an input data, such as coordinates and elevation (Chen et al., 2009). Besides the 2D map data, which are easily accessible to get the coordinates, there is a critical need to get altitude of certain points. The free web services providing an elevation API have specific limits. The limits are usually a number of requests per time period, and a maximum resolution between points, among which is the value interpolated. The highest resolution is 1m, provided by paid services.

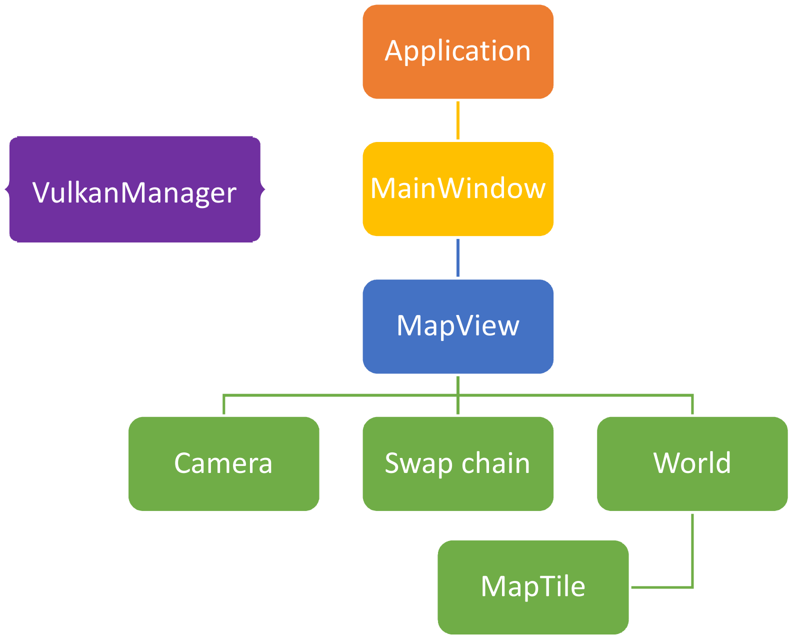
Finally, rendered terrain needs to be converted into a format which is suitable for 3D printers. A Gcode format is used by most of the printers (Kim et al., 2018). The Gcode is generated by slicing in a special software such as Slic3er, or Cura. The slicing software accepts an STL format, which needs to be rendered (Szilvśi-Nagy and Mátyási, 2003). One of the possibilities is to use a 3D graphics API.

The terrain model can result into object with high volume. On the other side, the slicing applications have algorithms to infill the solid object with a spatial pattern. So, the objective of the paper is to investigate and verify options for transforming map data into a format usable for 3D printing using the new Vulkan graphics API.

2. Materials and Methods

To investigate the options for transforming map data into 3D printable model using Vulkan API, we have developed an experimental application. The application consists of several components. It has been developed using C++ programming language, therefore it needs a C++ compiler. For the graphical user interface, Qt libraries were used. Vulkan API is used through the provided Vulkan SDK. The map data were taken from Bing maps and altitude from Bing Elevation API services. It offers the best ratio of the resolution and number of requests for free which is suitable for the experimental purposes. All the necessary components can be integrated using Microsoft Visual studio IDE.

Figure 3. Application architecture



Source: own processing

The application consists of eight components. Figure 3 shows the architecture of the application. The Application component serves as a manager and provides the GUI through MainWindow component. The MainWindow manages main application window, navigation, status bar, and Vulkan window. The VulkanManager is a singleton which manages objects working with the Vulkan API. It contains methods for creation of buffers and shader modules. MapView manages objects for rendering of the scene and motion within. It implements user input events (mouse and keyboard) to provide camera movement. The World component manages objects for rendering the world. It works together with the MapTile component which holds the terrain data and its rendering settings.

The application utilizes four shaders. Vertex Shader (VS) is used for extension of 3D vectors into 4D. Fragment Shader (FS) makes a mixing of terrain colors with constant color of the fog in 1:4 ratio. Tessellation Control Shader (TCS) is based on display space and uses GPU version of the Frustum Culling algorithm. Tessellation Evaluation Shader (TES) computes the elevation of the map input. Simplified, it adjusts the terrain according to camera movement. Both tessellation shaders use the Geoclipmapping rendering algorithm.

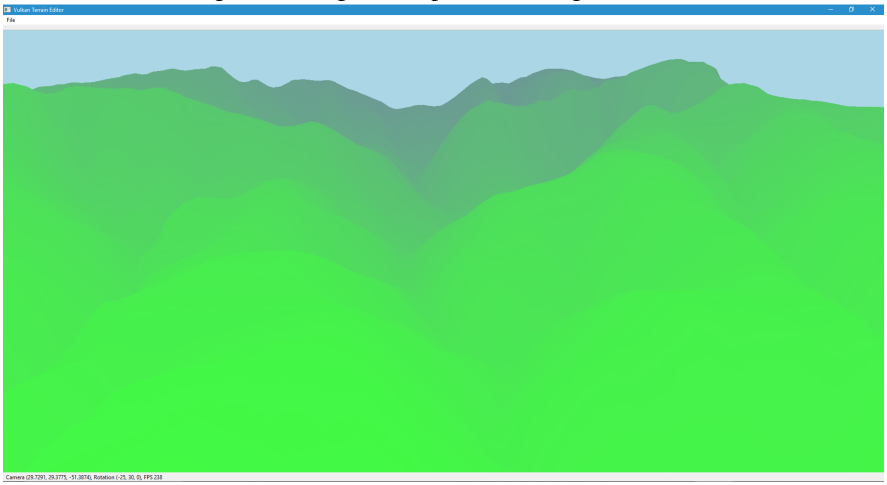
The computed model of the terrain is rendered as a grid. However, the grid is not closed. The model consists of only a top surface. Therefore, the base and walls need to be computed additionally. Otherwise the slicing program would not be able to prepare the Gcode. The 3D printers by its nature needs closed models to be able to print it out. The model is then converted into STL format for slicing.

3. Results and Discussion

We have developed an experimental application which transforms a specified area of the Earth's surface into 3D model. The application has a simple user interface. The source code is organized into separate modules (as show in Figure 3), taking into account a future development, such as framework and libraries. The modules can be adjusted to work separately as standalone libraries.

The application receives the testing map data from Bing Maps. Altitude is taken from Bing Elevation API. However, the map data provider can be changed by reprograming corresponding module of the application. The resulting 3D model is shown in Figure 4. It displays an elevation map, specifically the coordinates of Latitude 50° 46' 58.0188", and Longitude 15° 30' 40.9464". The area is about 13km^2 in size and its center is located in the center of Špindlerův Mlýn.

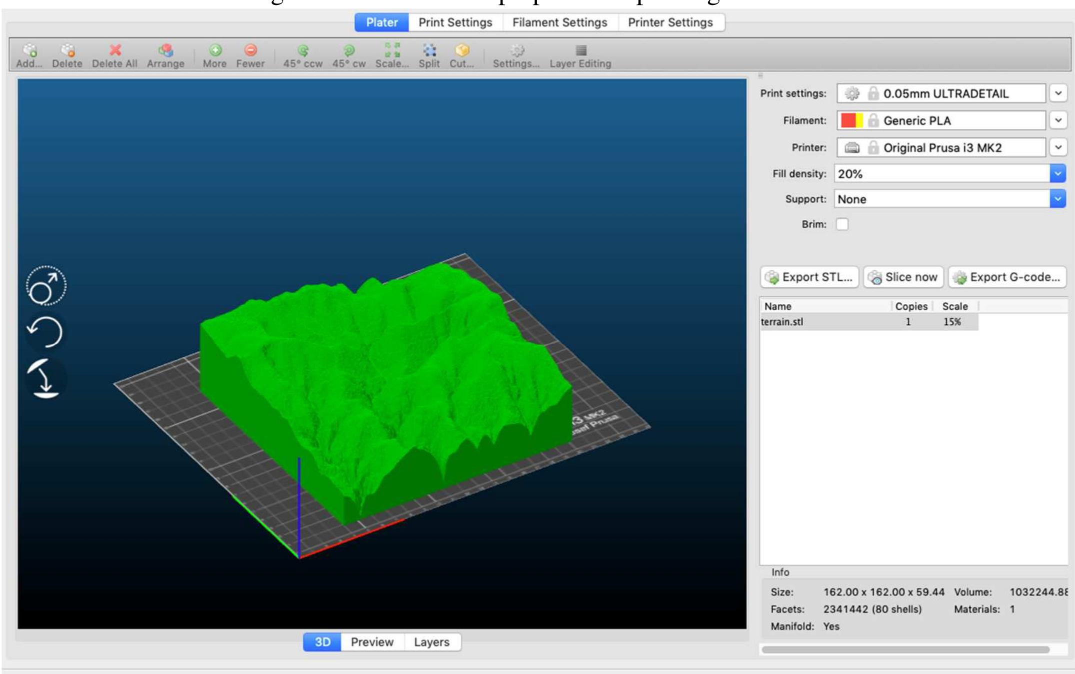
Figure 4. Image description ("AP figure" Font)



Source: own processing

The final model was evaluated using the Slic3r. It utilizes algorithms to slice the model and prepare the Gcode for printing. When the model is loaded and sliced, it is verified for the printing. If the model would not be printable, the slicing software would throw an exception and show an error. Therefore, it is not necessary to print the model. The result is shown in Figure 5. To confirm the result, the model was sliced in competitive Cura slicing software by Ultimaker.

Figure 5. Sliced model prepared for printing in Slic3er



Source: own processing

The proposed solution is unique in its way of automation and source map data retrieval. Currently, the 3D maps are often generated using airplanes or Unmanned Aerial Vehicles (UAV) by a lidar and other scanning technologies (Perz and Wronowski, 2019; Salah et al., 2018).

4. Conclusion

The results show that the Vulkan graphics API is possible to be used for transformation of map data to a 3D model. After that, the model can be programmatically closed and converted to STL format. The STL file can be sliced using appropriate software and printed on a 3D printer. The Vulkan is a low-level API. Therefore, the map conversion can run on a cheaper commodity hardware. One of the critical aspects for the conversion are the input map data. In particular, resolution of the elevation data determines the usable size of the area. The free online services provide the resolution in tens of meters, whereas paid services provide resolution up to one meter. However, the resolution varies by a location.

We have developed algorithms which can be used for automated conversion of a land into a 3D map using public (or private) map data services. The application can serve as a basis for a further research and a development of a framework for map conversion. The 3D model can be enriched by additional objects such as buildings, water surface, trees, forests, etc. The transformed model can be extended for simulation of a flow of the rivers and water in general. Even small-scale companies can use the final solution with low costs. Finally, it can help them to adjust their production to current climate changes, such as the drought.

The printed model can be used for various purposes. Landscape planners can use it for modeling in cases where virtual reality is not suitable. Another use can be in local museums - for local tourism support such as models of historical or planned landscape showcase. The automatic terrain conversion of map data to a 3D model can help environment and landscape planners to save time for modelling.

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ALTERNATIVE FOOD NETWORKS AS A TOOL INFLUENCING YOUNG CONSUMERS' PURCHASING DECISION-MAKING

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Annotation: One of the current topics, already often discussed, is the issue of consumption and consumer lifestyle in economically advanced countries. Alternative ways of buying food are another form of realization of food purchases that are carried through alternative food networks. Some consumers see this way of buying as an opportunity to express their ethical and life attitudes. Young people are susceptible to environmental problems and in many cases are looking for ways to define or to make difference in society. The younger generation should be interesting for retail dealers. In the future, it will be them who will, through their consumer preferences, lead the food market demand. In today's dynamically developing world, young people are interested in everything new and it is them who can change attitudes to everything new and alternative in many aspects of everyday life. The aim of this article is to evaluate young people's (aged 15 - 34) general awareness about alternative food networks in and to identify their consumer habits in the shopping system in the Czech Republic.

Key words: alternative food networks, consumer, food, shopping behaviour, young people

JEL classification: P25, R11, R23, R58

1. Introduction

Consumption in the current globalized world is not limited by borders anymore, goods are produced in a big volume and transported at a long. These facts negatively influence the environment and require new ways, which will guarantee sustainable growth for future generations, too (Hume, 2010). The population in economically advanced countries is characterized by strong tendencies towards excessive consumerism in all the consumer areas. In the above-mentioned fact we can see one of reasons for people looking for new possibilities and ways in the shopping area which means changes in shopping behaviour at some groups of population.

One of the areas to which it is necessary (in this connection) to pay special attention is consumer behaviour in relation to the ethical principles of consumption (Coppola et al., 2017, Terstappen, Hanson and McLaughlin, 2013). In this way, the ethical consumption represents a certain fashion trend, which influences the behaviour of shopping people (Manchiraju and Sadachar, 2014). This opinion confirmed by Spilková et al. (2016) too, they observe that in an advanced society the current form of consumption has been moving in the direction of more ethical and environmental lifestyle. Pham et al. (2018) consider the support of consumers' ecological behaviour to be one of the key factors for the sustainability of environment. State institutions and activist movements also urge citizens to the responsible consumer behaviour (Vecchio et al., 2015). Panico et al. (2014) state that consumers' attitudes towards ethical and moral questions - such as animals' good living conditions, a just remuneration for the producers of agricultural products, the social aspects of production and the preservation of community cultural elements - are really closely connected with their personal feelings and moral and social consciousness. Jerzyk (2016) points out that the perception of consumers in relation to social and environmental questions have been growing.

Alternative food networks (AFN) are rather often been perceived as a counterbalance to globalization in the area of food sale. They form an effort to reestablish direct relations between food consumers and producers (Spilková et al., 2016) and they generally differ from typical food systems (Barbera and Danges, 2016). The definition of alternative food networks is rather complicated as they exist in various and rather different forms, both from the point of view of their specific goals and the point of view of their organization (Dansero and Puttilli, 2013). Jarosz (2008) states that AFNs are usually characterized by certain particular attributes, among them a short distance between farmers and consumers, the existence of certain places for retailing or community supported agriculture.

"Alternative food networks (AFNs) represent efforts to respatialize and resocialize food production, distribution and consumption in North America, Europe and Australia." (Jarosz, 2008). The emergence of AFNs in the Czech Republic is attributed to the activities of certain interest groups and inspiring examples from foreign countries (Spilková et al., 2016).

Present-day younger generation in economically more advanced parts of the world were born and brought up in abundance and spoilt by their parents (Van den Bergh and Behrer, 2012). This generation are self-confident and independent consumers who appreciate authenticity and are in greater extent than previous generations inclined towards altruism and are more interested in environment (Yadav, 2016). Kim and Jang (2014) add that younger generation put the accent on health, the quality and freshness of purchased food. At the same time, they have at their disposal rather considerable spending power thanks to their parents and grandparents financial support.

The aim of this article is to evaluate young people's (aged 15 - 34) general awareness about alternative food networks in young people aged 15 - 34 and to identify their consumer habits in the shopping system in the Czech Republic.

2. Materials and Methods

The theoretical framework of the paper has been prepared with the use of scientific and specialized articles and completed with up-to-date information from the relevant internet sources. The document research method has been used. Primary data were obtained from our own research, which was carried by means of a questionnaire research survey. Of the total number of respondents (n = 373) there were 43% of men and 57% of women. The respondents were young people from the Czech Republic, aged 15 - 34 years. The research was realized in 2018 with the use of an electronic and personal questionnaire.

The paper will be processed using the methods and tools of descriptive and inferential statistics. A contingency table is used to test the mutual degree of association of (usually) a pair of variables that can only take a small final number of values. In its simplest form, which compares only binary values, this table is also called a four-field table (or 2x2). The tested criterion is the sum of normalized differences of the marginal frequencies and their translated values, which in the case of independency has an asymptotic distribution of χ^2. The calculated value is then compared to the critical value χ^2 (α) with (r-1)(s-1) degrees of freedom, where α = the required probability level of the test, r = number of rows of the table, s = number of columns of the table. The potential correlation (or absence thereof) was tested by the way of contingency tables, with an χ^2 test at the 0.05 level. Various coefficients may be used to measure the strength of correlation; we have opted for Cramer's *V*.

Stated hypotheses, which are to be analyzed are presented in the following table.

Table 1. Summary of stated hypotheses

Nr. of Hypothesis	Text of Hypothesis
H01	The fact that a respondent buys food at farmers markets is not related to their gender.
H02	The fact that a respondent buys food at farmers markets is not related to their age.
H03	The fact that a respondent buys food at farmers markets is not related to their household income.
H04	Respondent's opinion about the price level at farmers markets is not related to their gender.
H05	Respondent's opinion about the price level at farmers markets is not related to their age.
H06	Respondent's opinion about the price level at farmers markets is not related to their household income.
H07	The amount of money which a respondent spends on food at farmers markets is not related to their gender.
H08	The amount of money which a respondent spends on food at farmers markets is not related to their age.
H09	The amount of money which a respondent spends on food at farmers markets is not related to their household income.

Source: Own research, 2018

Abbreviations used: AFNs = alternative food networks, FMs = farmers markets

3. Results and Discussion

In this part of the article the research results are presented and discussed. First, the respondents' opinion about the importance of environment state and the general awareness about the term "sustainable development" were researched. The overwhelming majority of young people (91.4%, 341) of the total number (n = 373) of participants stated that they consider the state of environment to be important (replies „definite yes" 48.3% and „rather yes" 43.2%). More than 70 percent of respondents (71.3%, 266) stated that they have already heard the term "sustainable development". Nevertheless, an accurate knowledge of this term was expressed by 21.7 percent (81) of respondents. Approximately one half of all the participants (49.6%, 185) stated that they did not know exactly what the topic was. Unfamiliarity with the term "sustainable development" was noted as an answer by 28.7 percent of respondents (107).

Familiarity with the term "alternative food networks" was presented by more than one half of respondents (54.4%, 203). However, only 7.2 percent of all the respondents (27) declared the accurate knowledge of this term meaning. The same question was tested in relation to gender, age and household income of respondents.

Beside this, respondents' own experience and personal participation in food purchases in the framework of individual alternative forms of sale was researched.

Table 2. Respondents' personal experience with any of specific forms of food sale and personal participation in their purchase.

Individual specific forms of sale	Personal experience		Personal participation	
	Absolutely	Relatively	Absolutely	Relatively
Direct sale at farmers markets	329	88.2%	282	75.6%
Sale at farmers' shops	220	59.0%	161	43.2%
Sale at "farmyards"	185	49.6%	132	35.4%
Sale with the use of pre-paid so-called "boxes"	76	20.4%	30	8.0%
Organic food sale	285	76.4%	201	53.9%
Regional specialities sale	193	51.7%	153	41.0%
Fairtrade products sale	157	42.1%	99	26.5%
Community supported agriculture	25	6.7%	13	3.5%
Community gardens	38	10.2%	16	4.3%

Source: Own research, 2018

The results show that the overwhelming majority of young people have already met some of specific forms of sale within the framework of alternative food networks and carried out their food purchases there. The most frequent respondents' answers concerned their personal experience with farmers markets (88.2%, 329), organic food sale (76.4%, 285) a farmers' shops (59.0%, 220). Approximately half of participants have met regional specialities sale (51.7%, 193) and sale at "farmyards" (49.6%, 185). Fairtrade products sale was known to 42.1 percent of respondents (157).

Only a very small number of respondents answered that they have met community support agriculture (6.7%, 25) and community gardens (10.2%, 38). Spilková (2017) expresses her opinion (based on her research) that while abroad the main purpose of community gardens foundation in conurbationsis the effort to get high-quality food, this activity in the Czech Republic is mainly motivated by social reasons with the aim of strengthening local communities.

Of the total number of respondents (n = 373) only about 3.2 percent of people (12) stated that they have never met any specific forms of food sale in the framework of AFNs, 6.7 percent of respondents (25) have never shopped at them.

In view of the fact that young people most frequently stated their experience with shopping at farmers markets, this form of AFNs was subjected to more detailed research. 66.5 percent (248) of the respondents stated their personal experience with food purchases.

Table 3. The fact that a respondent buys food at FMs in relation to gender

Gender	Yes	No	Total
Female	162	52	214
Male	86	73	159
Total	248	125	373

Source: Own research, 2018

The calculated statistics $\chi 2$ for Table 3, which is 19.12 is higher than the critical value of distribution $\chi 2$ with 1 degree of freedom at the level of significance 0.05. Therefore we can reject the null hypothesis. The fact that a respondent buys food at farmers markets is related to their gender. Women make purchases at farmers markets more frequently. The level of relationship calculated with Cramer´s *V* is 0.22 the relationship is weak. Spilková, Fendrychová and Syrovátková (2012) state that the demographic structure of FMs visitors is really diverse and its typology depends on the size of farmers markets, the width of their supply and how often they are held. Nevertheless, among the visitors' main groups the authors in all cases place women on maternity leave and retired people. Females formed the majority (64%) in their questionnaire research performed directly at farmers markets, which indicates higher visit frequency by women. The same results were also reached by Cassia et al. (2012) in their research among Italian consumers (65.8%).

Table 4. The fact that a respondent buys food at FMs in relation to age

Age category	Yes	No	Total
15 – 24 years	160	70	230
25 – 34 years	88	55	143
Total	248	125	373

Source: Own research, 2018

The value statistics $\chi 2$ (2.55) is lower than the critical value of distribution $\chi 2$ with 1degree of freedom at the level of significance 0.05. The null hypothesis cannot be rejected. The fact that a respondent buys food at farmers markets is not related to their age. It has to be taken into account that the research was aimed at younger generation aged 15 - 34 which is rather homogenous (Van den Bergh and Behrer, 2012) and they stress the quality and freshness of purchased products (Kim and Jang, 2014). Spilková, Fendrychová and Syrovátková's (2013) results also show that the most frequent visitors of farmers markets are people aged 26 - 40, and within this group young people aged 31 - 35.

Table 5. The fact that a respondent buys food at FMs in relation to household income

Household income	Yes	No	Total
50.000 CZK and more	58	28	86
35.000 – 49.000 CZK	50	28	78
25.000 – 34.000 CZK	42	27	69
24.000 CZK and less	49	17	66
I do not know / I do not want to answer	49	25	74
Total	248	125	373

Source: Own research, 2018

The value statistics $\chi 2$ (3.00) is lower than the critical value of distribution $\chi 2$ with 4 degrees of freedom at the level of significance 0.05. Therefore the null hypothesis cannot be rejected. The fact that a respondent buys food at farmers markets is not related to their household income.

Moreover the respondents' opinion about the price level at farmers markets was examined.

Table 6. The summarized evaluation of contingency tables in relation to the price level at farmers markets

Category	Value types	Values - results
Gender	Degree of freedom	1
	$\chi 2$	0.07
	Critical value	3.84
Age category	Degree of freedom	1
	$\chi 2$	0.41
	Critical value	3.84
Household income	Degree of freedom	4
	$\chi 2$	8.53
	Critical value	9.49

Source: Own research, 2018

Table 6 summarizes statistical values of relationship between opinion about the price level at farmers markets and selected socio-demographic characteristics. In view of the fact that the calculated statistics $\chi 2$ were lower than critical values at the level of significance 0.05 for all the hypotheses tested (H04 – H06) these null hypotheses cannot be rejected. The spectrum of views on the price level at farmers markets is not related to gender, age or household income of the respondent.

The last tested question was aimed to find out what percentage of total financial means spent per month on food is spent at farmers markets in season period.

Table 7. The percentage of expenditure at farmers markets of total monthly expenditure on food in relation to gender

Gender	5% or less	6 – 10%	11% and more	Total
Female	90	45	27	162
Male	48	26	12	86
Total	138	71	39	248

Source: Own research, 2018

The value statistics $\chi 2$ (0.38) is lower than the critical value of distribution $\chi 2$ with 2 degrees of freedom at the level of significance 0.05. Therefore, the null hypothesis cannot be rejected. The percentage of expenditure at farmers markets of total monthly expenditure on food is not related to gender.

Table 8. The percentage of expenditure at farmers markets of total monthly expenditure on food in relation to age

Age category	5% or less	6 – 10%	11% and more	Total
15 – 24 years	106	33	21	160
25 – 34 years	32	38	18	88
Total	138	71	39	248

Source: Own research, 2018

The value statistics $\chi 2$ for table 8 (21.44) is higher than the critical value of distribution $\chi 2$ with 2 degrees of freedom at the level of significance 0.05. Therefore the null hypothesis can be rejected. The percentage of expenditure at farmers markets of total monthly expenditure on food is not related to respondents' age. The level of relationship calculated with Cramer's *V* is 0.29, the relationship is in the range weak - medium. More than one half of respondents (55.6%) shopping at farmers markets said that they spent at FMs less than 5 percent of their expenditure on food. Statistically significant differentiation between different age groups was confirmed. While in the age category 15 – 24 years, two thirds of respondents stated their expenditure at farmers markets at the level of 5 percent or less and one third of respondents expenditure higher than that, in the age category 25 - 34 years the proportion is opposite. This fact can be explained by worse economic situation of younger generation as these young people have not been fully involved in the working process yet. An important role is played by the fact that young people aged 25 - 34 years often live in separate households and found families. Therefore they place greater importance on high-quality food and a healthy lifestyle (Van den Bergh and Behrer, 2012).

Table 9. The percentage of expenditure at farmers markets of total monthly expenditure on food in relation to household income

Household income	5% or less	6 – 10%	11% and more	Total
50.000 CZK and more	31	15	12	58
35.000 – 49.000 CZK	26	16	8	50
25.000 – 34.000 CZK	20	15	7	42
24.000 CZK and less	36	9	4	49
I do not know / I do not want to answer	25	16	8	49
Total	138	71	39	248

Source: Own research, 2018

The value statistics $\chi2$ (9.54) is lower than the critical value of distribution $\chi2$ with 8 degrees of freedom at the level of significance 0.05. Therefore the null hypothesis cannot be rejected. The percentage of expenditure at farmers markets of total monthly expenditure on food is not related to household income. Miškolci (2017) notes that consumers buying at AFNs consider the price to be a factor of lesser importance when deciding on purchases than consumers who make their purchases within conventional chains. Also Zagata (2012) points to innovative aspects of consumer perception of the farmers' markets.

4. Conclusion

The results show that approximately 53% of participants are more or less familiar it the term alternative food networks, 47% of respondents do not know the term. From the point of view of individual forms of food purchase the respondents have most frequently met the direct sale at farmers markets (88%), organic food sale (approximately three fourths) and at farmers' shops (about 60%).

The aim of this article is to evaluate young people's (aged 15 - 34) general awareness about alternative food networks in and to identify their consumer habits in the shopping system in the Czech Republic. It can be concluded that young people generally show good awareness about the researched topic. Nevertheless most of them do not carry out their shopping in the framework of alternative food networks.

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AUTOMATED CLASSIFICATION OF USER INTERACTIONS WITH AGRARIAN APPLICATIONS THROUGH LABORATORY UX TESTING OF USABILITY

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Annotation: This paper focuses on the improvement of user testing methods and on the evaluation of gathered data from manual testing sessions with the help of the automated classification of user actions while interacting with agrarian info portals and applications. The bigger the enterprises are, the less place there is for usability issues with applications used by agrarian enterprises. The economic impact caused by usability problems can lead to a dramatic downfall of the operations' efficiency. Small businesses can greatly utilize well-made agronomics software solutions for a boost in operational efficiency, but the current state of solutions is not optional in ways like ease of use, speed of integration and many more.

Key words: Usability, UX, SW, testing, data evaluation

JEL classification: C83 Survey Methods / Sampling Methods, L86 Information and Internet Services / Computer Software

1. Introduction

Each year various software solutions focused on agriculture gain momentum. Despite the current state of advancement in general software development, agrarian solutions are often behind in terms of usability, ease of use and so on. Small businesses often don't possess the resources to invest in new solution adaptation. On the other hand, big agrarian enterprises don't want to alter their processes to new software solutions. That's why a fast and reliable usability process is needed to come up with great solutions that are easy to use and to manage in any kind of agrarian environment and that can help businesses boost their operational performance (Karanikolas, et al., 2018).

Usually, the software development process has many phases, which often leads to the fact that the needs of the target users are often ignored. Agrarian software is even more specific because of its user base, who has a vocational background. To test and to validate the user's needs, various user research methods were created, from simple interviews to laboratory testing (Wixon, 2003). The level of advancement of user testing via the design and the development of software solutions and the overall complexity of data gathered by these methods is still rising. Thanks to advanced methods and technologies, large quantities of valuable data are at our disposal to really understand the needs and the behaviour of the target user groups (Çakar, et al., 2017). Also, with this complexity rises the problem of evaluation of such data into a form suitable for discoveries and hypothesis testing. Manual processing of these data is hardly real and favourable for application in real life scenarios. Thanks to the existence of laboratory testing methods that allows testing bigger numbers of users in a parallel manner, it is now possible to test hypotheses with adequate quality and quantity of data very fast and effectively. The overall scope of these pieces of information is furthermore enhanced with the ability of gained biometric data, which paint the whole picture of the overall user experience (Maguire &

Isherwood, 2018). This situation lays out great foundations for harvesting valuable knowledge to create a methodology, which can bring the process of user testing to a whole new level and which can bring higher effectiveness and value without the need of large investments into its evaluation (Fernandes, 2016).

A typical feature of laboratory testing outputs of usability is its visual character. Data are often gathered from eye tracking, from the measurement of biometrical indicators, from the tracking of the mouse and of hand movement et cetera. These data come most often in the form of audiovisual recordings. With analysis of this type of data comes significant time consumption, because, unlike quantitative data, it is not easy to transform audiovisual data into a clear informative format (Lallemand & Koenig, 2017). Thorough analysis by a research worker is needed, which, in case of larger data quantities, means astronomical time costs (Nørgaard & Hornbæk, 2006). This critical problem could be solved by automated processes of audiovisual data in the form of smart marking of the user's actions and reactions while interacting with software solutions, with the identification of crisis situations and with the context leading to these situations (Petropavlovskiy & Nefedova, 2017). In this case, only the relevant information is presented from the whole dataset that is valuable for a concrete situation without loss of time resources or risk of overlooking important events (Harrison & Baecker, 1992). This form of testing could solve the problem of the evaluation of gathered data and of its presentation to the responsible stakeholders with the consequential optimisation of the whole UX testing process. This optimised process can then lead to an improvement in the development of agrarian apps thanks to its reduced speed and cost alongside with a better output quality. This pushes easy to use solutions and the fast integration of ready solutions to be leveraged by any size of agriculture business in no time with minimal investment in valuable resources.

2. Materials and Method

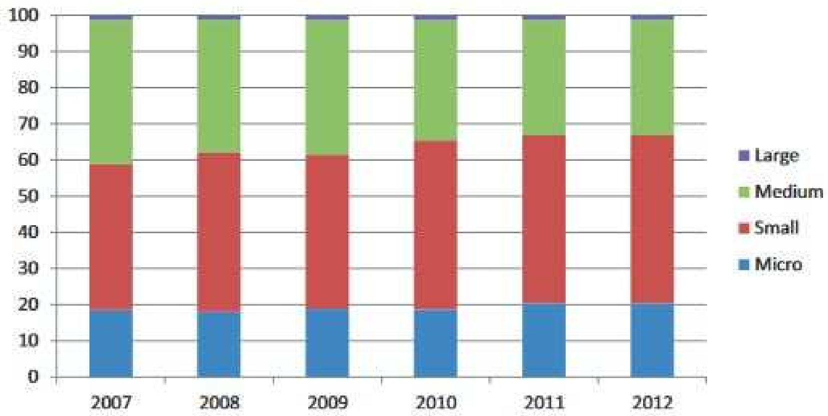
During the initial stage, proven user testing and research methods are used with various sizes of user bases and with apps of multiple agrarian enterprises. User research is needed to collect important data for later analysis. Thanks to HUBRU laboratory within the FEM CULS Prague, it is possible to conduct such research with various types of agrarian web applications and users at the same time. A great product needs to be shaped by the desires and the needs of its users, not of its creators. The possibilities of economic impact in context with business size as a result of the improvement of the usability of the testing process is also studied (Benda, et al., 2018). Along with standard UX testing methods, the role of psychology and biometrical data was also studied. To validate the created methodological framework, calibration tests were needed to establish, if or how synthesised methods provide beneficial and valid output ratings in various situations. This means, various scenarios with known user behavior output were created and then, with the help of biometric tracking, measured if the devices recognised a certain type of behavioral output in sync with the expectations.

A combination of various inputs allowed a more precise evaluation of user's actions and later a classification by computer vision algorithms. The testing user base contained users from various backgrounds, be it gender, age or the size of the agricultural company they work for or own, to achieve maximum objectivity in the results measured and an unbiased calibration of the used methods.

3. Results and Discussion

The question to ask is where the products target users are and where they come from. In this case, it is important to know the situation in the agrarian field, in particular the percentage of the differently sized agrarian enterprises. This can help to understand what the majority of the target user base is. In the included graph below, it is clear that more than 60% of all the agricultural enterprises are micro or small-sized (Novotná & Volek, 2016). This discovery is crucial to determine further needs and specifics of this group as the primary focus should be on these types of enterprises. In contrast to large agricultural enterprises which have more resources and often user custom-made solutions, small to medium agricultural businesses often rely on premade, ready-to-go solutions that fulfill most of their needs. The most popular features are field management, real-time insights, labour management, animal medical records and other features. These pieces of information are a great foundation to prepare for a prototype creaction, designs for calibration tests and testing scenarios.

Figure 1. Relative frequency of farms



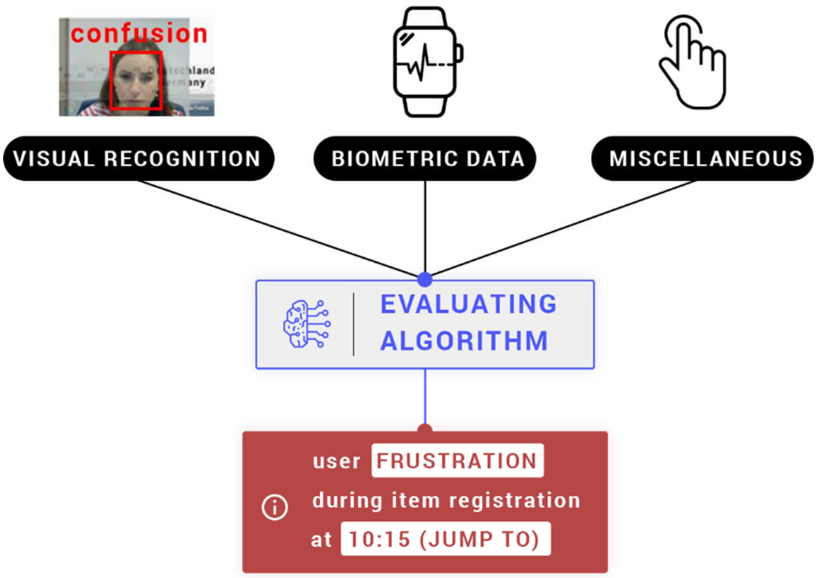
Source: (Novotná & Volek, 2016)

With this knowledge, it is now possible to start assembling the whole testing and evaluation framework, starting with an abstract product definition. This will help later with user interview layouts leading to an interactive version of the software UI prototype. The complete prototype creation process is beyond the scope of this paper. After completing a few variations of prototypes, user testing comes in place (Fraser & Plewes, 2015). This is the place, where effectivity issues are starting to take place and where automation could solve these problems. Prototype testing is realised in a specialised laboratory that researches the user behaviour to gather various types of data in high fidelity. Standard methods like face and eye tracking, mouse tracking and heatmaps are enhanced with biometric data from smart watches, providing heartbeat rates to determine the user's feelings, gyro values and miscellaneous interaction recordings like extensive clicking, mouse flickers and more.

The cornerstone is the audiovisual recording of the user interaction with the prototype. After a testing session, the computer vision is used to determine the user's facial expressions leading to the classification of certain emotions during specific moments. Data related to the heartbeat are gathered simultaneously with the help of any standard smartwatches to keep the need for specialised equipment at minimum. Data sent from this device can help greatly with the completion of the insight into the user's emotions. The last layer of data is miscellaneous interaction data to help determine the user's actions associated with certain interaction segments, emotions and body reactions.

With the help of the computer vision algorithm that has to be trained specifically for this type of task, it is possible to mark facial expressions in real time and to store pieces with timeline metadata (Katti, et al., 2019). This alone could help researchers save time and could help minimize the need to watch hours of material for valuable discoveries contained in just about 20% of the whole recording. Now, the user's facial expressions are marked on a video timeline, but to better understand the complex experience of the user, additional layers of data are combined. Figure 2 contains a simple schema describing the process of data collection to the delivery of results.

Figure 2. Data collection process



Source: authors

The data collected from visual recordings, pulse records and interaction records are combined and evaluated by a special algorithm. The researcher gets output in a usable form containing concrete user emotions, problems regarding the time of occurrence during the testing and what action or item is associated with this emotion. All the detected facts are then tagged on a video timeline to allow easy navigation for further user experience research (Harrison & Baecker, 1992).

This process creates a high-value output with around 70% in time savings while reducing the margin of error caused by human element dramatically. This leads to an affordable process and this affordability and automated simplicity could lead to implementation even in the development of small agrarian apps. This allows small businesses to have access to better functioning applications that are easy and cheap to integrate and easy to use with no need for additional training (Altukhov, et al., 2018).

When micro to medium agrarian enterprises widely use these software solutions, it impacts their economic performance as well, be it savings in resources thanks to better planning and management, more effective field management and prevention and so on and so forth (Karanikolas, et al., 2018). This higher quality of software curated by the described affordable and fast process could boost acceptance of modern software agrarian solutions in the micro to medium agrarian enterprise sector, by helping to secure more effective and precise farming in the future days.

4. Conclusion

As the paper described, an optimal method suitable for use in micro to medium agrarian enterprises that allows fast testing and evaluation of the user's actions automatically without the need of going through a procedure manually, which is very time expensive with a possible space for human-caused errors, could help solve the problem of an expensive process causing lower UX quality of agrarian software solutions . The actual economic impact caused by the described approach of software design and its result driven quality could be studied further in the future with the sizes of variable enterprise included. When and where it is ideal to apply this toolset and when there is no need for it could also be information of high value that we intend to gain more knowledge of as part of our ongoing research.

The described methodological framework that allows the evaluation of automatically tested data with increased output data quality, while achieving extensive savings in time, needed to measure and evaluate UX testing scenarios, even with such a specific user base as farmers, can lead to a higher acceptance of modern software farming solutions and create a great toolset for small farmers to boost their economical effectivity and to make their life easier by bringing technologies of the future into the present.

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TECHNICAL AND SCALE EFFICIENCY OF FOOD PROCESSING COMPANIES

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Annotation: There is wide acknowledged presumption that large companies can profit from their size and achieve the returns to scale. But some studies showed that returns to scale in food industry are small or were not identified. The aim of the paper is to assess the technical, pure technical and scale efficiency according to the size of food processing companies. We chose firms from NACE 10.8 – production of other food products as it includes both, small and larger companies. Non-parametric input oriented Data Envelopment Analysis and Barnes, Charles and Cooper model with variable returns to scale was used to calculate the technical, pure technical and scale efficiency. Data were taken for 34 small and 17 larger companies for year 2016.

Despite assumption that the middle and large companies will be more capable to achieve returns to scale due to their size, it is not clear whether their size is an advantage. There were no statistically significant differences found between small and middle and large sized companies in technical and pure technical efficiency. Technical efficiency of small firms was almost equal to that of middle and large firms as same as pure technical efficiency. On the other hand, scale efficiency was statistically significantly higher in small (90.39%) than in middle and large companies (78.66%). Almost all larger firms (14 from 17) exhibited decreasing returns to scale (were operating above their optimum); 3 firms had constant returns to scale. 11 small firms had increasing returns to scale, so it can be suggested that they can increase the size of their activity to achieve constant returns to scale (there were 7 such firms). Besides, there were 16 firms with decreasing returns to scale. Hence, the majority of firms in NACE 10.8 exhibit decreasing returns to scale and probably their activity is above the optimum.

Key words: data envelopment analysis, efficiency, food processing industry, returns to scale

JEL classification: L66, F12, C02

1. Introduction

In Europe is food and drink industry a major contributor to economy. It is characterized as a stable and robust sector. Share of food and drink employment in manufacturing is 15 % and it is key job provider, but labour productivity is lower than in other manufacturing sectors. According turnover, France, Germany, Italy, the UK and Spain belongs to the largest EU food and drink producers (Food Drink Europe, 2017).

Production of food products in Czech Republic belongs to traditional manufacturing sectors with strategic position. Production ensures the population diet, with respect to quality and food self-sufficiency. For analysis was chosen branch CZ-NACE 10.5 Production of other food products. It includes production of sugar, chocolate, confectionery, tee, coffee, spices, and others. Besides this branch is one of the main contributors to total sales of food industry (share of 20.4%), to employment (17.6 %) and business structure (20.6%). This sector also creates the highest value added (24.6 % share of the food industry) (Ministry of Agriculture, 2018). According to these results there is an assumption of efficiency.

Some topics deal with technical efficiency in Czech agriculture. Food industry is related part to this branch, so it can be also influenced by this sector. According to Čechura (2012) there is a technical inefficiency in our agriculture and in individual branches. Factors, which influence the efficiency relate to institutional and economic changes. Actual studies of technical efficiency of food processing were done by Náglová and Šimpachová Pechrová (2019a, 2019b) with respect to subsidies drawing. Their results showed that efficiency of subsidies firms is lower than in non-subsidies and differs according to region. But for example, in meat industry there is a positive impact of subsidies on technical efficiency (Rudinskaya and Náglová, 2018). Businesses are divided according to their size. Smaller firms contribute significantly to number of businesses, output and economic growth, exports, regional development (Charoenrat and Harvie, 2014). Efficiency has very important role, because efficient firms grow and survive, while inefficient stagnate or exit the industry. Large firms are therefore more efficient then smaller (Jovanovic, 1982).

The aim of this paper is to assess the technical, pure technical and scale efficiency according to the size of food processing companies. It will be an illustrative case to show whether the returns to scale are important in food processing. According to economic result of analyzed branch and based on the general economic theory, there is an assumption that larger firms are more technically, pure technically and scale efficient than smaller firms as they can economically benefit from their size.

2. Materials and Methods

Concept of technical efficiency was introduced by Farrell (1957) as the technical relation of inputs and outputs in the production process. It examines the maximum attainable output with given inputs or usage of minimum inputs to achieve given output. According to the definition, we can distinguish two types of models – output and input oriented. There are two methods that can be used to calculate the technical efficiency of the companies: parametric (that use econometrics) and non-parametric (based on linear programming). Both have their advantages and disadvantages. Parametric is somewhat more demanding on the assumptions – about type of production (cost) function and distribution of the inefficiency term. On the other hand, it enables usage of panel data and to assess the determinants of the technical efficiency in one step. It is also not that sensitive towards outliers. Non-parametric approach requires assumption about type of returns to scale, but allows to calculate the technical, pure technical and scale efficiency if variable returns to scale are supposed. Hence, we chose non-parametric method.

Data Envelopment Analysis (DEA) was used to calculate the technical efficiency. Particularly BCC model elaborated by Banker, Charnes and Cooper (1984) enabled to calculate technical efficiency (under the assumption of constant returns to scale), pure technical efficiency (variable returns to scale) and scale efficiency. The model was input oriented. There were two outputs: y_1 – sales of own goods and y_2 – sales of own products and services; and four inputs: x_1 – consumption of material and energy, x_2 – equity, x_3 – foreign resources, x_4 – number of employees. All data were in thous. CZK, except for the number of employees. Data for year 2016 (there were only few observations for later years and were not complete) for were taken from paid database of accounting data Albertina. We chose firms from CZ-NACE 10.8 – Production of other food products as it includes both, small and larger companies. Firms were divided according to the number of employees to small (under 50 employees) and middle and large (50 and more employees). There were 34 of the first mentioned and 17 of the later. Statistical description of the data can be found in Table 1.

Table 1. Statistical description of variables

Variable	Mean			Std. dev.	Min	Max
	-all	-small	-middle, large			
y_1 – sales of own goods	128475	8699	368027	767042	0	5490529
y_2 – sales of own products and services	290126	39616	791145	844588	0	5765351
x_1 – consumption of material and energy	171529	22075	470438	510003	0	3502776
x_2 – equity	103851	17455	276642	209526	-11192	1016981
x_3 – foreign resources	178798	17739	500915	618090	0	4101828
x_4 – number of employees	118	21	313	328	0	2250

Source: own elaboration, 2019, based on data from Albertina database, 2016

Average sales of goods were 128 thous. CZK (with standard deviation of 767 thous. CZK) and were over 42 times higher in case of middle and large sized companies than in small. On the other hand, the difference between small and middle and large firms in sales of own products and services was lower – they were only almost 20 times higher in case of middle and large companies. Regarding the consumption of material and energy, in the whole sample it was around 172 thous. CZK, small firms used material only in a value of 22 thous. CZK, middle and large 21 times more (470 thous. CZK). Also, equity is higher in middle and large firms (277 in comparison with 17 thous. CZK), while the average of the whole sample is 104 thous. CZK. Foreign resources were on average higher than equity (179 thous. CZK), but in case of small firms, there amount was almost similar (177 thous. CZK). Middle and large companies had foreign resources 1.8 times higher than equity. Large difference is also in the number of employees, where small firms employ on average 21, while middle and large sized 313 of them. Average of the whole sample was 118, minimum 0, and maximum 2250.

The advantage of DEA is that it is relative method. We selected input-oriented model that compare firms among themselves in terms of their ability to produce certain amount of outputs with the least possible amount of inputs (input minimization) and shows those firms that are 100% efficient and those that are less efficient. "In the traditional data envelopment analysis approach for a set of *n* Decision Making Units (DMUs), a standard DEA model is solved *n* times, one for each DMU." (Khezrimotlagh et al., 2019). It allows to include more inputs *m* and outputs *r* into the transformation process, but the sum of them shall be at least three times lower than number of DMU ($n \geq 3(m+r)$). In our case, DMUs are food processing companies, and there are $m = 4$ inputs and $r = 2$ outputs. Assuming variable returns to scale (1 unit of input can be transformed to more or less than 1 unit of output) a BCC model (elaborated by Banker, Charnes and Cooper (1984)) was estimated. Primary BCC model can be formulated as (1).

$$\begin{aligned}
\max \quad & z = \sum_i^r u_i y_{iq} + \mu \\
\text{s. t.} \quad & \sum_i^r u_i y_{ik} + \mu \leq \sum_j^m v_j x_{jk}, \quad k = 1, 2, ..., n, \\
& \sum_j^m v_j x_{jq} = 1 \\
& u_i \geq \varepsilon, \quad i = 1, 2, ..., r, \\
& v_j \geq \varepsilon, \quad j = 1, 2, ..., m, \\
& \mu \text{ - any}
\end{aligned} \tag{1}$$

where z is efficiency of unit U_q, x_{jk} is value of j-th input for unit U_k and y_{ik} is value of i-th output for unit U_k. There are m inputs, r outputs and n decision making units. v_j represents weights for inputs ($j = 1, 2, \ldots m$) and u_i are weights for outputs ($i = 1, 2, \ldots r$). ε is infinitesimal constant ensuring that all weights of inputs and outputs will be positive and included in a model. The value is usually set at 10^{-8}. μ ensures variable returns to scale. Convexity condition is $\mathbf{e}^T\lambda = 1$.

Technical efficiency is calculated under constant returns to scale assumption, pure technical and scale efficiency under variable returns to scale. Scale efficiency can be calculated as the division of technical and pure technical efficiency. The model can also tell which firms exhibit constant, decreasing or increasing returns to scale.

Two groups of firms are tested on differences between them. Because the efficiency is not normally distributed, the differences between groups of small, middle and large companies were tested by non-parametric Wilcoxon rank-sum test with H_0: There are no statistically significant differences in arithmetic means between two groups. If H_0 is rejected, the differences are statistically significant.

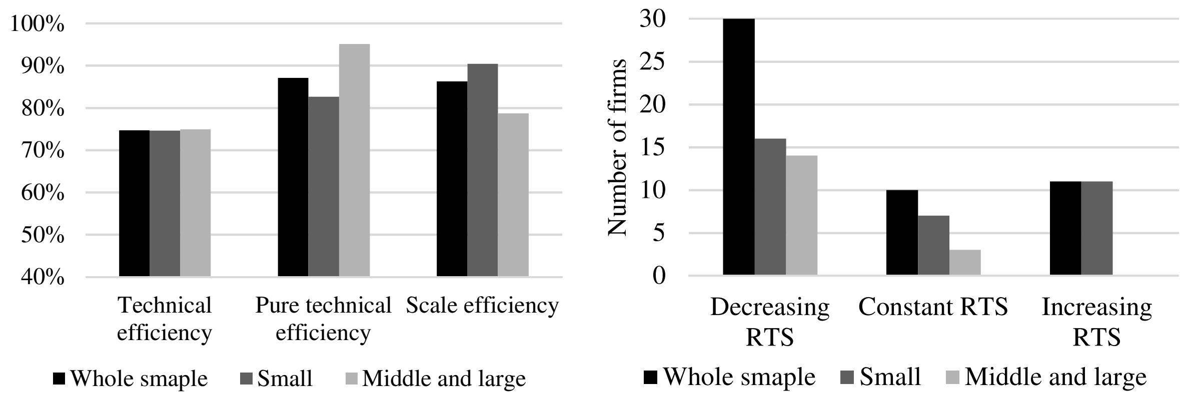
The calculations are done in econometric software Stata, version 15.

3. Results and Discussion

Results of input oriented BCC model are displayed at Figure 1. Average technical efficiency of the whole sample was 74.71% and almost similar in small (74.62%) and other (74.88%) firms. This average efficiency is lower than in meat industry, fruit and vegetable processing or in dairy and milling industry (Čechura, Hockmann and Kroupová, 2014). Hence, if we assumed constant returns to scale (1 unit of input produces 1 unit of output), the efficiency would have been almost similar regardless the size of the firm. However, more firms (7) exhibited constant returns to scale in case of small firms, while among middle sized farms there were only 3 of them. Regarding the pure technical efficiency, it was 87.07% on average, and was higher (95.13% in middle and large firms) than in small firms (82.65%). Same result presented Charoenrat and Harvie (2014). According to them smaller firms are labour intensive with low technical efficiency. Firm size is an important factor contributing to technical efficiency. Also, Janovic (1982), Yand and Chen (2009) demonstrated higher efficiency of large enterprises. They can better coordinate their resources and reach the advantage of economies of scale. On the other hand, some authors presented negative effect for larger firms or negative relation to firm size (Battese and Coelli, 1992).

Surprisingly scale efficiency was higher in case of small farms (90.39%) than middle and large sized firms (78.66%), while the average was 86.23%. There were only 11 firms with increasing returns to scale and only in a category of small farms. That shows that those firms do not operate at optimal scale and can be larger. They can turn into large firms (Janovic, 1982). On the other hand, 16 of them in a category of small are even too large to operate on optimal scale as they exhibit decreasing returns to scale. However, also in the category of middle and large firms, 14 of them operate at decreasing returns to scale. According to Alvarez and Crespi (2003) smaller firms are not able to have advantage of scale efficiency, but they can be efficient, because they are more flexible. Čechura and Hockmann concluded relatively small scale effect in food processing.

Figure 1. Results of input oriented BCC model



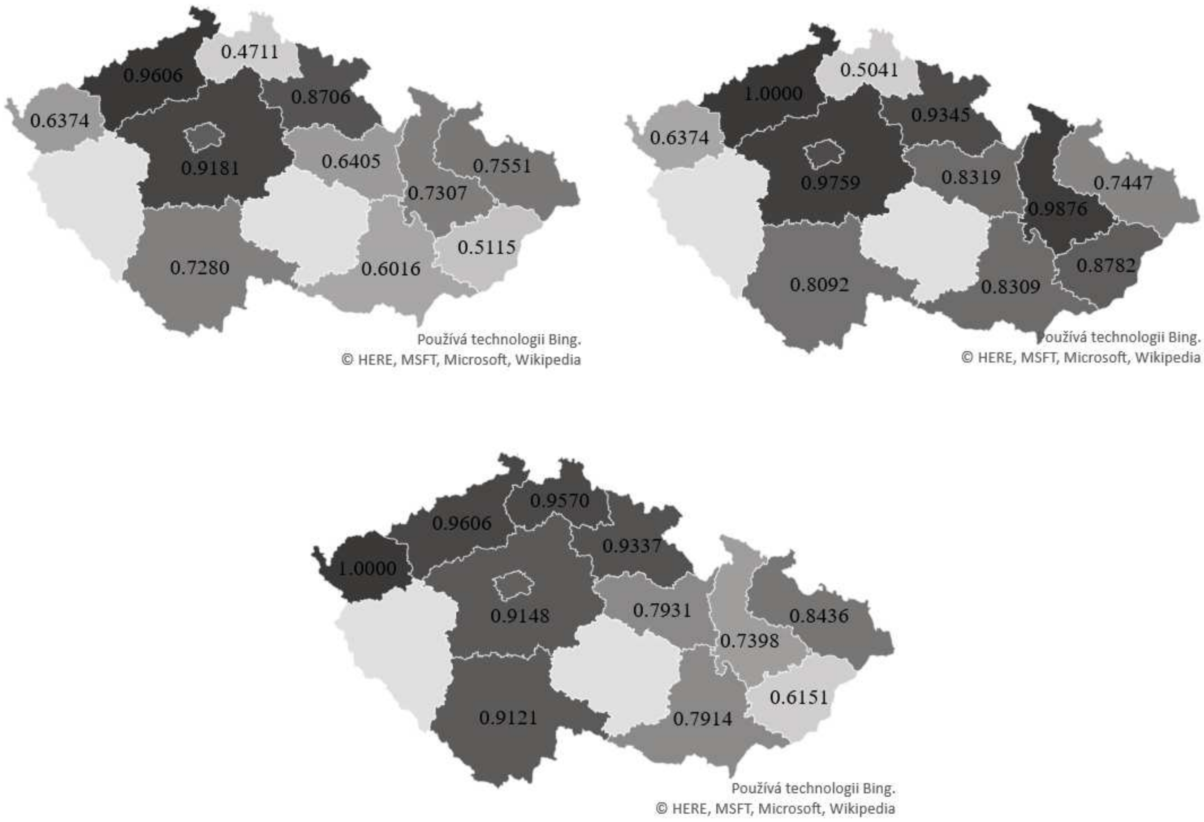
Source: own elaboration, 2014, based on data from Albertina database, 2016

Note: RTS = returns to scale

All types of efficiency are always non-normally distributed. Hence, we used Wilcoxon rank-sum test to test the differences between the groups of firms. The results showed that probability that technical efficiency is equal is 62.08% (p-value = 0.6208), i.e. there are no statistically significant differences. Also, the probability that the pure technical efficiency in both groups is equal is high – 36.68% (p-value = 0.3668), i.e. no statistically significant differences were found. On the other hand, scale efficiency is equal only with probability of 0.14%. p-value = 0.0014 is lower than level of significance 0.05 and hence the differences are statistically significant.

One of the determinants that can influence all types of technical efficiency of firms can be the region where they operate. However, we did not have such wide sample to test the differences. Nevertheless, for the illustration, we present at Figure 2 the map of firms according to their average efficiency. It can be seen that pure technical efficiency is always higher in all regions than technical efficiency as it is its nature. The shape of envelope of the data in BCC model is on convex and include more units to the frontier (Pechrová, 2014).

Figure 2. Average technical (left), pure technical (right) and scale efficiency (down) of food processing firms



Source: own elaboration, 2014, based on data from Albertina database, 2016

Technical efficiency can by affected also by other factors, for example firm age, type of ownership, investment, export activity (Charoenrat and Harvie, 2014). Or development in biotechnology, evolution of alternative food supply networks, innovations, policy (Dimara et al., 2008). Therefore, the challenge for future research is to examine the determinants of the scale efficiency and find out the causes of decreasing returns to scale in the sector and suggest potential improvement.

4. Conclusion

The aim of the paper was to calculate and analyze the technical, pure technical and scale efficiency according to the size of food processing companies. We chose CZ-NACE 10.8 – production of other food products. Non-parametric method, output oriented Data Envelopment Analysis (DEA), was used to calculate all types of efficiency (technical, pure technical and scale) of companies of two sizes – small and middle and large.

Despite that we assumed that the middle and large companies will be more capable to achieve returns to scale due to their size, it is not clear whether their size is an advantage. There were no statistically significant differences found between small, middle and large sized companies in technical efficiency and pure technical efficiency. Technical efficiency of small firms was almost equal to that of middle and large firms (74.62% vs. 74.88%). Also, pure technical efficiency was not statistically different (82.65% vs. 95.13%) despite being dissimilar.

On the other hand, scale technical efficiency was statistically significantly higher in small companies (90.39%) than in middle and large companies (78.66%). It is due to the fact that in a group of larger firms, almost all of them (14 from 17) exhibited decreasing returns to scale, i.e. they were operating above their optimum; 3 firms had constant returns to scale. In a group of small firms, there were 11 of them with increasing returns to scale, so it can be suggested that they can increase the size of their activity to achieve constant returns to scale (there were 7 such firms). Besides, there were 16 firms with decreasing returns to scale. Hence, the majority of firms in NACE 10.8 exhibit decreasing returns to scale and probably their activity is above the optimum. The challenge for future research is to examine the determinants of the scale efficiency and find out the causes of decreasing returns to scale in the sector and suggest potential improvement.

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DATA PROCESSING FOR YIELD OPTIMIZATION

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Annotation: The APSIM software can be used to process simulations with various setting such as sowing window, plants per meter squared, amount of irrigation, fertilization, soil properties etc. The resulting data from such simulations can provide important information about yield, biomass production, stover and grain size among others. And while this data can help producers to maximize farming efficiency, the required processing power and hardware needed might be a barrier, especially when it comes to small companies. This paper outlines the requirements and the simulation process and evaluates the possibility of utilizing the existing hardware infrastructure in smaller farms to conduct the simulation processing. Different software tools, that can be used to automate the simulation process, are also discussed. Lastly, in order to manage the simulations, there are several technical / computer expertise requirements for the personnel, which is a major issue especially for small companies.

Key words: spatial data, APSIM, simulation, big data, data processing

JEL classification: C8/C80 General Data Collection and Data Estimation Methodology • Computer Programs

1. Introduction

The APSIM (Agricultural Production Systems sIMulator) software is an important tool that allows simulating agricultural production depending on G x E x M (genotype, environment, management) interaction (Holzworth et.al., 2014). This software is quite dated (about 20 years old), but still relevant in the field of agriculture. With the increasing computational power of new machines, it has become possible to conduct large-scale multi-parameter simulations with high resolution grid. The problem is that the APSIM was not designed to be able to handle such a computation on its own. There are many areas where the software is sorely lacking, such as the inability of parametrization, single machine computation model, output data size optimization and so on. There is currently an effort to update the software for new millennium and tackle some of these issues (Holzworth et.al., 2018).

Apart from research on a regional, national or international scale, APSIM can also be utilized by local farmers and companies to optimize their management interaction to increase yield. However, such a use provides additional challenges, especially in terms of processing power, and expertise required to oversee software automation. As pointed out by (Reinmuth and Dabbert, 2017), even agricultural researchers rarely possess knowledge or training required to manage modelling software. For successful utilization of simulations for the production optimization, two key roles are required – an IT specialist who would conduct the computer processing and a data analyst to sift through the generated data and find favorable G x E x M scenario to implement. A small company or a farm is very likely not going to have either of those.

As for hardware requirement, apart from purchasing dedicated machines to conduct the simulation, there are several other options. Two of main approaches include utilizing cloud services for the computation and subsequent data storage or utilizing existing hardware infrastructure such as office desktop PCs during their downtime (nights / weekends etc.).

The second option seems more attractive, especially for smaller companies due to lower costs, but require a dedicated in-house employee with proper experience to manage the processing, which again, might be an issue. Additional problems may arise from non-compatibility within the company infrastructure. For instance (Bryan, 2013) explored the difficulties of managing computation with different platforms, operating systems and languages. Unless the company has large amount of homogenous machine setups, conversions will add an extra layer of management required to conduct the processing. (Schadt et.al., 2010) have reached similar findings when conducting large scale distributed processing – that the issues of data transfer and storage, standardization and utilization of multiple different data formats provides additional challenge that is better to be avoided.

2. Materials and Methods

This paper follows up on our previous research regarding APSIM (Jarolimek et.al., 2019), where we outlined data pre-processing and preliminary processing results. We continued our work on the proposed C# application that handles simulation generation and scheduling and conducted additional test runs to establish a processing time consumption estimates (see section Results and Discussion).

During our research about the possibilities of simulation automation, we found several different approaches, some of which were successfully utilized in the past. One of the used solutions were utilizing existing automation / scheduling frameworks, such as HTCondor. This framework, despite its age is still very commonly used in the area of modeling and simulation processing, for instance by (Thain, Tannenbaum and Livny, 2005) or (Zheng, Holland and Chapman, 2016). However, with regards to our target group, which consists mainly from agricultural researches and farmers, we decided against it due to additional knowledge and experience requirement to use such a framework.

We therefore opted to design a brand-new application, that would take these limitations into consideration. A similar approach was also used in the past. There is a python application called ApsimRegions (Stack and Kafatos, 2013) developed for similar research in the United States. However, this application does not allow for automated parametrization of the G x E x M properties the way we would need it to. Our goal was to create a tool that would allow for scaling the simulation processing along multiple axes.

After adjusting the application based on the end user requirements, we conducted several tests to ascertain the efficiency of the processing using several hardware setups. The state of ICT among farmers is usually not very good, for instance findings from Czech Republic (Vanek, et.al., 2010) show that many farms, especially the small ones often work with very dated hardware. That is why we included one very old computer as our first hardware setup. Our second setup was a slightly above-average desktop PC that was couple of years old, as it is very likely that small to medium companies and research groups will have some machines of similar processing power at their disposal. Last two setups are very powerful and very expensive new computers that use server-type processors. All four of our setups can be seen in table 1.

Table 1. Testing computer setups

No.	Processor	RAM	OS	Age
1	AMD Athlon II X4 605e, 2.30 GHz	8 GB	Windows 7, 64-bit	7 years
2	Intel Core i5-6500, 3.20 GHz	16 GB	Windows 10, 64-bit	2,5 years
3	AMD EPYC 7281 16-core, 2.10 GHz (two processors)	126 GB	Windows 10, 64-bit	< 1 year
4	AMD EPYC 7601 32-core, 2.20 GHz (two processors)	1,5 TB	Windows 10, 64-bit	< 1 year

Source: own research, 2019

3. Results and Discussion

At this moment the application we designed and are using for the testing is still quite crude and more akin to a "working prototype". Most of the parametrization is done in-code, since we mainly focused on the automation optimization and scheduling in the research we have done so far. The goal is to have a tool that would allow utilizing any unused hardware, regardless of its power to process simulation during its downtime, like the approach outlined by (Zhao et.al., 2013).

When the application is run it allows to generate simulations based on the given range of G x E x M parameters for selected grid areas. The simulations are added to a simple single-machine scheduler and run in batches. As pointed out by our previous research (Jarolimek et.al., 2019), the size of these batches, or chunks, also influences the processing efficiency. This is caused by the requirements for initialization and job allocation of the APSIM software. Same findings were shown by (Zhao et.al., 2012).

Table 2 shows the results for running simulation on different hardware setups (from table 1). We can see, that depending on the power of the processor the APSIM job runner performs different amount of parallel simulations. The average time for one simulation also differs, for instance our second setup has only 4 parallel simulations, same as our first setup, but due to the processor being much more powerful, the time required to perform one simulation is much shorter. Based on the amount of concurrent simulations and average simulation time, we calculated an estimate for the overall simulation processing speed (see table 2).

Table 2. Simulation processing speeds

No.	Parallel simulations	Average simulation time (seconds)	Simulations per minute (rounded)
1	4	44.1	5
2	4	22.8	11
3	32	33.7	57
4	64	43.3	89

Source: own research, 2019

These results however do not include the start-up time required for APSIM to initialize the processing, so the overall speed is lower. For instance, the setup number four can perform around 90 simulations per minute, but when we consider the additional time between batches over a long period of time (several hours / days), the average number of simulations per minute was approximately 65.

We will be continuing our research in this area. There are many more tests currently being planned and we are cooperating with end users in order to adjust our application with regards to low computer knowledge and experience, so that even less skilled employees and researchers can learn how to operate it. This includes improving the parametrization so that different G x E x M scenarios can be setup without any programming knowledge whatsoever.

4. Conclusion

While large-scale simulations can be utilized in agricultural production in order optimize yields, it comes with a set of specific challenges. The main three areas are software tools to manage the automation of processing these simulations, hardware requirements for the processing and IT expertise needed by the personnel conducting the simulations.

Since small companies cannot afford to invest into dedicated hardware and software, the optimal approach in such scenario is to try to utilize the existing hardware infrastructure. This however has the downside of needing an in-house employee that would oversee the processing. A light-weight custom built application, such as the one created by our team, that is run in parallel on existing company computers can be one of the solutions in such a case. We will continue our research in this area and publish more results in follow-up paper.

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FIRM PROFILE AS INFLUENCE FACTOR ON FINANCIAL ACCESS AMONG SMALL AND MEDIUM ENTERPRISES IN GEORGIA

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Annotation: Small and medium scale enterprises (SMEs) are the backbone of all economies and play critical role in the process of industrialization and economic growth by importantly contributing to employment, income generation and catalyzing development in urban and rural areas. However, small businesses do not have enough resources, skills and finances to cope with those big challenges, which are caused by society development. A lot of research reveals that access to finance is the main problem of small and medium enterprises that prevents them from mobilizing other resources and in development. Our research aim is to determine the effect of firm profile on access to finance. We will utilize primary sources of data using a Likert scale questionnaire and analyze our data using multiple regression analysis. In conclusion, the study will set out to address the question of whether firm-specific characteristics influence access to finance, which will help Georgian firms to eliminate the problem and effectively attract financing.

Keywords: Small and Medium Enterprises, Firm Profile, Financial Access, Georgia

JEL code: D29, D53

1. Introduction

The accessibility of finance by SMEs has been a subject of debate between policymakers and researchers globally. Access to finance allows small businesses to undertake productive investments and contribute to the development of the national economy (Beck et. al., 2006, 2009). External finance for small and medium enterprises is essential for boosting start-up businesses. In addition, without external finance, small and medium enterprises will probably not be able to compete in an international market, to expand the businesses and strike linkages of business with the large firms. As in most developing countries, private sector in Georgia is dominated by SMEs engaged in various business activities. For the purposes of this study we defined an SME as an enterprise with less than 100 employees and with annual turnover of less than 1.5 million GEL. Lack of access to finance is a major constraint facing SMEs, thus, is one of the reasons for the slow growth SME firms in Georgia. There are good reasons to suggest why access to finance is more adverse for SMEs. First, the fixed costs associated with loan appraisal, supervision, and collection is prohibitive to lenders. This implies that lenders prefer to provide larger amounts of credit to large enterprises than small amounts of credit to many smaller enterprises. Second, SMEs are less able to provide collateral against their loans. From the lender's perspective, the cost implications associated with the possible bankruptcy of the borrower rise accordingly, further diminishing incentives to lend to smaller enterprises. Thus, SMEs frequently report financing as a major obstacle compared to large firms (Ayyagari et al., 2006). We believe that SME firms face varying financing needs depending on firm specific characteristics. This study therefore sought to determine the effect of firm profile on access to finance.

1.1 Effect of Firm Size on Access to Finance

Extant literature associate firm size to the ability of firms to access finance. For example, Honhyan (2009) found that larger firms tend to be more diversified and fail less often, so size can be an inverse proxy for the probability of bankruptcy. Cassar (2004) argues that it may be relatively more costly for smaller firms to resolve information asymmetries with debt providers. Consequently, smaller firms may be offered less debt capital. In addition, transaction costs are typically a function of scale and may be higher for smaller firms (Evans, 1987). It is also possible that small firms have fewer opportunities to raise capital because capital markets are out of reach due to their size. Du and Girma (2012) using firm level data from China spanning the period 1998-2005 found that bigger firms source capital from the bank while smaller firms use self-raised finance. Thus, we hypothesize that:

H1: Larger firms have more access to finance.

1.2 Firm Age and Access to Finance

Firm age appears in several studies in the empirical finance literature as control variable especially in corporate strategy research (Villalonga, 2004). However, we believe that the age of the firm has implications on financial access. According Chandler (2009) the longer a firm exists; the more it signals that it can weather tough economic conditions. Furthermore, by staying in business, a firm can signal that it does not adopt opportunistic behavior. It also signifies that the firm and in particular the owners or managers are mature enough to deal with business challenges. Older firms provide a resume in which lenders can use to gauge their credit worthiness. Ngoc et al. (2009) found that it is often difficult and expensive for young SMEs to access bank financing, due in large part to information asymmetry between the banks and firms. Bougheas et al. (2006) argue that young firms are more prone to failure than older ones. Therefore, we hypothesize that:

H2: There is a positive relationship between the age of the firm and access to finance.

1.3 Effect of Ownership Structure on Firms' Access to Finance

There are several types of firm ownership. For example, sole proprietorship, partnership and companies. Dietmar et al. (1998) demonstrate that firms under limited liability, have higher growth than unincorporated firms. Several factors could explain the association between incorporated firms and growth. First, corporations have ability to issue stock and their stockholders have the freedom to resell their stock. This ability facilitates the process of accessing finance for expansion.

Cassar (2004) observed that lenders may perceive incorporation as a sign of credibility and formality of operations. Abor (2007) argue that the form of ownership could affect the debt-equity decisions of SMEs. Thus, corporations and limited liability companies may be more likely to finance their projects with equity, while sole proprietors are more likely to employ debt financing. (Coleman and Cohn, 2000) also find evidence suggesting a positive relationship between leverage and incorporation. Thus, we hypothesize that:

H3: Ownership structure has a positive effect on firms' access to finance such that incorporated firms are likely to have more access to finance.

1.4 Effect of Business Type on Access to Finance

The industry in which a firm operates does determine its capital structure albeit indirectly via the nature and composition of the firm's assets (Hall et al., 2000). Demsetz (1973) argue that the relationship between industry classification and financial leverage is based on the assumption that industry classification is a proxy for business risk. Firms in the same industry face the similar environmental and economic conditions and, thus, tend to cluster with respect to variance of earnings and sales. Abor (2007) found that SMEs in the agricultural sector exhibit the highest capital structure and asset structure or collateral value, while the wholesale and retail trade industry has the lowest debt ratio and asset structure. Theories from strategic management and industrial organization have emphasized the importance of industry affiliation to firm performance. Barriers to entry and other structural features of industries create significant differences in firm performance (Bain, 1951). Because of differences in sunk and fixed-cost requirements by industry, firm performance may differ significantly by industry regardless of country affiliation (Sutton, 1990). Thus, even among firms with different affiliations by country, important differences may arise in performance by industry (Porter, 1981). We argue that some industries are characterized by higher risk and thus because lenders assess risk levels of the industry, risk exposed sectors may not access as much finance as compared to other less risky sectors. In the same vein, some sectors are less profitable than others. Because profitability is a yardstick used by lenders, then it means that some sectors may be disadvantaged in access to finance. Thus, we hypothesized that:

H4: Business type has an effect on access to finance such that manufacturing firms have more access to capital.

2. Materials and Methods

We targeted 230 SMEs in Georgia, however, we managed to get 151 completed and usable questionnaires making a response rate of 66 percent. We utilized primary sources of data using a Likert type questionnaire in which the respondents had the choice of four scales. A set of questions were framed to interrogate whether the respondents firm had easy access to finance on a scale of 1-4 (1 strongly disagree, and 4 strongly agree). The summated responses of these questions provided a value for access to finance. This study deviates from other studies that have used a dummy coding for access 1 and no access 0 because we feel that some firms may have no access at all, some have little access while others have ease of access. Business type was measured using a dummy coding 1 for manufacturing firms and 0 for firms in the service industry. Similarly, 4 categories of age were developed to measure the age of the firm, business size was measured using a 4scale indicating the size of the firm based on the number of employees, while ownership structure was measured as a dummy coding of 1 if the business is registered and 0 otherwise.

We analyzed our data using multiple regression analysis. But before subjecting the data to regression analysis, we tested the data for possible violations of regression assumptions. First, we tested data for normality using Kolmogorov-Smirnov test and we found the data to be normally distributed. Secondly, we also tested the data for possibility of multicollinearity using Variance Inflation Factors (VIF) as well as Pearson's Correlation. In all the results, we did not find multicollinearity to be a problem. We also tested data for reliability using Cronbach Alpha and we found the data to be reliable i.e. above the threshold of 0.50 which is considered acceptable level (Fraenkel and Wallen, 1993). To test for the presence or lack of serial correlation, Durbin Watson statistic was used. We found Durbin Watson statistic to be 2.084 which is within the threshold of 1.9 to 2.5. Thus, there was no serious problem of serial correlation among the variables in the study (Scott, 2002).

Model Specification

The model Specified for this study is of the form: Access to Finance = α+ β1 (Firm Size) + β2 (Firm Age) + β3 (Ownership Structure) + β4 (Business Type) + ε

Where: β1, β2, β3, and β4 is partial slope coefficients and ε, is the error term.

3. Results and Discussion

Descriptive Statistics

Table 1 presents descriptive and correlation results between the study variables. The correlation results show that access to finance had a positive and significant correlation with business age, business size, and ownership structure. However, we did not find any significant correlation on business type. This indicates that older business enterprises, larger in size and incorporated are more likely to access finance. The results indicate however, that it may not matter much the type of business enterprise to access of finance.

Table 1. Descriptive and Pearson Correlation Results

Variables	Mean	Std. Dev.	Access to Finance	Business Type	Firm Age	Firm Size	Ownership Structure
Access to Finance	3.48	1.07	1.00				
Business Type	0.77	1.19	0.01	1.00			
Business Age	3.13	3.11	0.32**	-0.28*	1.00		
Business Size	4.11	2.12	0.51**	-0.27*	0.35**	1.00	
Ownership Structure	0.63	1.03	0.49**	-0.13	0.18†	0.29*	1.00

*N=151, significance level, p<0.01**: p<.05*; p<.1†*

Source: own calculation

Empirical Results

The study applied multiple regression analysis to test the hypotheses. Table 2 reports the regression results. Hypothesis 1 postulated that the size of business has a positive effect on access to finance such that larger SMEs have more access to finance. The regression results supported this hypothesis (β = 0.16; p<0.01). Hypothesis 2 predicted that the age of the firm has an effect on access to finance such that older firms have more access. Results provide support for the hypothesis (β =0.09; p<0.05).

Hypothesis 3 conjectured that ownership structure of the business has an effect on access to finance such that incorporated businesses have more access to finance as opposed to unincorporated entities. Again, the results support the prediction (β = 0.22; p<0.01). Finally, Hypothesis 4 postulated that business type or the industry to which the business belong has a positive effect on access to finance. Specifically, manufacturing firms have more access to finance as opposed to finance in the service industry (β = 0.15; p<0.01).

Table 2. Regression Results

Variables	Parameters	Standard Error	T-values	Significance
Intercept	0.75	0.22	3.35	0.001
Firm Size	0.16	0.03	4.61	0.00
Firm age	0.09	0.04	2.23	0.03
Ownership Structure	0.22	0.05	4.67	0.00
Business Type	0.15	0.06	2.66	0.008
R Square	0.44			
Adjusted R Square	0.42			
F Statistic	18.57**			

*** Significant at $p<0.01$; Source: own calculation*

The study set out to address the question of whether firm-specific characteristics influence access to finance. Indeed, results confirm the prediction that firm-specific characteristics affect the ability to access finance. First, consistent with the extant literature, the size of the business affects the ability to access finance. The probable reason for this is that larger firms are likely to have collaterals that act as a security in securing finances. Another reason is that large size provides information to lenders that the firm is able to meet the needs of other constituencies and thus can grow in size. Secondly, firm age was found to play a role in firms' access to finance. More specifically, firms that are older were found to have more access to finance. These results were not unexpected because older firms have the network capital generated overtime and also credit history that can be used by lenders to assess their credit worthiness. In contrast, younger firms may lack the necessary connections on the providers of finance and also the historical performance of the firm may be lacking.

Thirdly, the ownership structure was found to affect firms' access to capital. Firms incorporated have more access to finance than their unincorporated counterparts. Reason attributed to this is that incorporated firms have inherent characteristics such as perpetual existence unlike unincorporated counterparts which are likely to dissolve in the event of death or for whatever reason. Perpetuity therefore is an important ingredient to lenders because it promises the fulfillment of obligations in an event of uncertainty in the owners of the business. Lastly, the industry with which the business belongs was also found to have an implication on access to finance. Given that different sectors enjoy dissimilar opportunities, profitability, and risks, some sectors have more opportunities and thus make more profits. Consistent with capital structure theories, it has been found that manufacturing firms have more access to finance because of asset tangibility (Titman and Wessels, 1988) which acts as collaterals in debt financing. It is also noteworthy that the risks in each industry vary and that service industry is relatively volatile as compared with manufacturing firms. Thus, lenders are inclined to lend to more to manufacturing firms as compared to service firms.

4. Conclusion

It is important to note the study's limitations. First, the study sample may be small and drawn from a homogenous environment. We hope that this can be expanded to make it more generalizable by testing the same model in different contexts and increasing the sample size. Secondly, we focused only on firm-specific characteristics; however, we contend that these may not be the only factors that influence access to finance. Future studies may need to include external factors into the model. Thirdly, we measured direct effect of the firm-specific factors on access to finance. We also believe that this can be improved by including moderating variables such as firm performance in the model. Future research can therefore interrogate the moderating effects of other firm specific outcomes in determining access to finance.

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TRAINING OF AGRIBUSINESS MANAGERS IN THE FIELD OF ICT AS A REASON FOR INCREASING COMPETITIVENESS

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Annotation: Lately lifelong learning has become an integral part of the whole society. This is also the reason for the greatest development of new concepts serving just the implementation of lifelong learning policy. These changes in the process of continuous education are in practice much more than a comprehensive adaptation of the education system, which is why this trend is currently understood mainly in the developed countries of the world as a response to the changing labor market. Lifelong learning thus provides individuals with a better perspective and at the same time increases the chances of an organization in which they succeed and differentiate themselves on a global scale. That is why we can designate lifelong learning, learning and constant improving as an essential part of the development of managers. Education and training of human resources in organizations form a significant part of lifelong learning. Employee training focuses on shaping individuals, their skills and increasing their competitiveness on the global market. In today's turbulent and difficult-to-anticipate period, educational activities in management and training are important. This brings the ever-increasing demands for expanding, specialized and retraining education and thus the constant demand for new and more efficient forms of education.

Key words: Information and communication technologies, business performance, manager, educating of managers.

JEL classification: A12, I25

1. Introduction

Global developments in the information society are placing ever greater emphasis on professionals in the area of Information and Communications Technologies (ICT) and especially on managers. Training of skilled employees starts with training the manager or supervisor. Before you select a manager to train your industrial and manufacturing employees, you should identify if they have the ability to teach others, strong facilitation skills, and patience (Dor et al., 2016). But the most important characteristic is that the selected trainer should be knowledgeable about the subject they will be teaching. This is important because they're the ones in charge of administering the training program. It is necessary to have a training plan for your employees, whether in the ICT field or in other areas. (Hennyeyová et al., 2010). Human resources and capacities are one of the organization's most important competitive advantages, and therefore their education and development should be given the appropriate attention and should be firmly placed in the corporate strategy. In this paper we will pay the most attention to the education and development of the organization's employees. We present the specific forms and methods of education used today and compare them in terms of effectiveness in relation to the performance of the organization. Performance is a concept whose presence in our everyday life is quite common regardless of a specific professional interest. In general, the more common term we use in our language, the more natural part of our life and expectations the term becomes. In general, the term performance is mostly used in the connection with the main existence of the firm on the market and its success and ability to survive in future (Šilerová et al., 2016; Hennyeyová et al., 2013).

When new employees start working in business, they must be adequately trained to perform their role. To achieve this goal, it is necessary to rely on other employees. Current employees may need to upgrade their skills - not only to help the business, but also to develop their own careers and maintain their challenges and engagement. Changing circumstances require new learning, such as new technologies and entrepreneurship, and social and legal changes. Sometimes it is necessary to change the role of an employee to deal with it, which will require further training (Hallová et al., 2017).

1. A cost-effective way to meet your skill needs is based on talent. Explore your existing employee skills and find that they have the skills you need
2. Employees train others - make sure that useful skills are not lost as a result of absence or retirement (Šilerová et al., 2015)
3. Developing the skills of existing employees - Refresher courses, seminars and online tutorials can help employees further develop their own career goals and increase job satisfaction. (Hallová et al., 2017).

Šimek et al. (2008), Stočes et al. (2016), Steiner-Khamsi (2010) and Ongori et al. (2010) believe that the main goal of IT managers' knowledge is to enable managers to communicate effectively with IT staff. Many authors define interconnection as a stage in which IT missions, goals and plans support business mission, goals and plans through their mutual alignment. Managers are increasingly aware of the need to constantly flexibly reflect on the current needs of organizations, and naturally expand their horizons through lifelong learning. The issue of lifelong learning is not only about managers but it is an all-society phenomenon that is also anchored in the lifelong learning strategy and lifelong guidance as a tool for forming a knowledge society (Neeley, 2013). The most effective way to increase the level of information literacy of the managers is their continuous education. However, learning brings the barriers that arise from both the external and the internal environment. Barriers arise in an educated subject, a sending organization, an organization providing education, but also a state with its legal regulations. Barriers in the literal sense of the word mean obstacles. We define them as factors that prevent us from doing something, in our case education. The barriers faced by managers in their education are often related to their family situation, education, employment. Based on published studies Šilerová et al. (2015), Šilerová et al. (2016), Dor et al. (2016), we identified the following major barriers in the training of current ICT managers:

1. Lack of time to learn,
2. Lack of finance,
3. The enterprise does not support education,
4. Low education offers,
5. Low quality of education,
6. One-off, non-systemic,
7. Unwilling access of a trainer,
8. Fear.

2. Materials and Methods

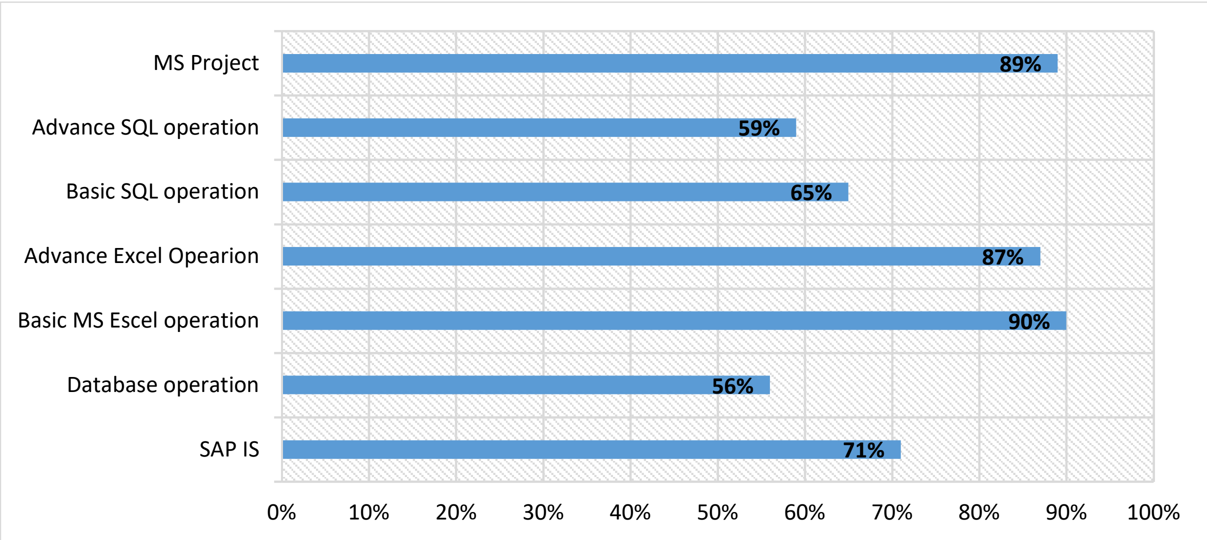
In 2018 the Department of Informatics, Slovak University of Agriculture in Nitra, Faculty of Economics and Management carried out a research on manager training in ICT skills at Agriresort enterprises. Department of Informatics has been dealing with ICT issues in agro-resort businesses for a long especially in SMEs. Data collection was processed in the form of a questionnaire in 2018. The sample of respondents consists of managers of eight selected agribusiness organizations of Southern Slovakia in the total number of 67. Of the total number of respondents, 66% were men and 34% were women. The questionnaire was made available to a company employee on a web site. Questionnaires were distributed electronically to employees of the company in order to create feedback and to gather respondents' views on the forms of education that the company provides for their personal development. We also tried to save time by means of a questionnaire that was not required to be written but was available in electronic form. The questionnaire uses two types of questions. The first type is a closed-ended questions with a four-point scale to measure the degree of satisfaction with a particular area of the education system. The second type is semi closed-ended questions four-point that reveal the gaps in educational programs through the opinions of the respondents. We also added an open-answer option to some questions in order not to limit creativity responses. When creating a barrier list, we learned from several literary sources of domestic and foreign authors - Jones et al. (2003), Neeley (2013) and Šimek et al. (2008). The basic and also the starting point was the analysis of available resources dealing with this issue, especially research conducted abroad. Several statistical methods have been used for the statistical evaluation. Verification of dependencies between the trait was carried out by use of chi-square test ($\chi 2$), respectively ($\chi 2$) - square contingency. The questionnaire survey was evaluated with statistical methods for the detection of relevance and relations of the data collected to confirm or refute the hypothesis of statistical indicators. The hypotheses for this article: We assume that with a growing level of managerial work, managers achieve a higher level of ICT skills and the interest in ICT education is partly dependent on a manager with more experience.

3. Results and Discussion

Using the IT technology helps getting quality and timely information for the success of both large and small organizations. Obtaining knowledge in the field of information and communication technologies has become a necessary condition for the success of managers in all areas of economic activity. Education is a demanding and lengthy process that lasts certain time and the personal attitudes of the trainees. These factors cannot be circumvented or omitted. Therefore, it is important to highlight the value of education and possible future benefits for the person concerned. Just a little of ICT training is outside the routine office space. This involves self-learning or knowledge transfer or action learning. The effectiveness of these methods is mainly time saving, but the company should consider the amount of external training where employees would come into contact with other managers from other companies and bring new ideas, suggestions and insights into society, find out how similar situations are addressed in other companies. The fact that foreign languages is an indispensable part of the everyday work of each employee. However, it is not clear why it is not done more or more systematically in using some of the new educational methods. Improving the presentation, argumentative knowledge in foreign language communication can be a valuable asset. All respondents agreed on the fact that education and staff development really affect the competitiveness of society. Almost 91% of surveyed managers consider development to be a key factor. The remaining 9%

of managers are of the opinion that education and development are more likely to affect competitiveness. Up to 80% of surveyed managers are dissatisfied with the education and development opportunities provided by the employer in their company. Many of managers are rather dissatisfied. Rather satisfied is only 16% of managers. Absolutely dissatisfied with the learning opportunities provided is 5%. The most common goal for managers in the field of education that is 55% is willingness to acquire new knowledge and skills. Ability to adopt new work processes is 25% of the managers asked. The same number is to overcome difficult obstacles. Only 7% of managers are satisfied with career growth opportunities and talent development in the organization. Enough support from the organization has 57% and insufficient 43% of managers. The manager lacks a number of areas of day-to-day activities, which the employer has no ambition to deal with. This may then be seen in a higher error rate when performing work tasks or a longer time frame within which managers are required to complete their work. In finding out what software product trainings the agribusiness managers are most interested in, we found the following results Figure 1.

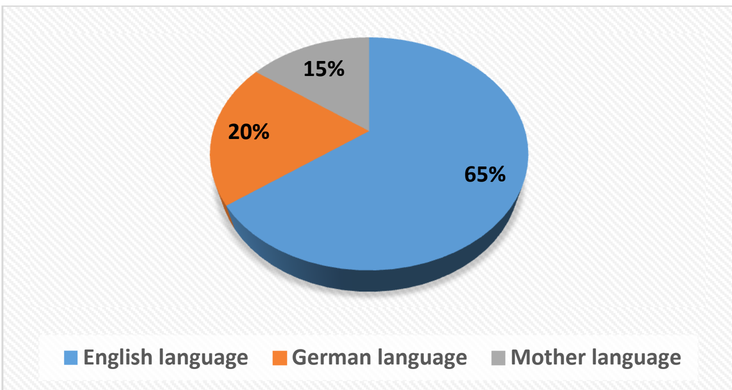
Figure 1. Interest of software product training



Source: own research and processing

In the question of what language should be trained for each software product, we have obtained the following results, which are documented in Figure 2.

Figure 2. Interest of training language



Source: own research and processing

Most data were normally divided by $p > 0.05$. Statistical significance was tested using a parametric T-test. The statistically significant influence of gender was confirmed in the disability barrier, the non-systematic $p = 0.026$. The statistical significance was confirmed in the barrier of lack of quality education $p = 0.015$. After analyzing the significance of individual barriers according to the age group, we tested the statistical significance of the influence of age groups on individual barriers, at the level of significance $\alpha = 0.05$. Most data matched the normal data distribution condition $p > 0.05$. We then used the Anova method to test the normally distributed data. The statistically significant impact of the age group was confirmed by the lack of quality education $p = 0.0310$ and the lack of funding on the company side $p = 0.026$. The impact of the age group on perceptions was tested by a Kruskal-Wallis nonparametric test. The hypothesis that we assume that with a growing level of managerial level, managers achieve a higher level of ICT skills and the use of ICT technology, and the interest in ICT education is partly dependent on a manager with more experience has been confirmed. Managers declared interest in ICT education in all experience categories. As a reason they said they needed to be constantly educated in ICT and their main interest were about advanced MS Excel and information systems - business modules. The management often does not feel the need to further educate their managers in ICT because they feel that the knowledge gained would not be used in their work and the company's investment in their education would not return. Up to 84% of respondents educate themselves in their free time. As a result, managers who do not have the opportunity to develop in their work are in fact interested in further development. For the reasons outlined above, however, this education and training goes beyond working hours. As a result of the previous question, up to 90% of managers said that education was done in the form of self education.

Petersen et al. (2005) states in its research report entitled "Skills and training in ICT and e-business in Europe - Towards a comprehensive European reference framework":

In the area of e-skills, which industry needs in the field of ICT, the skills and professionals have increased and changed rapidly in recent years, both quantitative and qualitative. The data and studies of the ICT sector and of ICT users, in particular the automotive, banking and finance and agriculture sectors, indicate that the quantitative needs of ICT professionals are highly dependent on the economic situation as a whole. Author in his research report also suggests that it is highly desirable that prospective managers have sufficient digital literacy to cope with difficult and complex tasks that no comprehensive use of ICT cannot be effectively implemented.

4. Conclusion

The issue of development of managers in the field of ICT education is a very wide area in human resources management, while the work and organization psychology has its place in this area as well. Businesses should employ professionals who can help create and design an effective training and development program for managers to improve development efficiency, and the development program delivers results both on the employer and the educated individual. Lecturers should represent and become top management partners, as well as help to transform their development requirements and goals into a concrete form in real-world proposals towards specific employees. In this way, it is possible to set appropriate criteria for achieving goals. It is important to emphasize the timeliness and necessity to pay attention to the issues of manager development in organizations from the perspective of both individuals - employees working in the company as well as the organization itself. In particular, the benefit to individuals is the fact that, as a result of training ICT training programs, employees can develop their knowledge and competences that they can use within their private life as well as gain the chance to be promoted and work on interesting and challenging projects or tasks. From an individual perspective, development is of great importance for career development opportunities and to excel in the labor market among competitors of other candidates for a similar job. It is important for organizations to invest in learning and developing employees in terms of competitiveness, the need to work with qualified professionals, to make the company prosper and a valuable in the market. Among other things, today's global company places high demands on people in the field of qualifications and it is necessary for employees to be able to adapt flexibly to the changes brought about by the changing business environment in the market. That is why we consider the topic in the field of ICT managers' knowledge development to be very broad and there is a great deal of space for further research work to explore other aspects of development.

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ECONOMIC RESULTS OF SOCIAL FARMS IN THE CZECH REPUBLIC

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Annotation: Although still at the beginning of its development in the Czech Republic, social farming has considerable potential for further development and providing benefits for groups of people disadvantaged in the labour market. This paper offers the first comprehensive financial analysis of social farms in the Czech Republic between 2013 and 2017. At the same time, the results of the social farm analysis were compared with other entities operating in farming which are structurally the most similar, i.e. incorporated farms of up to 50 ha. Based on the analysis results, we can state that social farms in the Czech Republic are in a stable position with an improving trend shown over the period under review. The most significant problem of social farms was the low efficiency of selling their own products, since such sales represent a primary source of income. One of the positive findings was a slight surplus management of the subjects under research. Subsidy support from the European Union, which has contributed to the extension of the services provided, was identified as key to the existence as well as further development of social farms in the Czech Republic.

Key words: social farming, green care, social economy, social enterprise, rural development

JEL classification: J43, L33, Q01

1. Introduction

In the context of the social economy, social farming in the Czech Republic is an innovative approach, involving a small number of social farms that contribute to rural development in various forms, for example, social service provision, reduction of unemployment, educational activities, and providing therapies or regional products (Tula et al., 2017).

Multiple terms are used simultaneously for this concept – social farming, green care, care farming for health, or green therapies. We might proceed from the definition of the European Economic and Social Committee (2013), which defined the objectives of social farming: "the goal of social farms is to provide social services when using agricultural resources". However, the definition of a social farm has been inconsistent, and can be considered a possible reason why no analysis of these entities from an economic point of view has yet been carried out. The importance of the social economy in the context of today's society is increasing, not only because of efforts to meet the demand for socially responsible products, but also due to the growing global trend towards sustainable development (Hudcova et al., 2018). Social farming began to develop in the 1960s in Western Europe, where on a global scale it today enjoys the most dominant position (Fonte and Cucco, 2017).

In the Czech Republic, there is only general legal regulation (e.g. in the form of corporations under Act No. 89/2013 Coll. or commercial corporations under Act No. 90/2012 Coll.) allowing the establishment of a farm in a legal form typical for the commercial as well as non-profit sector. The founders of such farms may decide that it will be social based on the subject of its activity. A coherent legal framework at the European Union level, which would focus on social farms in more detail, is also absent (Bonfiglio et al., 2017). Due to the general nature of the legal regulation, social farms in the Czech Republic have a variety of legal personalities. By 2017, social farms had seven different types of legal personality, the most used form being the association.

The topic of social farms in the Czech Republic and their financial position has not yet been comprehensively analysed. Elsewhere abroad, such as in Austria or Italy, the situation is different (Lanfranchi et al., 2015). On the other hand, financial analyses of agricultural companies with conventional production are commonplace (Kołoszko-Chomentowska, 2014). The present paper aims to contribute to an initial analysis of social farms from an economic point of view. The paper presents a comprehensive view of the financial position of social farms through financial statements and financial indicators, which are subsequently processed in accordance with the methods of financial analysis. At the same time, the situation with social farms is compared to their closest agricultural counterparts, i.e. farms with an agricultural land area of up to 50 ha.

2. Materials and Methods

For the purposes of this research, an entity systematically operating primarily in the area defined as social farming according to the European Economic and Social Committee (2013) is considered as a social farm. To define a social farm, the subject of the entity's activities as published in the Commercial Register administered by the Ministry of Justice (2019) was used as the criterion. In order to fulfil the set criterion, the entity had to meet both the following conditions: performance of farming activities and provision of social services. Since the definition of the subject of activity in the Commercial Register is based on the discretion of the given entity, the choice of social farming as the primary systematic activity is entirely in the entity's own competency. In this way, neutrality in the evaluation of primary systematic activity is achieved.

To initially identify social farms, the Czech portal of the Association of Czech Social Farming (2019) was used. The association records social farms based on voluntary registration, according to the entity's discretion. For this reason there are also registered entities that carry out activities related to social farming, but whose main activity is different. Such entities cannot be classified as social farms, since their activities in the area of social farming represent only a marginal part of their overall activities. Therefore, data from these entities are not included in the financial analysis, since to do so would lead to distortion of the data on the financial position of social farms.

The financial analysis of social farms is based on the absolute indicators included primarily in the horizontal analysis of the balance sheet and the profit and loss statement in the form of year-on-year absolute change. Data on social farm management are publicly available in the Commercial Register in the Collection of Documents (Ministry of Justice, 2019). The Balance Sheet and the Profit and Loss Statement are classified according to the breakdown by type, based on the applicable Decree 500/2002 Coll., as amended, in relation to Act 563/1993 Coll. (Accounting Act). Ratios are used for a vertical cost benefit analysis, as well as for assessing efficiency, particularly through profitability, liquidity, indebtedness and turnover time (Stekla and Gryčová, 2015). To assess the financial position of social farms and small farms, the bankruptcy model index IN05 was included in the analysis.

As a part of the research, a comparative financial analysis was carried out with data from small farms. In this research, a legal entity operating an agricultural area of up to 50 ha is referred to as a small farm. This comparative analysis was carried out owing to the fact that the set of social farms is quite heterogeneous in terms of legal personality, and results would not be representative. Thus, a comparison of social farms with small farms provides insight into the financial performance of both groups as a whole, representing a specific part of farming entities which are relatively close to each other from the economic perspective (Dessein et al., 2013). Data on this second group of entities was obtained from the Farming Accounting Data Network (2019).

Based on the established methodology, 24 social farms were registered in the Czech Republic by 2017. In individual years, the set of social farms was always made up of the current number of entities, whereas 10 subjects implementing social farming only as an additional activity were not included.

Table 1. Trend in Number of Social Farms and Small Farms

Number of entities	**2013**	**2014**	**2015**	**2016**	**2017**
Social farm	17	19	20	21	24
Small farm	27	27	34	30	27
NNO (marginal activity within social farming)	9	10	10	10	10

Source: own analysis, based on data of Social Farms and FADN Database, 2019

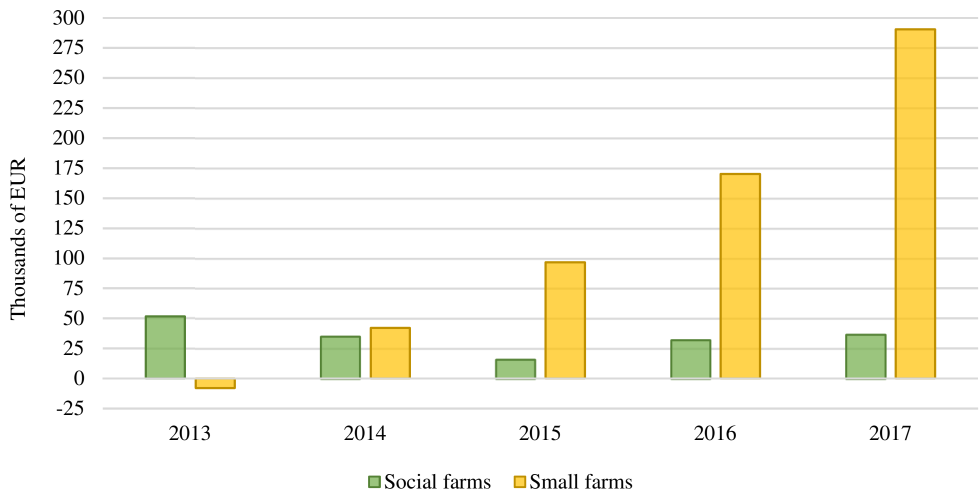
All presented data represent individually calculated average values per social farm/small farm and are always expressed in EUR. Calculating individual values as averages means that just a simple sum cannot be used to obtain results. The resulting values show the average management of one social farm and one small farm in the Czech Republic between 2013 and 2017.

Finally, the data on subsidy support received by social farms, which are registered in the Central Register of Budget Subsidies Information System (2019), were analysed. The development of subsidy support was analysed based on the date of registration of the social farm's subject of activity. One limiting aspect of the Information System is the fact that it only contains data since 1999.

3. Results and Discussion

The primary insight into the financial position of social farms in the form of the achieved economic result is provided in Figure 1. This shows a slightly surplus management which appears to be quite stable. On the other hand, the economic result of small farms oscillates. Compared to social farms, small farms can obviously achieve significantly higher profits, but they are likely to be more prone to potential losses. For this reason, social farm management appears to be more limited, but with a higher degree of stability. For the monitored periods, the average profit per social farm and small farm was EUR 34.4 thousand and EUR 118.3 thousand, respectively. It is interesting that at least 70% of the social farms in the Czech Republic earned a certain amount of profit each year.

Figure 1. Profit or Loss Development (EBIT)



Source: own analysis, based on data of Social Farms and FADN Database, 2019

Assessment of social farms was carried out using the IN05 bankruptcy model, showing financial health and potential risks. Again, the results show that social farms had a more stable financial position: in 2013 and 2017 they had a value exceeding even 1.6, meaning that such farm had a 92% probability of not going bankrupt, and had a 95% probability of generating some value according to the IN05 benchmark criteria. In other years, the results always ranged between 0.9 and 1.6, indicating a mean interval, at which the farm had a 50% probability of not going bankrupt and a 70% probability of generating some value. In the case of small farms, it shows that the IN05 was improving year on year and was even higher than for social farms in 2016 and 2017. However, in 2013, when the average small farm was operating at a loss, the value of IN05 was only 0.79. Such result highlights a high risk of bankruptcy for a farm, namely 97%.

Table 2. Bankruptcy indicator

IN05	2013	2014	2015	2016	2017
Social farm	1.67	1.53	1.53	1.48	1.95
Small farm	0.79	1.01	1.24	1.55	2.60

Source: own analysis, based on data of Social Farms and FADN Database, 2019

Financial Analysis of the Balance Sheet

Table 3 shows that social farms have a large amount of fixed assets, particularly in the form of buildings, land, and adult animals. The state of these assets is related to the implementation of social services in which adult animals (e.g. horses) are often used not primarily for being processed and sold, but for providing services such as therapies (Zugravu and Soare, 2013). For social farms, land and buildings are an indispensable component of their assets, representing the basis for the provision of social services to clients in the form of therapy, counselling, or education. Unlike small farms, social farms have a lower value of tangible moveable assets and their sets, which can be attributed to the fact that social farms focus their production, especially in the case of plant production, on crop farming with high portion of manual work and do not use as much machinery and equipment as small farms (see Table 3).

In the case of inventories, i.e. current assets, the most significant item of social farms includes products and unfinished and semi-finished products. This suggests that social farms have large inventories of unsold products in their stock by the end of the year, and are, therefore, trying to reduce material inventories, unless they sell the stocked products. The inventories of small farms have the opposite structure: they have large inventories of material and young animals by the end of the year that are essential for further production. The low level of product inventories at the end of the year in the case of small farms suggests that they are better at selling their products during the year, which is one of the reasons for the higher value of receivables. This is evidenced by the comparison of turnover time for inventories and receivables in Table 4, where small farms achieve a better result, i.e. a shorter turnover time. Social farms have a higher value of adult animals than small farms, the situation with young animals is reversed.

In the case of liabilities and, in particular, registered capital, the values of both farm groups are similar. However, the level of bank loans increased considerably in 2014 and 2015 for small farms compared to the trend in social farms, where values highly decreased in 2016. On the contrary, there was a significant decline in 2017.

Table 3. Horizontal Balance Sheet Analysis for Social farms and Small farms (in thousands EUR)

Item	**Social farms**					**Small farms**				
	2013	**2014**	**2015**	**2016**	**2017**	**2013**	**2014**	**2015**	**2016**	**2017**
Assets										
B. Fixed assets										
B.II.1.1. Land	121	-35	-6	-3	+20	63	-7	+16	+22	+18
B.II.1.2. Buildings	1 311	-300	-124	-4	+414	843	-412	+598	+394	-28
B.II.2 Tangible movable assets and their sets	194	-54	-23	+2	+66	346	-56	+162	+56	-59
B.II.4.2. Adult animals and their groups	123	-55	-4	+27	-40	23	-9	+2	+14	-2
C. Current assets										
C.I. Inventories	418	-59	+76	-124	-173	499	-69	+47	+81	+45
C.I.1. Material	43	-12	-4	+11	-17	56	-20	+23	+6	+5
C.I.2. Unfinished and semi-finished products	116	-22	+33	-56	-51	23	+14	+9	+1	+39
C.I.3.1. Products	133	+22	+5	-43	-54	10	+16	-5	+3	+6
C.I.3.2. Goods	22	-9	+2	+7	-14	7	+12	-4	-13	+1
C.I.4. Young and other animals and their groups	105	-38	+39	-43	-32	404	-91	+23	+84	+5
C.II.2.1. Trade receivables	229	-33	-62	-6	+88	419	-133	+152	+143	-18
C.IV. Funds	205	-52	-37	+17	+70	123	-34	+130	+25	+330
C.IV.1. Petty cash	9	-2	-3	+1	-3	3	+3	-2	+1	+3
C.IV.2. Funds held on account	197	-50	-35	+16	+81	120	-37	+132	+25	+327
Liabilities										
A. Own resources										
A.I. Registered capital	1 396	-349	-129	+224	+155	777	-152	+210	+261	-5
B. Foreign sources										
B.III. Foreign sources	264	-51	-45	+22	-1	652	-207	+156	+62	+166
B.IV. Bank loans and subsidies	68	-6	-49	+4	+38	89	+58	+86	-3	-122

Source: own analysis, based on data of social farms and FADN Database, 2019

Financial Analysis of the Profit and Loss Statement

Social farms focus primarily on their own production and not on the sale of goods. Revenue from the sale of products and services accounted for more than 90% of proceeds for social farms in 2013–2017. However, after 2014, revenue from the sale of goods increased at social farms. The reason for this change was probably the year 2014, when there was an absolute decline in revenue for products and services, which might have driven social farms to find additional income sources and diversify their revenue.

Figure 2. Vertical Analysis of Social farm Expenses

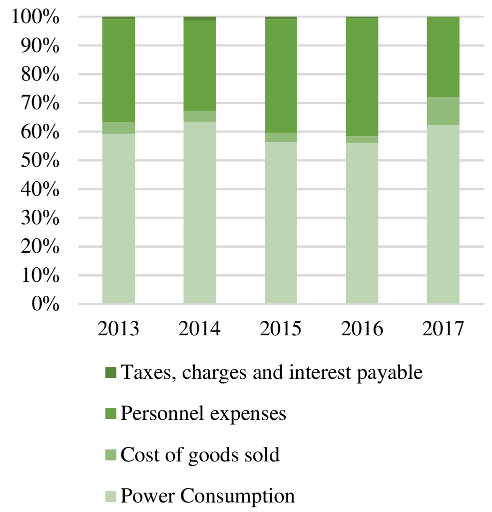
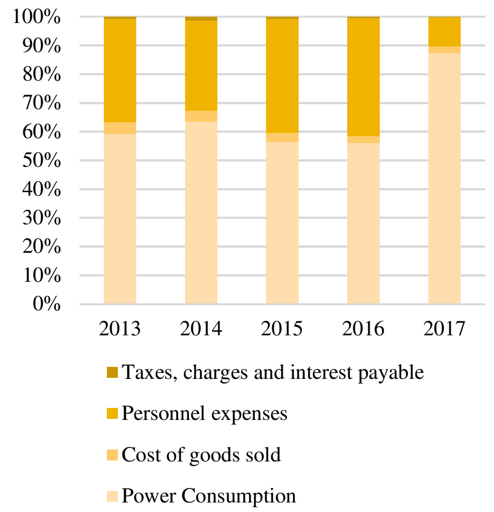


Figure 3. Vertical Analysis of Small farm Expenses



Source: own analysis, based on data of Social Farms and FADN Database, 2019

In terms of the cost structure shown in Figure 2 and 3, the most significant cost item is represented by power consumption, being more than 50% of costs and personnel costs, which are above 30%. In terms of time, the cost structure can be considered as relatively constant.

The proceeds of social farms increased on average year by year, except for 2014, when there was a decline in revenue (despite which, social farms were still able to achieve a balanced budget that year). Nevertheless, from 2013 to 2017, revenue from the sale of goods increased dramatically from the original value of EUR 9 thousand to EUR 42 thousand, which is an increase of more than 400 %. However, sales of own products and services remain the key source of proceeds. For small farms, the situation in the revenue structure is similar: the revenue from the sale of goods being a supplementary component of total revenue. In terms of total sales volume, small farms achieve fourfold that achieved by social farms. The potential for increasing the revenue of social farms lies in improving sales efficiency.

In terms of the costs of goods sold, it was shown that social farms have managed to reach a positive balance since 2014, when sales for goods already exceed costs. Labour costs represent an important cost for social farms. Over the period monitored, a social farm expended on average EUR 276.2 thousand on labour costs. Certainly, these costs depend strongly on the number of clients of social farms. Another important aspect includes the fact that not only farm workers, but also employees responsible for social services provision are working for social farms. (Di Iacovo, 2009). However, the area of employment, i.e. payment of labour costs, is precisely the area of social farms that receives the most support from subsidies.

Financial Analysis of Ratios

Table 4. Social and Small farms Ratios

Indicator	Social Farms					Small Farms				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Return on										
Assets (ROA)	2.19 %	1.95 %	1.27 %	1.89 %	1.63 %	-0.31 %	2.61 %	3.44 %	4.59 %	6.50 %
Equity (ROE)	2.50 %	2.42 %	1.43 %	2.15 %	3,03 %	-0.52 %	5.56 %	5.59 %	7.15 %	10.17 %
Sales (ROS)	7.09 %	7.14 %	4.29 %	5.43 %	5.93 %	-0.25 %	2.64 %	3.20 %	4.56 %	6.53 %
Costs (ROC)	14.41 %	7.68 %	4.47 %	5.62 %	6,30 %	-0.23 %	2.90 %	3.52 %	5.01 %	6.36 %
Liquidity										
Current (CR)	2.54 %	2.79 %	2.37 %	2.08 %	2,28 %	1.53 %	1.60 %	1.79 %	1.75 %	1.74 %
Quick (QAR)	1.77 %	2.08 %	1.38 %	1.05 %	1.77 %	0.86 %	0.80 %	1.11 %	1.13 %	1.22 %
Immediate liquidity (CPR)	0.69 %	0.66 %	0.63 %	0.62 %	0.91 %	0.16 %	0.16 %	0.35 %	0.01 %	0.49 %
Turnover period for										
Assets	35 months	45 months	41 months	35 months	44 months	10 months	12 months	12 months	12 months	13 months
Receivables	103 days	136 days	105 days	78 days	138 days	56 days	69 days	59 days	71 days	67 days
Liabilities	119 days	147 days	133 days	119 days	83 days	86 days	115 days	81 days	86 days	95 days
Inventories	92 days	103 days	132 days	122 days	81 days	58 days	92 days	55 days	53 days	49 days
State of Indebtedness										
Total	12.42 %	12.83 %	11.07 %	12.01 %	14.79 %	38.74 %	50.80 %	37.15 %	34.14 %	34.67 %
Debt ratio	21.01 %	23.98 %	20.08 %	16.48 %	17.37 %	125.95 %	108.34 %	60.28 %	53.14 %	71.00 %
Self-financing factor	59.10 %	53.50 %	59.07 %	68.38 %	85.17 %	59.52 %	46.89 %	61.63 %	64.24 %	63.94 %

Source: own analysis, based on data of social farms and FADN Database, 2019

Since profit is not a major goal of social farms, it is understandable that the profitability indicator is not as high as in the case of small farms, in particular in the case of return on assets and equity. Significant improvement can be observed especially for return on costs, with social farms being able to generate revenue at much lower costs than in 2013.

Assessment of the resulting liquidity values is similarly positive. The data in Table 4 show that the liquidity level of social farms is increasing year on year and reaches the values in recommended intervals. Most notably, this was reflected in the current liquidity, with values exceeding the recommended upper interval limit of 1.5% and 2.5%, respectively, in 2013 and 2014. On the other hand, the available liquidity was positively constant during the entire monitored period. The reason for the liquidity level of social farms improving was, in particular, a significant drop in liabilities.

A much worse situation prevailed for social farms compared to small farms during the turnover period, in all monitored indicators. The most significant difference can be observed for the turnover period for inventories and receivables.

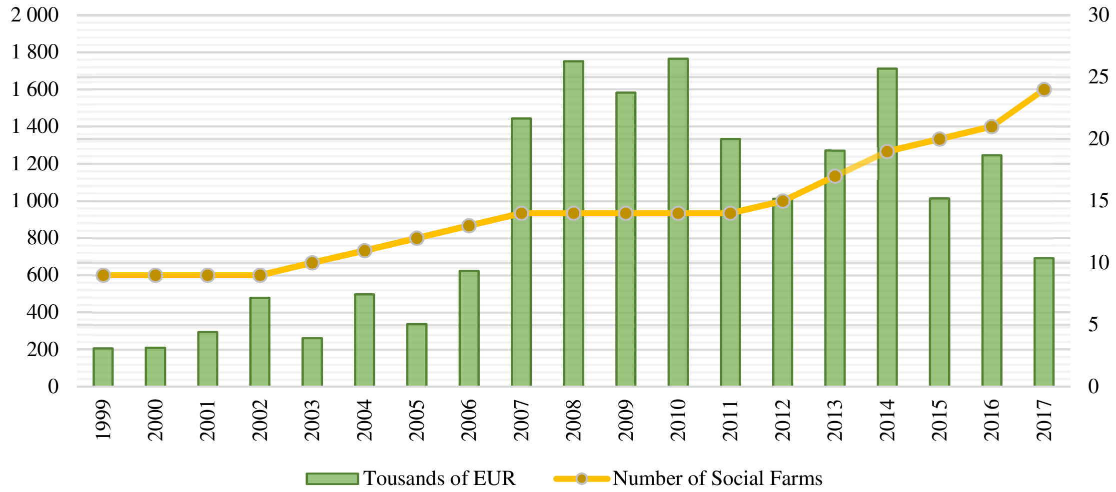
In terms of indebtedness level, social farms can be assessed very positively. All indicators achieve positive values with a slightly positive trend. For the debt ratio, there is a significant difference in tens of percent between social farms and small farms; the latter, however, significantly reduced their indebtedness in 2015.

Subsidy Support for Social Farms

The Czech Republic's accession to the European Union and, hence, the programming period 2007–2013 was clearly the turning point for social farms. This is evidenced by the increase in subsidy support between 2006 and 2007, with an increase by more than 200%. Since 2007, the annual amount of subsidy support has not fallen below EUR 1 million. However, the year 2014 was a record year in terms of subsidies paid: social farms were supported by more than EUR 1.765 million. From 1999 to 2017, EUR 932,79 thousand on average were granted annually per social farm in the form of subsidy support.

In addition, Figure 4 shows that there were two gradual increases in the number of social farms between 2002 and 2007 and then between 2011 and 2016. The last three years and especially 2017 show that social farms can also operate with a lower subsidy amount and be stable and profitable. The key indicator now will be the development of the number of social farms.

Figure 4. Development of Subsidy Support and Number of Social Farms



Source: own analysis, The Central Register of Subsidies, 2019

The largest portion of subsidy support (45%) in 1999-2017 was granted by the Ministry of Labour and Social Affairs. These financial resources were intended mainly to support employment and social services. Other, very important departments supporting social farms in the Czech Republic include the Ministry of Education, Youth and Sports, the Ministry of Environment, and the Ministry of Agriculture. In total 11 institutions provide some form of subsidy to social farms, showing the wide range of focus that social farms have. At the same time, it can be said that the public sector offers subsidy support for almost all the activities implemented by social farms.

4. Conclusion

This financial analysis of social farms in the Czech Republic has shown the stable management of these farms, even though they exist in a limited number and their operation has a relatively short history. However, if the trend of results from 2013–2017 continues, the financial position of social farms can be assumed to improve. But the question remains whether this good financial position will deprive potential founders of social farms of due caution with regards to unsustainable funding. The analysis showed that a social farm in the Czech Republic can carry out its activities in the social and farming areas and achieve a balanced budget. Although comparison with small farms showed that social farms have a lower performance, profit is not their goal. The analysis also showed that there are areas with growth potential. The turnover period and sale of products are particularly important examples: these are simultaneously the most important sources of income for social farms. In contrast, in terms of costs, labour costs represent a significant item. However, the employment of people disadvantaged in the labour market is the aim of most social farms, and this results in significant labour costs. The ambiguous definition of a social farm is a persistent problem. Of course, a different definition would lead to results other than those presented in this paper. Nevertheless, the methodology used ensures that all entities in the research defined as social farms carry out farming and social activities as the main subject of their activities. Another persistent problem consists in the publication of reports in the Collection of Documents, where information from the given entities is not uniform in scope. Therefore, any use of other financial and statistical methods is in principle impracticable. In conclusion, social farms exist with substantial public sector support through subsidies, and there is a question of whether they would be able to exist without such subsidy support. Given the aim of social farms is to meet the demand for social services and to create employment opportunities to people disadvantaged in labour market, the public sector should continue to take an interest in supporting the wide range of activities performed. Were subsidy support to decrease, it is possible to predict that social farms would be converted into small farms not providing social services.

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EVALUATION OF MANAGERIAL AND DECISION-MAKING SKILLS OF SMALL-SCALE FARMERS

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Annotation: The majority (60%) of holdings in the agriculture sector of the Czech Republic are classified as small-scale holdings which are mainly in ownership by natural persons - farmers. In such a company, the farmer is usually the only one manager. His/her decision-making and managerial skills determine the economic result of the farm. In most examples, farmers have only basic practical experience in management, without any education in that field. The aim of the pilot study, summarized in the paper, is to evaluate the managerial and decision-making skills of farmers and to compare them with managers employed in larger enterprises. Ten farmers without education or professional practice in management and ten senior managers participated in the experiment. Their skills were tested in the experimental environment of the business simulation game. The analysis is consisting of two parts. In the 1st part, the analysis of the economic results reached in the game is carried out. The 2nd one includes the evaluation of structured interviews by the Atlas.ti© software with the aim to find out whether and how respondents support the decisions. Based on the results, the following main differences are summarized: Farmers have less ability to adapt to new conditions and apply their decision-making skills in a new environment; they prefer current certainty rather than future risk and thus they tend to create stock and keep reserves; they have less competitive behaviour; they are focused on their business and less on market situation and competitors; they are less profit-oriented. Only one common characteristic was found in the behaviour of both groups: the negative personal attitudes to taking a loan.

Key words: Business simulation, Decision-making, Farmer, Management, Small-scale holdings

JEL classification: A12, C91, D03, M11

1. Introduction

According to the economic size classification of business, almost 60% of holdings in the agriculture sector of the Czech Republic are classified as small-scale holdings. 98% of these are natural persons (hereinafter farmer) (CZSO, 2016a). In such a company, the farmers are usually the only ones who work there, alternatively they employ a few workers (CZSO, 2016b). Farmers hold the majority or all working roles in their companies (Havel, Krepl and Verner, 2004). The article is focused on their managerial role. Farm management is the science of decision-making for businesses engaged in the production of agricultural commodities (Edwards and Duffy, 2014). Farmers as managers are closely linked to their business, like any other manager from another industry (FAO, ©2019). The literature often points out that a manager is the person who manages people (Knootz and Weihrich, 1998). But this argument is not always valid for small-scale farmers. A farmer usually represents the roles of owner, manager and worker. The two most important resources (management and work) are concentrated in one person (Havel, Krepl and Verner, 2004). Management is a process consisted of planning, implementation, and control (Giles and Stansfield, 1990). Farmers make decisions about production, resources, budgets, planning or controlling (Edwards and Duffy, 2014). They provide these activities regardless of whether they employ someone. In fact, they are the only managers of their farm. Decision-making is crucial because every decision has an impact on the farm (FAO, ©2019). The manager's decision-making and managerial skills determine the economic result of the business (Thywissen, Pidun and Knyphausen-Aufseß, 2017).

Economics is a necessary, but not sufficient framework for the study of management practice. Many studies set the economic perspective as a theoretical framework of farm management. Attention to define the characteristics of successful farmers was paid on mathematical modelling or statistical analysis. The effect of the farmer was ignored (Gray, Parker and Kemp, 2009). In order to identify the farmers' management processes, it is necessary to put emphasis not only on quantitative surveys but also on qualitative case studies (Howard and MacMillan, 1991). In order to understand, how farmers manage it, it is necessary to understand how they perceive the world in which they operate and the mental models they use (Cary, 1980). Case studies can be a good tool for farm management research (Malcolm, 2000). They provide a better understanding of the complex processes used by managers in decision-making (Mintzberg, 1979). Despite this fact, the number of case studies focused on the farmers' management processes is limited (Gray, Parker and Kemp, 2009). Simulation games can be considered as a modern form of case studies. They serve as a deliberate simplification of reality for a needed purpose (Keys and Wolfe, 1990). Business simulations are the art and science of creating a representation of a process or a system for experimenting and evaluation (Gogg and Mott, 1993). The use of simulations for the given purpose is based on the idea that respondents reflect there their managerial skills and previous experiences. Decision-making is based on experience (Havel, Krepl and Verner, 2004). Constructs, what a one use in a decision are a function of their perception of the current situation, and their experience with similar situations (Murray-Prior and Wright, 1994).

The aim of the pilot study, summarized in the paper, is to evaluate the managerial and decision-making skills of farmers and to compare them with managers employed in larger enterprises (professionals). It has been examined using the experimental simulation environment, which offers to set equal conditions to all. This is a form of benchmark, as a method, where the professionals represent best practice. The biggest benefit of benchmarking is that different values open the question of what is causing the difference. Then the causes should be investigated (Grasseová, 2012). The differences are presumed. In most examples, the farmers have only basic practical experience in managing their business, without any education or professional experience in management (CZSO, 2016c). The comparison of farmers' results with professionals enables us to understand some differences and circumstances of their decision-making and to test how effectively they are able to manage their business.

2. Materials and Methods

2 groups of respondents participated in the research: 10 small-scale farmers without education or professional practice in management and 10 senior managers with an adequate university degree. The business simulation FactOrEasy® was used as the experiment environment. The user runs a virtual enterprise there and makes 5 basic decisions – (1) Material Purchase, (2) Production, (3) Product Sale, (4) new Factory (production capacity expansion) and (5) taking a Loan (Švec et al, 2016). FactOrEasy® has been proved to be a good tool for the analysis of decision-making (Prokop and Švec, 2018). The respondents were instructed about the rules at first, then they played and finally, they answered questions in a structured interview. Their aim in the game was to earn as much score (cash in account) as they will be able. Time for playing was unlimited, but each player had to finish at least one game (without bankrupt before the end of the game). The data analysis is divided into 2 parts. In the 1st part, the analysis of the economic results is carried out. Basic indicators (Profit, Total Assets, Number of Factories, Number of Loans) and ratio indicators (ROA, ROS, Debt Ratio, Market Share, Inventory Turnover in Days) were used for this purpose. The financial ratios serve

to evaluate the economic situation of the company and to compare different companies (Wu, 2010). Calculations were computed from the export of the best game (the highest score) of each player. Then the averages and medians of indicators were computed for both groups. It enables to evaluate the success of their virtual companies and thus the efficiency of the decision-making. The interviews were analysed in the 2nd part by Atlas.ti© software, which enables visualization and integration of text, graphics, audio, and video data. The software is used for qualitative data analysis from large sets (ex. many interviews) and has tools allowing to uncover complex phenomena hidden in data (Atlas.ti, ©2002-2019). Interviews in .avi format were uploaded to Atlas.ti© and transformed into text. The main codes were defined, which allowed the next data processing. The codes represent the game phases (1-5). Then the software searched text and found sub-codes that explain the main codes. Detected sub-codes justify the actions of respondents in certain parts of the simulation. Then concept maps, which offer to visualize complex properties and relations (Konopásek, 1997) among the main codes and sub-codes were created in Atlas.ti©. Maps of individuals were merged into 2 comprehensive maps (farmers and managers) - decision-making schemes, which allowed the extraction of the main points. These points were logically clustered and ordered by priority. Priority was determined by the frequency of points in interviews. This made possible to identify the main factors which the respondents consider important for decision-making.

3. Results and Discussion

Each respondent spent 60-90 minutes playing the game. Managers played 3.8 games and farmers 4.5 on average per person. Farmers more often went bankrupt. Most bankrupts occurred in both groups during the first few games. This usually happens because players must understand the environment and adapt to it. Farmers needed more attempts to adapt their managerial knowledge. The economic indicators summary is in Table 1. There are no high differences among averages (av.) and medians (me.) - no significant influences of outliers. The farmers were able to realize only low profit. Profit is not a single evidence of management efficiency. Total assets include accumulated assets like new factories and stock capacities. That comparison also proves the higher efficiency of managers. They were more courageous in investments in factories (av. 2.45 vs. 2.3). The higher ROA (av. 32%) of managers proves that they used the assets more effectively than the farmers (av. -5%). A combination of ROS and Market Share uncover important evidence of farmers' worse results. Although both groups reached approximately the same success (market share) in selling, the farmers sold the products on the limit of costs. It is reflected in their poor ROS and finally in poor profitability. That could cause their cash deficits. Farmers used loans more often. Thus, they have a higher overall debt ratio. Inventory Turnover in Days shows that farmers held the inventory longer. In consideration that the market share of groups is similar, it means farmers held more stock.

Table 1. Summary of the economic results of managers and farmers

	Managers		**Farmers**	
	Average	**Median**	**Average**	**Median**
Profit	14245.09	10986.00	651.30	2179.00
Total Assets	40319.27	38141.00	29409.10	28294.00
Number of Factories	2.45	2.00	2.30	2.00
ROA	32%	31%	-5%	8%
ROS	13%	11%	-2%	3%
Market Share	29%	25%	27%	28%
Debt Ratio	9%	0%	26%	20%
Number of Loans	0.36	0,00	0.8	1.00
Inventory Turnover in Days	84.10	61.62	121.61	106.23

Source: Own computation

Table 2. shows the managers' (M) and farmers' (F) priorities. The significant differences were found in phases 1-4. During the (1) Purchase, managers were focused on the competition and market situation. They tried to buy the only minimum, necessary for production. Farmers were focused only on their business and they created stock reserves according to the development of prices. It led to problems with storage costs. (2) Managers were focused on stock optimization also in the Production. They tried to use production capacities at the maximum, and they planned the minimization of potential future stocking costs. Although farmers observed the market, they produced the maximum they could from the material, regardless of the market demand. Their strategy was: "What I can't sell now, I store and will use later". (3) Managers, in Sale, kept in mind competition on the market. They tried to set prices to profit maximization, but in some moments, they used aggressive policy and tried to set dumping prices to beat competitors. Farmers stayed focused only on their business with the aim to just cover costs. They tried to make low profit only when the market was favourable. (4) Farmers extended their production capacities less than managers. They explained that they hadn't considered this possibility. Managers thought about it more deeply. They used it according to opportunities on the market, but they kept in mind costs connected with a new factory. They considered risk reductions. (5) The only common behaviour of both groups relates to loans. Respondents tried to avoid loans because of their personal aversion. They took loans mainly in cases of lack of cash for operation or the threat of bankruptcy. Only a minority of players said that they took a loan for investments in factories.

Table 2. Managers' and Farmers' priorities for decision-making

Phase	Group	Priority 1	Priority 2	Priority 3
Material Purchase	M	Competition	Material market situation	Storage costs minimization
	F	Development of prices	Reserves creating	Storage cost problem
Production	M	Stock optimization	Production optimization	Cost planning
	F	Market situation	Maximal production	Reserves creating
Product Sale	M	Competition	Profit maximization	Aggressive selling policy
	F	Cost-covering	Profitability	X
Factory	M	Opportunities on market	Cost reduction	Risk reduction
	F	No consideration	X	X
Loan	M	Personal aversion	Risk reduction	Investments
	F	Personal aversion	Risk reduction	Investments

Source: Own compilation

Based on the results the following main differences in decision-making among the professional managers and small-scale farmers are summarized. Farmers have less ability to adapt to new conditions and apply their decision-making skills in a new environment. Giles and Stansfield (1990) state that farmers are well-informed and well oriented in their field, but they work in relative isolation. Therefore, they probably needed more attempts to adapt their managerial knowledge. But more bankrupts could be also caused by their insufficient managerial skills (Wu, 2010). The competitiveness of small-scale farmers is one of the main problems of agriculture (Hron and Macák, 2013). Results uncover their lower managerial and decision-making skills, which can be one of the causes. Skills gathered only from practice (CZSO, 2016c) may not be sufficient, especially when the management becomes more complex and difficult (Joshi et al., 2003). Attention to their education in the field will be needed, even though it is not currently required (Environmental Science, ©2019). Kilpatrick and Johns (2007) draw attention to the relationship between farmers' management education and its positive impact on farm profitability. The more a farmer is aware of the decision-making processes that affect the economy of the farm, the more sustainable and profitable the business will be (FAO, ©2019). Farmers tend to create stock and keep reserves for "worse times". They prefer current certainty rather than future risk. The cause can be found in unpredictability and risky specifics of agriculture - price developments, weather and natural changes, animal and plant diseases or marketing/sales difficulties (Boháčiková et al., 2017). Profits are associated with risks. Farmers generally do not take a risk unless there is a chance to make money (Kahan, 2013). Farmers have a risk aversion and are slow to accept unproven ideas (Guerin and Guerin, 1994). Risk aversion includes a debt aversion. Farmers have negative personal attitudes to taking a loan like other managers. This finding is interesting when the using of loans by farmers is growing. And in fact, that the EU, governments or banks offer guarantees and rate advantages to them (Košovská and Váryová, 2017). Farmers have less competitive behaviour. They are focused on their business and less on market situation and competitors. They operated virtual businesses on the level of costs, without the aim to make a higher profit. These findings are close to Casebow (1981) who claims that small-scale farmers tend to be more concerned with the independent lifestyle that farming afforded than economic outputs. Although Robinson (1983) found that the highest rated objective among farmers in general, is to make a sufficient profit. But managerial skills must lead the farm to competitiveness because the field of farm management is rapidly developing (Havel, Krepl and Verner, 2004).

4. Conclusion

The managerial and decision-making skills of small-scale farmers were tested in the pilot research. Their skills were benchmarked with professional managers. The business simulation game was used for this purpose. Based on the results the following main differences are summarized: farmers has less ability to adapt to new conditions and apply their decision-making skills in a new environment; they prefer current certainty rather than future risk and thus they tend to create stock and keep reserves; they have less competitive behaviour; they are focused on their business and less on market situation and competitors; they are less profit-oriented. Only one common characteristic was found in the behaviour of both groups: the negative personal attitudes to taking a loan. The results are limited by the small research sample of the pilot study and the methodology used. A verification of a larger research sample will be necessary, as well as another validation of the findings, either in another simulation environment, which reflects more the farmers' environment, or in real conditions.

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PRICE TRANSMISSION ANALYSES: THE CASE OF SLOVAK REPUBLIC MILK FOOD VERTICAL

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Annotation: According to the history of Slovak dairy sector and its problems mainly in its price development, there is a persistent problem in added value distribution among the milk food vertical in Slovakia. This fact affects farms and processors revenues as well as their profitability. The Added value distribution is affected mainly by price transmission asymmetry among the milk food vertical in the Slovak Republic. The aim of the study is to analyse the relationship between prices on individual milk food vertical levels. In the first part of the results, the data descriptive characteristics are presented to enclose the market situation. Time series are tested for the unit root presence as the first condition for further analyses. The time series relationship analyses, the co-integration, and vector error correction model are applied. Our research suggests changes in added value distribution and long-run relationship between individual levels of milk food vertical in the Slovak Republic. Price transmission analyse indicates asymmetry in price distribution among the vertical.

Keywords: milk, milk price, milk food vertical, price transmission

JEL classification: C01, C02, C10

1. Introduction

The agricultural sector in Slovak Republic especially dairy primary production and industry get over many difficulties during the last years. Agricultural commodity prices have undergone strong fluctuations as a consequence of economic, political and financial issues that have reshaped the global economic equilibrium (Ricci et al., 2019). The major problem in Slovak agriculture were great disruptions in agricultural products prices, milk not excluding and therefore decreasing dairy cows` number. As mentioned by Vargová and Rajčániová (2018) margins reflect the particular part of the consumer price that covers the costs and profits of the processing industry and trade. The processors' margin showed decreasing trends. The percentage share of total marketing margin from consumer milk price, for example, has grown.

Processing industry suffered by lack of investments due to low production profitability and retail gross margins were increasing. All the difficulties came from inequitable value-added distribution among the milk food vertical.

The milk food supply chain is composed of three main sectors. Agriculture, processing and retail sector. According to Lajdová and Bielik (2013) price transmission in agricultural markets has been a subject of numerous studies and asymmetry in price transmission has been detected in most agricultural products markets. The extent of price transmission through the production, processing, and retail markets, as well as the relation between farm prices (i.e. primary), producer (i.e. processor) prices, and consumer (i.e. retail) food prices, are matters of considerable interest (Rezitis and Tsionas, 2019). As a consequence, research has given particular attention to the question of price adjustments asymmetry (Bakucs, et al. 2014;

Lloyd, 2017), i.e., the different size and timing with which increases and decreases of prices are transmitted (upstream or downstream) along the food chains (Cavicchioli, 2018).

The main objective of the paper is to investigate possible asymmetric price transmission in milk food vertical in the Slovak Republic.

2. Materials and Methods

Paper analyses price transmission elasticity and long-run relationship in milk price time series across the supply chain. The data comes from Data Cube, Eurostat database and annual reports of The Research institute of agricultural and food economics (RIAFE). January 2007 to December 2018 is the observed period and data are logarithm. Prices are expressed in EUR per litre of milk. Possible time series homoscedasticity and autocorrelation is not proven. Gretl software is used for all conducted analyses.

For the stationarity unit root test of original data and its first differences, The Augmented Dickey-Fuller Test (ADF) is used. Optimal lag order is estimated using VAR modelling. Akaike, Schwarz Bayesian and Hannah-Quinn criterion are considered.

$$\Delta Y_t = \gamma + \delta_t + (\alpha - 1)Y_{t-1} + \sum_{j=1}^{k} \alpha_j \, \Delta Y_{t-j} + \varepsilon_t \tag{1}$$

Where Y_t is the tested time series; γ is a constant; δ is an estimated coefficient; t is deterministic trend; $(\alpha - 1)$ unit root (H_0:$(\alpha - 1) = 1$)); Y_{t-1} is the Y_t value shifted by one period; Y_{t-j} is the shifted Y_t value; ε_t is the random error (Baffes, 1991).

For the co-integration analyse the Johansens` vector autoregressive (VAR) method is used.

$$Y_t = \gamma + \prod\nolimits_1 Y_{t-1} + \prod\nolimits_2 Y_{t-2} + \prod\nolimits_p Y_{t-p} + v_t \tag{2}$$

Where γ – is *m x 1* vector level constants; $\prod_p -$ *m x m* unknown parameters matrix of endogenous time shifted variables; v_t – *m x 1* random components vector; *m* – equations number.

Trace test:

$$J_{trace} = -T \sum_{i=r+1}^{k} \log(1 - \lambda_i) \tag{3}$$

Where – *T* –is number of observations; λ_i – value of *i*-th maximal canonical correlation.

Maximum Eigenvalue test:

$$J_{max} = -T \ln(1 - \lambda_{r+1}) \tag{4}$$

Where - *T* – number of observations; λ_i – value of *r+1* maximal canonical correlation (Johansen and Juselius, 1990).

Estimation of price transmission in short-run and long-run relationship is evaluated using vector error correction model (VECM).

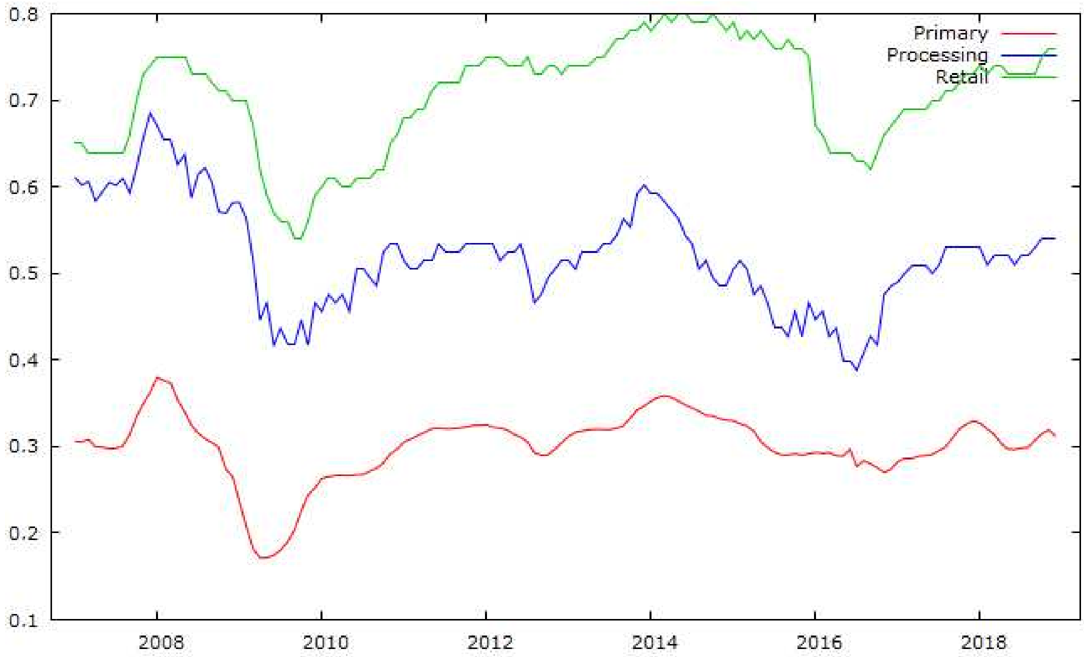
$$\Delta y_t = \mu + \alpha z_{t-1} + \sum_{i=1}^{q} \Gamma_i \, \Delta y_{t-1} + \varepsilon_t \tag{5}$$

Where z_{t-1}= β′ y_{t-1} refers to the (r x 1) lagged equilibrium errors vector from r ≤ n – 1 unique co-integrating relationship between prices in the system; β contains the co-integrating vectors representing long-run equilibrium parameters characterizing long-run equilibrium relationship between prices; the μ, α, and 's Γ_i are unknown parameters to be estimated, q is the lag order for the dynamics; and the VEC errors ε_t are serially uncorrelated but may be contemporaneously correlated (Myers et al., 2015).

3. Results and Discussion

Price development at separate milk food vertical levels, primary production, processing and retail are presented in chart 1. Price differences, higher or lower price variations, as well as growing gap between processors and retail price are obvious and retail gross margin rises. It is evident that the most varying is the processors' price time series. Price development differs on each milk food vertical level. Primary milk producers' price is the less varying. Processors milk price decreases and retail milk price increases in average.

Figure 1. Various levels milk food vertical price development in € per litre (1/2007 – 12-2018)



Source: RIAFE Annual reports, Data Cube, Eurostat, own processing

The correlation coefficients for primary-processing (0.5375), processing retail (0.4209) and retail-primary (0.7316) are positive, time series are correlated in all pairs. Based on the ADF test we accept H0 hypotheses – the level variables time series, except of primary, does not have unit root and are non-stationary. Contrary all the first differences ADF test reject the H0 hypotheses and accept the alternative hypotheses – time series have unit root and are stationary at 1 % significance level. Results are presented in Table 1. Performed ADF tests are with constant and with constant and trend.

Table 1. ADF test results for milk prices and its first differences (p-value)

	With constant		With constant and trend	
	Level variable	First difference	Level variable	First difference
l_Primary	0.0199	1.271e-005	0.0779	0.0001
l_Processing	0.1235	4.123e-010	0.3849	2.731e-009
l_Retail	0.1332	2.25e-006	0.3053	2.368e-005

Source: RIAFE Annual reports, Data Cube, Eurostat, own processing

Based on the Johansen co-integration test results for each possible pairs (Table 2.), time series relationship can be considered as long-run.

Table 2. Johansen co-integrating test results

Variable	Lmax test		Trace test	
	r=0	r=1	r=0	r=1
Primary - Processing	15.954**	5.8002**	21.754***	5.8002**
Primary – Retail	23.843***	6.0282***	29.872***	6.0282***
Processing - Retail	11.009*	5.6847**	16.694**	5.6847**

Significant at 10%; **Significant at 5%; * Significant at 1%*

Source. RIAFE Annual reports, Data Cube, Eurostat, own processing

The divergence in liquid milk price trends has raised a concern about the efficiency of the milk market price transmission in Slovakia (Weldesenbet, 2013). Testing for asymmetric price transmission and calculating elasticities of price transmission are important areas of research for providing insights into market efficiency issues (Capps and Sherwell, 2007) VECM models are estimated with VAR modelling optimal lags number.

Table 3. Estimated VECM models

Pairs	Co-integration vector β	Adjustment coefficient α	Adjusted R-square	Durbin-Watson coefficient
Primary - Processing	0.1322***	0.1052***	0.5752	2.2238
Primary - Retail	0.4403***	0.2413***	0.6462	2.2508
Processing - Retail	0.7158***	0.0326*	0.1399	2.5721
Processing - Primary	0.3353***	-0.0911***	0.1288	2.4794
Retail - Primary	0.1560***	-0.0945***	0.2387	2.0225
Retail - Processing	0.1237***	-0.0735***	0.2436	2.1277

statistically significant at 10%; * Significant at 1%*

Source. RIAFE Annual reports, Data Cube, Eurostat, own processing

The estimated vector error correction models proved a long-run relationship between all observed pairs. Estimated β co-integration vector of Primary-Processing pair suggests a possible 1% increase in processors` price can lead to a 0.13% increase in primary producers` price on average. The average price adjustment rate is 0.11% per month. In the opposite direction, 1% farm price increase can cause an average increase in processers` price by 0.34%. Potential price disruption in price balance can be restored by average month rate of 0.09%. Possible 1% increase in retail price can cause an average increase in farm price by 0.44%. Price equilibrium can be re-established by the average speed of 0.24% per mount. Contrary, 1% farm price increase can lead to an average increase in retail price by 0.16%. The average monthly price adjustment rate is 0.09%. Processing-Retail pair co-integration vector indicates the potential average increase in processing price by 0.72% in the case of 1% retail price increase. Price adjustment coefficient is significant at the 10% significance level. 1% processors` price increase can lead to an increase in retail price by 0.12% on average. Possible disruption in price equilibrium can be restored by a rate of 0.07% per month. As mentioned by Hupková et al., (2018), the annual price data showed a statistically significant dependence of the milk retail price on the production price.

4. Conclusion

The paper assesses price links between individual milk food vertical levels (farms, processing, and retail) in the Slovak Republic. Price differences, higher or lower price variations and growing gap between processors and retail price are obvious and retail gross margin rises during the last twelve years. Thus, the added value distribution among the milk food vertical is widely discussed between professional public.

Relationship diagnostic between individual milk food vertical levels was conducted using the Johansen co-integration test and vector error correction model. Johansen co-integration test revealed a long-term relationship among milk food vertical. Vector error correction model provided evidence of price transmission asymmetry. Accommodation to possible long-term equilibrium disruptions differs among individual levels of milk food vertical. All the cointegration vectors are positively correlated and inelastic. Despite positive price transmission elasticities, the price transmission in Slovak milk food vertical is due to the relatively long accommodation time asymmetric. An important sign of the market power to be referred to is the existence of price asymmetries, indicating an unbalanced relationship between price increases and decreases for a product in the farm and retail markets. If the price transmission is asymmetric among the specific stages of the supply chain, the price changes will not be affected quickly at the production level through the processing and/or retail level (Rostami, Hosseini and Moghaddasi 2018). Asymmetric price transmission is crucial because it influences welfare negatively (Meyer and Cramon-Taubadel, 2004; Hahn, 1990). The possible reason for price transmission asymmetry is long-term pressure from the retail side as well as increasing retail margin.

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EU28 COUNTRIES` COMPETITIVENESS AND ITS DRIVING FORCES

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Annotation: The aim of this paper is to assess the EU28 countries` competitiveness from output side, from input side and analyse relationship between them. In first part a Competitiveness Output Index 2016 (COI 2016) is created from four output variables and countries are divided into three groups: strong competitive countries, competitive countries and weak competitive countries. Subsequently input variables that drive competitiveness are used to classify groups of EU countries with similar indicators` values. Countries are grouped into five clusters: The lowest quality of human potential and the lowest innovative potential, The lowest business potential, The highest innovative potential, The highest business potential and the highest labour market and human potential, The lowest Labour market and human potential. In the last part the relationship between outputs (COI 2016) and inputs (factors) are analyse by using a robust regression model with conditional heteroscedasticity. COI 2016 stands on the side of a dependent variable and four competitiveness factors stand on the side of independent variables.

Key words: national competitiveness, COI 2016, competitiveness factors, competitiveness` output-input relationship

JEL classification: A1 General economics, A10 General

1. Introduction

Competitiveness growth has gradually become a prime objective both at the European Union`s level as a whole and at the individual EU Member States` level. In the year 2010 EU adopted a new ten-years strategy Europe 2020, where one of the main goal is to increase EU countries` competitiveness and to decrease disparities between them. Europe 2020 is an EU strategy to ensure economic growth in order to build a smart, sustainable and inclusive economy. These three complementary priorities should help the EU and its Member States achieve higher levels of employment, productivity and social cohesion.

Garelli (2002) considers national competitiveness to be one of the strongest concepts in the modern economy, as it includes the economic consequences of non-economic areas. According to Porter (1990) the only meaningful concept of national competitiveness is productivity. Martin (2003) argues that the real challenge for national competitiveness`s analysis is to identify factors that explain it rather than those that describe its results. The analysis of competitive position and competitive factors help policy makers better understand the potential development options and limitations for countries.

Since the year 2005, World Economic Forum analyses national competitiveness by creating Global competitiveness index (GCI). GCI is a complex tool designed on the basis of soft and hard data of 148 economies. In the year 2018 Germany is on the first position, Netherlands is on the second positon and United Kingdom is on the third position in GCI ranking (World Economic Forum, 2018).

World Competitiveness Yearbook (2018), published by Institute for Management Development, ranking 63 countries` competitiveness results using 258 indicators. According to the World Competitiveness Yearbook in the year 2018 the US takes the first place among world's most competitive economies. The country takes the lead on economic performance while Hong Kong, Singapore, the Netherlands and Switzerland round out the top 5.

Indicators, using to evaluate national competitiveness by creating indexes, can be divided on two sides - outputs of competitiveness – represent competitive outcomes and inputs of competitiveness– represent competitive drivers (factors).

Melecký (2013) evaluate the EU countries` competitiveness with respect to distinguish between driving forces of competitiveness and direct or indirect outcomes of competitive economy and society. In his work "Assessment of EU Competitiveness Factors by Multivariete Methods" he classifies EU countries into clusters according to the similarity of created input` and output` factors. In the case of inputs, Denmark and Sweden have the greatest level of competitiveness indicators. In the case of outputs, Germany has the highest economic efficiency and performance.

According to Stanickova (2014) the most economic powerful countries with good conditions and facilities for competitiveness, resp. with best driving factors are Germany and Finland. Germany is also the country with the best competitive performance.

If we distinguish between inputs and outputs of competitiveness, we can analyse the relations between them and find the best way to increase the countries´ competitiveness outcome.

The aim of this paper is to assess the EU28 countries` competitiveness by creating a Competitiveness Output Index 2016 (COI 2016) from four output variables representing the competitiveness results. Input variables that drive competitiveness are used to classify groups of EU countries with similar indicators` values and to identify the best way to increase national competitiveness.

2. Materials and Methods

Working database consists of 4 output variables (Gross domestic product – GDP, Gross value added – GVA, Compensation of employees – CompEmp, Disposable income – Income) and 17 inputs variables (Gross fixed capital formation – GFCF, Export of goods and services – Export, Total fertility rate - TotFerRate, Life expectancy – LifeExp, Number of beds in hospitals – BedsHosp, Students with tertiary education – TerEduc, Employment rate – EmpRate, Economic activity rate – ActRate, Number of establishments – NumEstab, Intramural R&D expenditure – GERD, R&D personnel and researchers - R&DPer&Resd, Human resources in science and technology – HRST, Patent applications – PatApp, Life satisfaction – LifeSatisf, Energy production – EnergyProd, Infant mortality rate – InfMorRate, Unemployment rate – UnempRate), downloaded from Eurostat for year 2016.

Principal component analysis (PCA) is used to reduce the number of output competitiveness variables, to remove multikolinearity between them and to evaluate EU28 countries` competitiveness by creation the Competitiveness Outcome Index 2016. PCA is an ordinal method that examines how variables are mutually correlated. If the variables are correlated, the amount of information they capture can be expressed by a smaller number of variables, thus reducing the dimension. In the PCA, the set of p observed variables $X_1, X_2, \dots, X_p$ is transformed into a set of new variables $Y_1, Y_2, \dots, Y_p$ (principal components) such that they are a linear combination of original variables:

$$Y_1 = a_{11}X_1 + a_{12}X_2 + \cdots + a_{1p}X_p$$

$$Y_2 = a_{21}X_1 + a_{22}X_2 + \cdots + a_{2p}X_p \qquad \textbf{(1)}$$

$$\dots\dots\dots\dots\dots\dots\dots\dots$$

$$Y_p = a_{p1}X_1 + a_{p2}X_2 + \cdots + a_{pp}X_p$$

Coefficients a_{ij} represent weights (saturations), estimated to not change overall variability. New variables (principal components) are not mutually correlated and the first principal component explains the main part of common variables` variability and therefore is the most important. The optimal number of components is determined based on Kaiser's rule, which claims to use those principal components whose eigenvalues are higher than the average of all eigenvalues (Stankovičová and Vojtková, 2007).

Factor analysis (FA) is applied to reduce the number of input competitiveness variables, to remove multikolinearity between them and to create competitiveness factors, represent EU28 countries` driving forces. FA assumes that the dependencies between analysed variables are due to the effect of some immeasurable variables standing in the background (so-called common factors).
The method is based on a set of observable variables $X_{jj} = 1,2, \dots, p$ having a multidimensional distribution with a *p*-membered mean value vector μ_X and a covariance matrix $\sum p$ of rank *p*. The general FA model assumes that there exists *q* in the background standing common factors $F_1, F_2, \dots, F_q$, while *q*<*p*. These factors allow to expressed the *j-th* observable random variable X_j by the following equation:

$$X_j = \mu x_j + a_{j1}F_1 + a_{j2}F_2 + \cdots + a_{jq}F_q + e_j \qquad \textbf{(2)}$$

where: $e_j, j = 1,2, \dots, p$ - random (error) components referred to as specific factors,
a_{jk} – factors` weights, explaining the impact of *k-th* common factor on variable X_j.

Significant common factors are those whose eigenvalue is greater than 1 (4 factors in our paper). Based on the factor weights, the variable that has the highest factor weight is selected for each factor. For better interpretation, equamax rotation is used (Stankovičová and Vojtková, 2007).

Cluster analysis (CA) is used for EU countries` multidimensional classification into similar clusters. Criterions for the countries` inclusion into clusters are common competitiveness factors. The aim of the analysis is to decompose a set of objects into several relatively homogeneous clusters. The objects belonging to different clusters are least similar and the objects belonging to one cluster are as similar as possible.

Euclidean distance is used as a measure of similarity between objects and Ward's method is used as a clustering method. In Ward's method, distances between clusters are not counted, but clusters are formed by maximizing inside-cluster homogeneity. The measure of homogeneity is the inside-cluster sum of squares deviations from the cluster average (ESS).

$$ESS = \sum_{i=1}^{nh} \sum_{k=1}^{q} (x_{ki} - \bar{x}_{ch})^2 \qquad \textbf{(3)}$$

where: *nh* – the number of objects in a cluster *Ch*,

x_{Ch}- the vector of the average character values in the cluster *Ch*,

x_{hi} – the vector of i-th object`s character values in the cluster *Ch*.

The algorithm ensures that the ESS minimum increment is achieved at each step. Five clusters are determined based on the tree structure - dendrogram and the clustering indicators (Stankovičová and Vojtková, 2007).

Regression analysis is applied to analyse the impact of individual competitiveness factors on the Competitiveness Output Index 2016. The regression analysis quantitatively expresses the influence of the individual explanatory variables on the explained variable. Generally, the linear regression model has the form:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_k x_{ik} + e_i \quad \textbf{(4)}$$

A robust regression model with conditional heteroskedasticity is applied to analyse the relationships between factors and Competitiveness Output Index 2016 (Šoltéz, 2008).

3. Results and Discussion

In the first part the EU countries' competitiveness is assessed on the basis of created Competitiveness Output Index 2016 – COI 2016. COI 2016 is created from four outputs variables: Gross domestic product - GDP, Gross value added - GVA, Compensation of employees - CompEmp and Disposable income - Income. Because of high significant correlations between selected competitiveness outputs, Principal component analysis is used to create COI 2016 and to catch information contained in all four output variables. One principal component PRIN1, created by linear combination of outputs, explaining 79.2 % of total outputs` variability.

Table 1. Eigenvectors

Eigenvectors	
	PRIN1
GDP	0.556
GVA	0.556
CompEmp	0.556
Income	0.272

Source: Own calculations, software SAS

The impact of output variables on a created principal component is given by eigenvectors (Table 1). GDP, GVA and CompEmp share approximately the same weight on the main component` creation (0.56), the weight of Income is almost twice lower (0.27).

According to the value of Competitiveness Output Index 2016 countries are divided into three groups: **strong competitive countries, competitive countries and weak competitive countries**. There are 5 countries in the group **"Strong competitive countries"**: the most competitive Germany with the highest value of COI 2016, United Kingdom, France, Italy and Spain. 12 European countries, namely Netherlands, Sweden, Belgium, Denmark, Austria, Luxembourg, Ireland, Finland, Poland, Portugal, Czech Republic and Greece belong to the group **"competitive countries"**. The **group "weak competitive countries"** consists of 11 countries: Cyprus, Malta, Slovenia, Romania, Hungary, Slovakia, Estonia, Lithuania, Croatia, Latvia and least competitive Bulgaria (Figure 1).

Figure 1. Competitiveness of EU28 countries

Source: Own calculations, mapchart.net

Subsequently input indicators are used to analyse the EU28 countries` competitive driving forces. Factor analysis is applied to reduce the number of variables and remove multicollinearity. The Factor analysis`s role consists from the creation of a smaller number of common factors reflecting countries` comparative advantages – driving forces. Equamax orthogonal rotation is applied to obtain the best interpretable results. Four factors of competitiveness are created from 17 input variables (Table 2).

Table 2. Rotated factor pattern

Rotated Factor Pattern				
	Factor1	**Factor2**	**Factor3**	**Factor4**
GFCF	0.16881	0.08672	0.01856	0.95490
Export	0.22203	0.16814	-0.03158	0.91795
TotFerRate	0.73936	0.12153	0.00173	0.15833
LifeExp	-0.22662	0.52611	0.63427	0.33621
BedsHosp	0.07639	-0.14963	-0.83851	0.03901
TerEduc	0.53495	0.09215	0.66700	-0.08078
EmpRate	0.86733	0.34354	-0.06481	0.02789
ActRate	0.80467	0.20761	0.32775	0.01764
NumEstab	-0.46098	-0.07007	0.12603	0.70085
GERD	0.39701	0.77840	0.27988	0.22653
R&DPer&Res	0.32113	0.69993	0.41643	0.17226
HRST	0.62706	0.61706	0.25279	0.10341
PatApp	0.45313	0.70353	0.20145	0.31675
LifeSatisf	0.16182	0.77158	-0.06541	-0.08405
EnergyProd	-0.07565	0.56615	0.44060	0.25299
InfMorRate	-0.28145	-0.15451	-0.65383	-0.13020
UnempRate	-0.56273	-0.36340	0.55472	-0.00700

Source: Own calculations, software SAS

First factor, interpreted as **"Labour market and human potential"** is constructed through indicators as Total fertility rate (0.739), Employment rate (0.867), Economic activity rate (0.805), Human resources in science and technology (0.627) and Unemployment rate (-0.562). **Second factor**, named as **"Innovation potential"** indicates connection between Intramural R&D expenditure (0.778), R&D personnel and researchers (0.700), Patent applications (0.704), Life satisfaction (0.772) and Energy production (0.566). **Third factor**, interpreted as **"Quality of human potential"** positively correlates mainly with Life expectancy (0.634), Students with tertiary education (0.667) and negatively correlates mainly with Number of beds in hospitals (-0.839), Infant mortality rate (-0.654). **Fourth factor**, named as **"Business potential"** is created by indicators of Gross fixed capital formation (0.955), Export of goods and services (0.918) and Number of establishments (0.701).

Based on the calculated factor score, EU countries are grouped into five clusters (Figure 2). In the **first cluster "The lowest quality of human potential and the lowest innovative potential"** are grouped 4 weak competitive countries: Croatia, Malta, Romania, Slovakia one competitive country Poland, (countries with highest average value of infant mortality rate and with lowest average value of Students with tertiary education, Economic activity rate, Intramural R&D expenditure, R&D personnel and researchers and Patent applications). **Second cluster "The lowest business potential"** consists of 5 weak competitive countries: Bulgaria, Estonia, Hungary, Latvia, Lithuania and one competitive country Czech Republic (countries with the lowest average value of Gross fixed capital formation, Export of goods and services, Life expectancy, Number of establishments and Energy production). **Third cluster "The highest innovative potential"** contains 9 competitive countries: Austria, Belgium, Denmark, Finland, Ireland, Luxembourg, Netherlands, Portugal, Sweden and one weak competitive country Slovenia (countries with highest average value of Intramural R&D expenditure, R&D personnel and researchers, Human resources in science and technology, Patent applications, Life satisfaction and Energy production and with lowest average value of Infant mortality rate). In the **fourth cluster "The highest business potential and the highest labour market and human potential"** are grouped 3 strong competitive countries: France, Germany and United Kingdom (countries with the highest average value of Gross fixed capital formation, Export of goods and services, Total fertility rate, Employment rate and Economic activity rate and with the lowest average value of Unemployment rate. **Fifth cluster "The lowest labour market and human potential"** consists of one weak competitive country Cyprus, one competitive country Greece and two strong competitive countries: Italy, Spain (countries with the highest average value of Life expectancy, Number of establishments and Unemployment rate and with lowest average value of Total fertility rate, Number of beds in hospitals, Employment rate, Human resources in science and technology and Life satisfaction).

Figure 2. EU28 clusters

Source: Own calculations, mapchart.net

With the exception of some countries (e.g. Italy, Spain), we can summarize that strongly competitive regions in terms of competitiveness output are also included in clusters with high average value of input`s variables. On the other hand, weak competitive regions are also weak in terms of inputs.

It is important to analyse the relationship between outputs (COI 2016) and inputs (factors) when assessing competitiveness. A robust regression model with conditional heteroskedasticity is applied to analyse the interrelationships between COI 2016 and factors. COI 2016 stands on the side of a dependent variable and four competitiveness factors stand on the side of independent variables. 94.9% of variability is explained by the regression function (Table 3).

Table 3. Linear regression model

```
Linear regression                               Number of obs     =         28
                                                F(4, 23)          =     100.04
                                                Prob > F          =     0.0000
                                                R-squared         =     0.9492
                                                Root MSE          =     .43482
```

PRIN1	Coef.	Robust HC2 Std. Err.	t	P>|t|	[95% Conf.	Interval]
Factor1	.3219962	.1118165	2.88	0.008	.0906861	.5533062
Factor2	.2925265	.0661676	4.42	0.000	.1556483	.4294047
Factor3	.1639574	.0756073	2.17	0.041	.0075518	.3203629
Factor4	1.670532	.1149876	14.53	0.000	1.432662	1.908402
_cons	-4.84e-11	.0838537	-0.00	1.000	-.1734645	.1734645

Source: Own calculations, software SAS

All regression coefficients are statistically significant and the estimated regression equation is:

$$COI\ 2016_i = 0.32F1_i + 0.29F2_i + 0.16F3_i + 1.67F4_i$$

From the regression model, we can determine the impact of individual factors on the resulting level of competitiveness representing by COI 2016. If the first factor **"Labour market and human potential"** increases by one unit, we can expect COI 2016 to increase by 0.32 units on average.

Factor 1 has the second largest impact on the resulting level of competitiveness. If the second factor **"Innovation potential"** increases by one unit, we can expect COI 2016 to increase by

0.29 units on average. The third factor **"Quality of human potential"** has the lowest impact on COI 2016, the increase of factor 3 by one unit leads to increase of COI 2016 by 0.16 units on average. The highest impact on COI 2016 has the fourth factor **"Business potential"**, one unit increases of this factor leads to increase COI 2016 by 1.67 units on average. The most influential factor "Business potential" is made up of variables: Gross fixed capital formation (0.955), Export of goods and services (0.918) and Number of establishments (0.701).

From the dependency's analysis between Competitiveness Output Index 2016 and individual factors**, we conclude that countries can increase their competitiveness mainly by increasing Gross fixed capital formation, Export and Number of establishments.**

The strong influence of factor 4, mainly of variables Gross fixed capital formation, Export and Number of establishment, can be seen in the example of Italy and Spain, countries grouped in the cluster **"The lowest Labour market and human potential**" in terms of inputs, but among the strong competitive countries in terms of outputs.

4. Conclusion

Based on competitiveness outcomes, represented by Competitiveness Output Index 2016, the most competitive country is Germany, belong to the group "Strong competitive countries" with United Kingdom, France, Italy and Spain. According to Melecký (2013), Germany has the highest economic efficiency and performance and stands on the first place in Global competitiveness index 2018. 12 EU countries belong to the group "competitive countries" and 11 EU countries belong to the group "weak competitive countries" based on the COI 2016 results. Fura, Wojnar, Kasprzyk (2017) divided EU28 countries into 4 groups based on their level of Europe 2020 strategy achievements, which main goal is to improve Europe`s competitiveness to a level similar to other developed economies in the world. A high level of Europe 2020 strategy achievements is observed in Sweden, Denmark, Austria, Finland, Slovenia, Czech Republic and France. The most competitive Germany together with strong competitive United Kingdom are situated in second group with upper middle level of strategic goals. Italy, Spain together with "weak competitive countries" Malta, Greece, Bulgaria, Romania are situated in the last group with lowest level of strategic goals achievement.

From the point of four created competitiveness factors, EU countries are grouped into five clusters. France, Germany and United Kingdom have the best "business potential" and "labour market and human potential". Austria, Belgium, Denmark, Finland, Ireland, Luxembourg, Netherlands, Portugal, Sweden and Slovenia are the countries with highest "innovative potential". Stanickova (2014) marks Germany and Finland as economic most powerful countries in the view of input factors. France and United Kingdom are grouped into the cluster with very similar levels of factors endowments as Germany and Finland. Except of some countries (e.g. Italy, Spain), strongly competitive regions in terms of competitiveness output are also included in clusters with high average inputs` variables value. On the other hand, weak competitive regions are also weak in terms of inputs.

From the COI 2016 and individual factors dependency analysis, we conclude that countries can increase their competitiveness mainly by increasing Gross fixed capital formation, Export of goods and services and Number of establishments. The strong influence of those variables, can be seen in the example of Italy and Spain. According to the competitiveness factors they belongs to the "The lowest Labour market and human potential" cluster, but according to the competitiveness outcomes to the strong competitive countries. Contrary to our conclusions, Ciocanel and Pavelescu (2015) claim that the best way how to increase the national competitiveness is increasing innovation performance. An improvement of innovative performance by 5% can lead to an increase of national competitiveness by 2,32 percentage points.

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THE POSITION OF THE ČESKOSASKÉ ŠVÝCARSKO REGIONAL PRODUCT BRAND AMONG CONSUMERS

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Annotation: The article presents part of the results of a research study that analyses chosen factors of customer´s preference in the Ústí Region with a focus on regional food purchase of the brand Českosaské Švýcarsko. Regional food branding is part of labelling of origin, which is a useful marketing tool for small and middle-sized farms and farmers. In many countries has this labelling a positive impact on the economic situation of the small and middle-sized farms/farmers or food enterprises. The quantitative research was conducted in 2017 in the Ústí Region Region and data presented in this article analyses the opinions of 231 respondent´s. Respondents were selected according to factors like gender, family income, age and education. Data have been processed with statistical analysis; the results show very similar recognition of the brand Českosaské Švýcarsko by age, income and also level of education of the respondent´s. The typical customer group for those product is customer from middle class - highest education (university or college), with the family net income 25,001-50,000 CZK and middle-age (36-50 years old). An interesting outcome of the research is that men recognize the brand more than woman and the respondent´s with higher income do not prefer those products.

Key words: Marketing; Consumer Behavior; Food labelling; Origin; Region

JEL classification: Q13, M31

1. Introduction

About 30 years ago, regional, microregional and local labelling of regional and local products and services started to spread from the Western part of the EU; the trend arrived in the Czech Republic some 15 years ago. It aims to make small and middle-sized food producers more visible and more easily identifiable by consumers. Research of the regional affiliation for food was realized f. e. by authors Gracia, De Magistris (2016) or Lošťák and Kučerová (2007).

According to GoDu (2015), regional labelling may have a strengthening effect on local identity, Messely et al. (2015) have observed positive effects on the attractiveness of the region for tourism and leisure time activities. Regional brands proved to be a useful marketing tool especially for small and middle-sized entrepreneurs (farmers and agriculturists) – the benefits may include innovations and new business development, improvement in production processes, increased output, profitability and employment through the better market access (Dempsey, 2011, Rojík et al., 2016). However, Stoklasa and Starzyczna (2016) warn that the expected and actual benefits of regional brands for companies shouldn't differ substantially, the discrepancies being an effect of exaggerations or lack of communication from the brand coordinators.

Vokáčová and Margarisová (2017) describe three main types of origin labelling systems in the Czech Republic – EU level (PDO, PGI and TSG), national system (f.e. Regional Food label) and microregional system (represented by Association of Regional Brands). Apart from national authorities as a certifier, there are food origin labelling systems that have been developed by a broad range of actors such as food producers, producers associations or retailers. Velčovská and Del Chiappa (2015) have been studying the effect of the growing number of various food labels on the Czech market and confirmed that the costumers are not able to see clear differences among them and therefore are not able to use some of the labels properly in their purchase decisions. One of the most important aspects for the successful functioning of regional branding systems is the recognition and appreciation of these brands by the customers, their trust in the brand values is a prerequisite for the success of the labelled products (Gracia, DeMagistris, 2016).

The main goal of this article is to test the recognition of the microregional labelling system Českosaské Švýcarsko in the Usti Region.

2. Materials and Methods

The Českosaské Švýcarsko is one of four microregional labelling system in the Usti Region. The brand was established in 2010 and is the oldest microregional labelling system in the region. The national coordinator is the Association of Regional Brands (ARZ), the microregional (local) coordinator is České Švýcarsko o.p.s. According to the methodology for certification, firms need to comply with the certification criteria. The certification committee decides on the granting of the certificate, which currently has 13 members. Three types of products and products can apply for the brand: food and agricultural products, craft products and works of art, natural products.

Figure 1: Logotype of the 'Českosaské Švýcarsko' brand

Source: Asociace regionálních značek (ARZ), 2018, regionalni-znacky.cz

The quantitative research, conducted in 2017 in the Ústí Region Region analysed the opinions of 231 respondent´s - inhabitants in the Usti Region aged 18-65 years. They were selected according to gender, family income, age and education. Primary data were obtained through a questionnaire survey from September 2017 to December 2017. Data have been processed with statistical analysis due to selected socio-demographic aspects (gender, age, net monthly family income, level of education).

The data were analyzed using Pearson's Chi-square test of independence to test the null hypothesis. The null hypothesis was determined as follows: Recognition of the brand Českosaské Švýcarsko regionální product does not depend on the chosen socio-demographic aspects.

H1: Recognition of the brand Českosaské Švýcarsko Regional Product does not depend on the respondent´s ´ level of education.
H2: Recognition of the brand Českosaské Švýcarsko Regional Product does not depend on the respondent´s ´ net family monthly income.
H3: Recognition of the brand Českosaské Švýcarsko Regional Product does not depend on the respondent´s ´ age.
H4: Recognition of the brand Českosaské Švýcarsko Regional Product does not depend on the respondent´s ´ gender.

Categorical data were obtained during the analysis of the questionnaire survey. In order to apply Pearson's Chi-square test, a maximum of 20% of the expected frequencies must be less than five (see Řezanková, 2007; and Agresti, 2013). Where this test could not be applied, Fisher's exact test was used or the simulated p-value of the χ^2 statistic was calculated (see Anděl, 2005):

$$\chi^2 = \sum_i \sum_j \frac{(n_{ij} - e_{ij})^2}{e_{ij}} \quad (1)$$

Alternatively:

$$G^2 = \sum_i \sum_j n_{ij} \ln \frac{n_{ij}}{e_{ij}} \quad (2)$$

e_{ij} is the expected and n_{ij} the observed frequency. Either the test statistic χ^2 of the Pearson's chi-square was used to test independence, or G^2 for the likelihood-ratio test. These two statistics are asymptotically $\chi^2_{(r-1)(c-1)}$ distributed. The null hypothesis of the test assumes independence. In order to apply the Pearson's Chi-square test, a maximum of 20% of the expected frequencies must be less than five (Agresti, 2013). Where this test could not be applied, Fisher's exact test was used or the simulated p-value of the χ^2 statistic was calculated (Anděl, 2005).

The p-value for each hypothesis was calculated by means of the Statistica software. Where $p < 0.05$, the null hypothesis was rejected in favor of an alternative hypothesis on the basis of the assumption of the dependence of the variables.

3 Results and Discussion

The analyzed research data presented in Table 1 show that the brand recognition of Českosaské Švýcarsko Regional Product is the lowest by respondent´s with lowest education (Elementary school), relatively similar recognition is by all other education category groups: High school (16 respondent´s it is 13.22 %) vs. respondent´s with Apprenticeship (6 respondent´s it is 14.29 %). The highest level (only slightly less well-known compare to other education categories) of brand recognition shows the consumers with University or College level of education (15.09 %).

Table 1. Recognition of the Českosaské Švýcarsko regionální produkt brand according to respondent´s ´level of education

Recognition of brand	Elementary school	Apprenticeship	High school	University and Collage	Row Totals
Yes	0	6	16	8	30
Column %	0	14.29	13.22	15.09	
No	15	36	105	45	201
Column %	100	85.71	86.78	84.91	
Total	15	42	121	53	231
Chi-square			df	P-value	
Pearson Chi-square		2.52	df=3	p=0.47	

Source: Own research, 2019

The P-value presented in the Table 1 is 0.47 - the H1 hypothesis was not rejected at a level of significance of 5% - H1 hypothesis *"Recognition of the regional label Českosaské Švýcarsko regionální produkt does not depend on the respondent´s level of education"*.

Table 2. Recognition of the Českosaské Švýcarsko regionální produkt brand according to net family monthly income

Recognition of brand	Up to CZK 25000	CZK 25001-50000	CZK 50001 and above	Row Totals
Yes	10	17	3	30
Column %	10.99	15.04	11.11	
No	96	81	24	201
Column %	89.01	84.96	88.89	
Total	91	113	27	231
Chi-square			df	P-value
Pearson Chi-square		0.83	df=2	p=0.66

Source: Own research, 2019

Table 2 presents that brand recognition according to the net family income. The recognition is the highest among respondent´s with middle net monthly income (25001-50000 CZK) it is 15.04 %. The lowest level of recognition is presented by respondent´s with a net monthly family income up to 25 000 CZK (10.99) and 50001 CZK and above (11.11). The P-value is 0.66; therefore the hypothesis H2 was not rejected at a level of significance of 5%. *Recognition of the brand Českosaské Švýcarsko Regional Product does not depend on the respondent´s ´ net family monthly income.*

Table 3. Recognition of the Českosaské Švýcarsko regionální produkt brand according to respondent´s age

Recognition of brand	**18 to 35 years**	**36 to 50 years**	**51 to 65 years**	**Row Totals**
Yes	18	9	3	30
Column %	12.68	13.85	12.50	
No	124	56	21	201
Column %	87.32	86.15	87.50	
Total	142	65	24	231
Chi-square			df	P-value
Pearson Chi-square		0.60	df=2	p=0.97

Source: Own research, 2019

The results presented in Table 3 show that brand recognition is very similar, according to all age categories. Only slightly higher is by middle-aged respondent´s (13.85 %). Two other age categories show very similar results: recognition 12.68 % by respondent's age category 18 to 35 years and 12.50 % by oldest respondent´s (age category 51 to 65 years). It is clear from Table 3, that p-value of Pearson´s Chi-square test of independence is significantly higher than the defined level of significance 5 %. The H3 hypothesis was not rejected at the selected level of significance: *Recognition of the brand Českosaské Švýcarsko regionální produkt does not depend on the respondent´s age.*

Table 4. Recognition of the Českosaské Švýcarsko regionální produkt brand according to respondent´s ´gender

Recognition of brand	**woman**	**men**	**Row Totals**	
Yes	21	9	30	
Column %	10.88	23.68		
No	172	29	201	
Column %	89.12	76.32		
Total	193	38	231	
Chi-square			df	P-value
Pearson Chi-square		4.60	df=2	p=0.031

Source: Own research, 2019

The results presented in Table 4 show very interesting and unusual result. Recognition of the brand Českosaské Švýcarsko much higher by men (23.68 %) than by women (only 10.88 %). Table 4 shows that p-value of Pearson´s Chi-square test of independence is significantly lower than the defined level of significance of 5 %. The H3 hypothesis was rejected at the selected level of significance: *Recognition of the brand Českosaské Švýcarsko regionální produkt statistically does depend on the respondent´s ´ gender.*

Presented data are part of previous authors' research focused on brands of origin or quality. Therefore it is possible to compare presented results with results from other brands coordinated by the same coordinator (ARZ). I. e. the recognition of similar brand coordinated by ARZ shows, that in South Moravian Region respondent´s with the highest education recognize this brand also, youngest and middle-aged customers (Rojík et al., 2016). The higher interest in local brands is observed in the regions with the above average monthly income as Prague and the Central Bohemian Region (Šánová et al., 2017). The similar observations can be found f. e. in the neighboring countries - for example in Austria, (Rojík et al., 2016).

4. Conclusion

The research shows that recognition of the Českosaské Švýcarsko Regional Product brand is rather low - 14 %. This result is not surprising as the level of regional labels recognition in other regions is similar, which was indicated by the authors' previous researches (f.e. Rojík et al., 2018, Chalupová et. al., 2016). Authors believe that the reason is, that in the Czech Republic, regional labelling is still struggling as the coordinators do not provide sufficient information for buying decisions and the regional labels fail in communicating the clear message to the consumers. Food with a regional brand, in contrast to larger scale food production, does not tend to attract consumers based on, for example, low prices. The findings presented in this research show that consumers in the Usti Region are not very aware of the specifics and opportunities of the Czech micro regional brand system (ARZ). The brand Českosaské Švýcarsko Regional Product is mostly recognized by consumers with the highest education, respondent´s from the 'middle class' with the family net income 25,001-50,000 CZK and middle-aged consumers (36-50 years old) from the Usti Region. Even in those groups in which brand recognition is poor, there are opportunities for marketers to increase the brand's recognition. However, the most significant group in the Usti Region for marketers is the group of respondent´s with the highest incomes, as labelled products are being marketed as a premium. But an interesting outcome of the research is that the respondent´s with higher income do not prefer those products. The reason could be current 'low exclusivity' of those products. It is the next task for the marketing specialists for changes in communication strategies of the brand Českosaské Švýcarsko Regional Product or ARZ. Another interesting fact of the research is that men recognize the brand Českosaské Švýcarsko Regional Product more than woman. The future research should be focused on collection and comparison of the data in other regions and countries, especially from countries where the regional food labelling is existing for a longer time to do the benchmarking and define the weaknesses of the regional labelling systems in the Czech Republic.

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PRODUCTIVITY OF SELECTED PRODUCTION FACTORS IN RELATION TO AGRARIAN EXPORTS OF INDIVIDUAL EU COUNTRIES

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Annotation: This paper identifies the differences between individual EU28 countries in relation to the development of the value of agrarian and food exports (under the SITC rev. 3: 00, 01, 02 and 04) and the development of the volume of selected inputs. The analysis is processed by recalculating the value of realized exports in relation to the farm land and the number of workers. Subsequently, cluster analysis is applied to identify groups of countries having similar developmental characteristics. The analysis is interpreted in relation to the old and new EU Member States. The results obtained have confirmed the significant domination of the old Member States over the new Member States. These countries control more than 83% of the value of realized exports and dominate in factor productivity. Calculated exports per hectare of agricultural land or per worker in agriculture are significantly higher for the old Member States compared to the new Member States. The average hectare size of farm is definitely not the key to export success. Countries having even smaller farms and only few employees are able to compete, respectively to dominate over countries having much bigger farms and more employees.

Key words: Agrarian export, productivity, labor, land, farm, duality, EU28.

JEL classification: Q17, Q18

1. Introduction

EU agricultural and food trade is developing dynamically. Between 2004 and 2017, its value increased from more than EUR 200 billion to more than EUR 460 billion. More than 70% of this value is realized within the EU28. In the last two decades, EU28 agrarian trade has been undergoing a major restructuring process. The value of trade within the internal market is growing significantly (Sarker & Jayasinghe, 2007). On the other hand, the value of exports in relation to third countries has been suffering because of lower dynamics. However, import value dynamics is increasing (Zolin & Uprasen, 2018). The specific feature of the EU28 agrarian trade is its considerable territorial concentration, which can be seen as an advantage in terms of rationalization of export operations. On the other hand, the limited territorial concentration threatens the stability of exports during crises (see, for example - the Russian Federation's agri/food import ban applied in relation to EU's export to Russia in 2014 up to nowadays (Kutlina-Dimitrova, 2017; Veebel & Markus, 2016). There are significant differences between the countries of the European Union in terms of territorial and commodity structure of their own agricultural and food exports. The EU agri/food trade is suffering because of its dual structure. There is extreme difference if we compare trade performance of old and new EU member countries. In this respect, the differences between the new (EU 13) and old Member States (EU15) are worth comparing. The EU15's export dynamics is significantly lower in comparison to EU13's agri-food exports dynamics (Bartosova, Bartova, & Fidrmuc, 2008). However, there are also significant differences in the commodity structure of realized exports (Svatoš & Smutka, 2009).

While in the case of EU 15, the export strategy is primarily based on export of production with higher value added and higher kilogram prices. In the case of EU 13, the primary source of trade value growth is especially the increasing volume of exports of unprocessed production or semi-finished products (Ciutacu & Chivu, 2015; Gilbert & Muchov, 2018). EU 15 countries set up their export strategies primarily on qualitative elements of the marketing mix. In the case of EU 13, the basic success of the applied export strategy is a low price, mainly due to the lower price of land and labour (Stanickova, 2015). There are significant differences in the productivity of basic production factors between the above-mentioned groups of countries (Ghazalian, 2013). These differences are due to different historical developments and because of unfinished process of economy transformation (Fuglie, 2018). While many EU 15 countries are operating in a market economy for a long time, the new Member States have only recently passed the process of transforming their own economies, and they have not yet completed the process of adaptation to EU market conditions. Their market is still profiling and adapting for constantly changing global and transnational economy environment (Baer-Nawrocka & Poczta, 2018; Kiss, 2008).

The aim of the paper is to identify possible differences among individual EU28 countries in viewpoint of the factors' productivity and food export. Based on the selected methodology the working question whether: "*Should we consider the farm level as the main factor of the duality problem or whether is it the difference in land and labor productivity between old and new Member States?*" is answered.

2. Materials and Methods

The paper identifies the differences among individual countries in the area of recalculation of the value of agricultural exports per one farm. Furthermore, there are identified differences existing if we recalculate the realized agrarian exports per hectare of utilized agricultural land and per one person working in agriculture. The main purpose of the analysis is to highlight the differences in factor productivity in the area of agricultural exports among the countries of the European Union with regard to average size of local farms.

The paper analyses the development of agrarian trade in EU28 countries in relation to the basic unit of the agrarian sector, which is a farm, as well as in relation to the volume of available agricultural land and the number of people working in agriculture. Because of different export structure of individual countries, the analysis includes only a selected segment of agricultural exports, which is by nature the same in all countries under investigation. The source of data concerning the development of the value of agrarian exports is the UN COMTRADE database and the data involved into the analysis include the following aggregations according to the SITC rev. 3: 00 - LIVE ANIMALS, 01 - MEAT, MEAT PREPARATIONS, 02 - DAIRY PRODUCTS, BIRD EGGS, 04 - CEREALS, CEREAL PREPRTNS. The analysis has been covering the period 2004 - 2017. Another source of data is the EUROSTAT database (the number of farms in individual EU countries, the number of economically active people in agriculture (in AWU) and the volume of available agricultural land (Utilised agricultural area in hectares)).

The analysis provides an overview of the development of the value of exports, including the sum of the aforementioned aggregates per farm, one AWU unit (working person) and one hectare of agricultural land. For the whole period under review, a base index is calculated identifying the rate of change in the value of agrarian exports in relation to the selected variables.

In the final part of the paper, a cluster analysis is carried out. Based on the cluster analysis, the individual EU Member States are divided into specific segments according to specific features, i.e. according to the average value of export realized per farm, per person working in agriculture and per hectare of agricultural land. Cluster analysis is based on Ward's method (Hebák et al., 2013; Meloun, Militký, & Hill, 2012; Ward, 1963). The analysis provides a detailed overview of the differences in productivity of selected production factors in individual EU countries in relation to realized exports of live animals, meat and meat products, milk and dairy products and cereals.

The differences in EU Member States are also examined based on comparison of the following two groups of countries: old EU15 Member States (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, Spain, Sweden, United Kingdom) and new EU13 Member States (Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia).

3. Results and Discussion

Between 2004 and 2017, the value of EU 28 agrarian trade developed dynamically. Significant dynamics of export value growth was identified not only within the value of agricultural exports as one entity. But the significant export dynamics was recorded also in the area of basic agricultural and food products typical especially for the European region. Those are mainly commodity aggregates 00, 01, 02, 04. Within the monitored period, EU28 countries increased the value of above-mentioned aggregates (both in relation to internal and external market) from about EUR 80 billion to more than EUR 165 billion. There are significant differences between EU 15 and EU 13. While in the case of EU 15 the nominal value of realized exports grew by about 85% (from EUR 74 billion to about EUR 138 billion), in the case of the new Member States, exports increased by almost 390% (EUR 5.6 billion to EUR 28 billion). A detailed overview of the development of the value of realized exports provides Table 1.

Table 1. Development of export value realized within 00, 01, 02, 04 SITC rev. 3 by individual EU28 countries in relation to the development of the number of farms and their average size

	Export value in EUR		**Farms number**		**Average size of farm in ha**	
	2004	2017	2004	2017	2004	2017
Belgium	7 574 035 591	12 410 890 945	51 540	36 890	27	37
Bulgaria	304 763 644	1 660 713 340	534 610	202 720	5	22
Czechia	644 718 140	2 701 735 422	42 250	26 530	84	130
Denmark	6 046 525 476	8 517 858 255	51 680	35 050	52	75
Germany	13 071 419 355	28 031 568 735	389 880	276 120	44	61
Estonia	119 708 908	515 020 558	27 750	16 700	30	60
Ireland	3 480 127 698	7 083 297 962	132 670	137 560	32	36
Greece	356 065 975	1 102 343 531	833 590	684 950	5	7
Spain	3 819 081 206	10 208 075 988	1 079 420	945 020	23	25
France	15 206 742 511	20 854 445 377	567 140	456 520	49	61
Croatia	108 468 437	542 578 688	181 250	134 460	5	12
Italy	5 434 938 573	11 188 614 664	1 728 530	1 145 710	7	11
Cyprus	33 435 768	181 605 972	45 170	34 940	3	3
Latvia	74 051 720	936 401 422	128 670	69 930	13	28
Lithuania	372 687 796	1 726 836 119	252 950	150 320	11	19
Luxembourg	258 815 857	563 751 227	2 450	1 970	53	66

Hungary	1 356 747 581	3 821 489 632	714 790	430 000	6	11
Malta	3 220 357	23 795 207	11 070	9 210	1	1
Netherlands	10 684 665 424	23 044 627 050	81 830	55 680	24	32
Austria	1 948 384 998	4 225 506 543	170 640	132 500	19	20
Poland	1 869 225 437	10 541 121 387	2 476 470	1 410 700	6	10
Portugal	409 859 065	1 244 796 606	323 920	258 980	11	14
Romania	254 211 000	3 098 923 566	4 256 150	3 422 030	3	4
Slovenia	341 578 046	1 237 497 902	77 170	69 900	6	7
Slovakia	140 547 765	560 425 312	68 490	25 660	27	74
Finland	539 138 576	744 722 937	70 620	49 710	33	45
Sweden	838 718 648	1 438 382 564	75 810	62 940	42	48
UK	4 691 922 402	7 104 156 991	286 750	185 060	56	90

Source: UN COMTRADE, 2019

The significant value growth of realized exports is due to the old Member States dominant trade performance. Those countries realized more than 80% of total exports operated by individual EU28 countries in the period under analysis. However, the situation is gradually changing due to higher growth dynamics of the new Member States’ export value. The share of old Member States in total realized exports is gradually decreasing, from about 93% in 2004 to 83% in 2017. Although the new Member States have relatively higher dynamics of export value growth, but at the same time they achieve much lower intensity of realized exports in relation to the size of their own agrarian sector. The Table 2 provides an overview of the development of the value of exports per farm in the EU28, as well as per hectare of agricultural land and per one AWU unit (i.e. working person in agriculture). If we recalculate the results of individual countries´ realized agricultural exports per farm, there are significant differences. The size of an average farm unit does not necessarily mean an export advantage (e.g. Slovakia). The key factor in this respect is the ability to export especially production having a higher degree of processing and higher value added. To a certain extent, the obtained results could be influenced by the countries' ability to realized trade benefits as a re-exporter (Netherlands, Denmark, Belgium, and Luxembourg). But those countries are not specialized only into re-export but they have been operating the significant food processing capacities to process an increasing volume of unprocessed and bulk imports.

Differences among countries are primarily noticeable if we convert the value of realized exports into one hectare of agricultural land or per one converted worker (AWU). The results of the analysis proved extreme differences among individual EU28 countries especially in relation to export performance per one hectare of agricultural land (e.g. Slovakia - 297 EUR / ha vs. Netherlands - 12,829 EUR / ha). Despite the growing productivity of agricultural exports in relation to available agricultural land, the new Member States (during the period under review, the value of export monitored per hectare of agricultural land increased from € 117 to € 557) are not able to effectively reduce the gap between them and old Members States (during the reporting period the value of export per hectare of agricultural land increased from EUR 595 to EUR 1112). EU-15 countries are escaping new Member States through the increasing value-added of their exports, and because of their concentration on the qualitative aspects of realized exports.

Based on above-mentioned arguments, the much lower productivity of new Member States’ (in relation to old Member States) exports per one unit of agricultural land is evident.

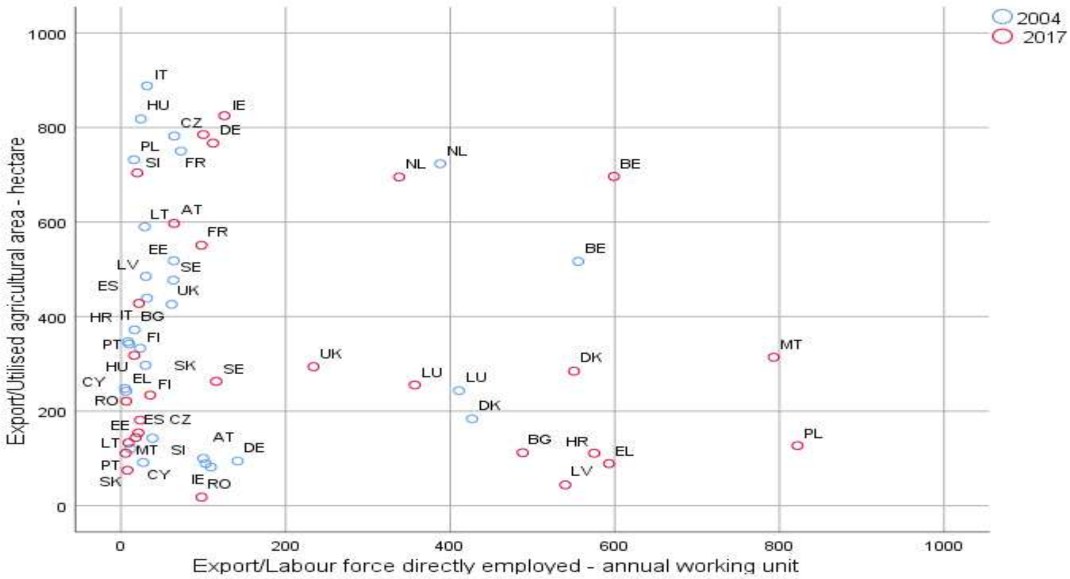
Table 2: Development of the value of exports per farm or hectare of farmed land and one converted worker (AWU) in EU28

EUR	2004	2017	2004	2017	2004	2017
	Export/Farm	Export/Farm	Export/hectare	Export/hectare	Export/AWU	Export/AWU
Belgium	146 955	336 430	5 466	9 164	108 838	224 226
Bulgaria	570	8 192	112	372	488	6 696
Czechia	15 260	101 837	181	782	4 244	26 162
Denmark	116 999	243 020	2 233	3 258	100 025	172 147
Germany	33 527	101 520	767	1 677	20 322	57 200
Estonia	4 314	30 840	144	518	3 244	25 906
Ireland	26 231	51 492	825	1 450	22 838	44 064
Greece	427	1 609	89	242	593	2 459
Spain	3 538	10 802	154	439	3 847	12 742
France	26 813	45 681	551	750	17 775	29 448
Croatia	598	4 035	111	347	575	3 405
Italy	3 144	9 766	428	888	3 955	12 788
Cyprus	740	5 198	221	1 622	1 167	10 888
Latvia	576	13 391	44	485	540	12 183
Lithuania	1 473	11 488	133	590	1 682	11 640
Luxembourg	105 639	286 168	2 004	4 315	64 866	165 809
Hungary	1 898	8 887	318	818	2 932	9 755
Malta	291	2 584	314	2 140	793	4 657
Netherlands	130 571	413 876	5 457	12 829	61 431	156 553
Austria	11 418	31 891	597	1 583	11 706	41 532
Poland	755	7 472	127	732	822	6 391
Portugal	1 265	4 807	111	342	1 030	3 966
Romania	60	906	18	248	98	1 952
Slovenia	4 426	17 704	704	2 534	3 596	15 475
Slovakia	2 052	21 840	75	297	1 423	12 003
Finland	7 634	14 981	234	333	6 460	9 416
Sweden	11 063	22 853	263	477	21 026	25 699
UK	16 362	38 388	294	426	42 511	24 861

Source: UN COMTRADE, EUROSTAT, own processing 2019

If the situation of exports per hectare of agricultural land is significantly to negative for EU-13, the situation is similar or even worse in the case of exports per working person in agriculture. The results of the new Member States are significantly behind the old Member States. In the period under review, the value of per-worker exports in the agricultural sector increased from EUR 813 to EUR 6072 in the case of the new Member States, while in the case of the old Member States, the export per worker increased from EUR 12 989 to EUR 30 111. Most of the new Member States are unable to compete in terms of labour productivity in relation to realized agrarian exports to the old EU Member States (except for Portugal and Greece). The Czech Republic and Estonia recorded the best results among the EU13.

Figure 1. Comparison of EU28 countries according to the value of agrarian export per hectare of agricultural land, respectively per one AWU unit in 2004 and 2017

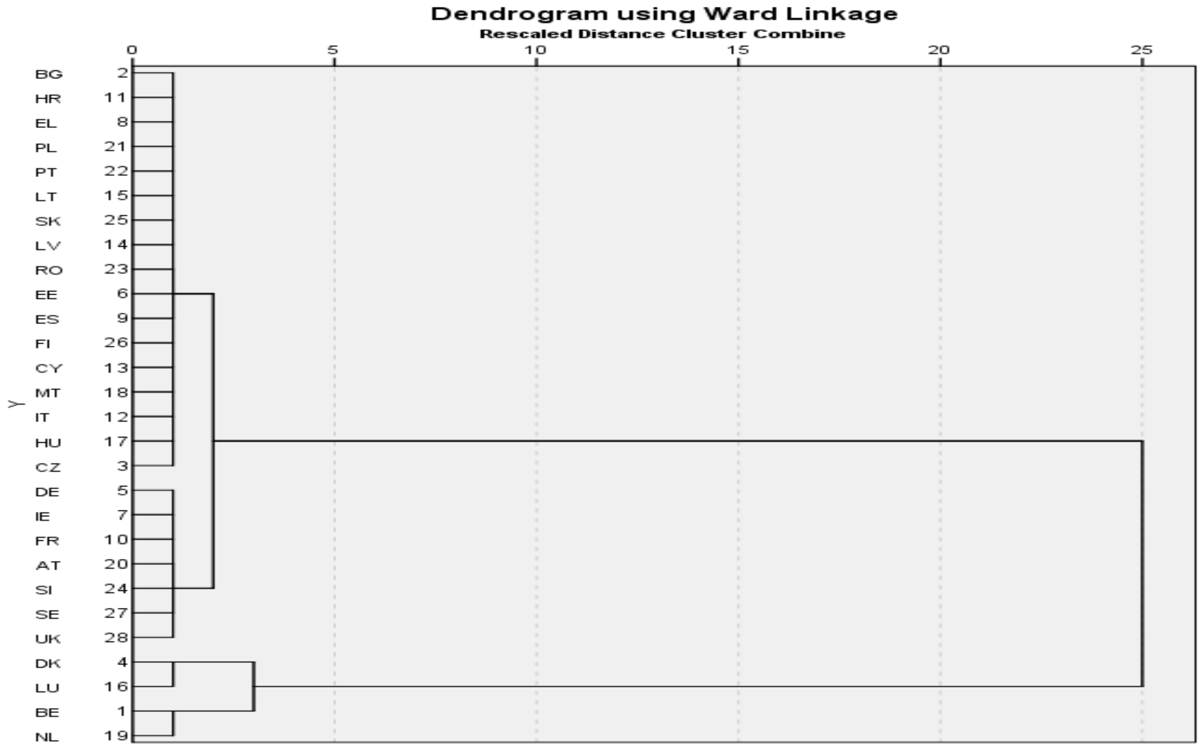


Source: UN COMTRADE, EUROSTAT, own processing 2019

Based on above-mentioned results could be again confirmed the following. The key to export success is not the average size of the farm, but the ability of agriculture and then the food industry to generate added value. It is necessary to establish links between agriculture and food industry. And it is necessary to reduce their mutual „fights" as they are dependent on each other. While in many old Member States the agrarian sector serves primarily as a source of raw materials, which are subsequently processed by the food industry, and this production is further exported. In the case of new Member States the situation is the opposite. A high proportion of agrarian production is exported without going through any process increasing its added value. Figure 1 has been illustrating the strong dominance of the old Member States over the new Member States. There is also a strong position of countries with access to seaports and those countries specialized in re-export operations. In this respect, the Netherlands and Belgium have been dominating. Differences existing between old and new Member States tend to be progressively improved. The new Member States dynamics is rather positive. However, in the area of factor productivity the significant predominance of old Member States still exists.

The results of the cluster analysis show (figure 2) that the EU countries according to the above-mentioned parameters can be divided into three groups: 1) The Netherlands, Belgium, Luxembourg and Denmark (countries with an export strategy based on re-exports and food processing capacities, specialized primarily in the export of food production. The role of non-processed agricultural exports is limited.); 2) Great Britain, Sweden, Austria, France, Ireland, Slovenia and Germany (countries realizing agrarian and food exports through the interconnection between agro and food sectors. They are oriented primarily towards higher value-added exports.); 3) Other EU countries - their exports are uncoordinated. They agrarian and food sector export performance is suffering because of lack of mutual coordination. The high share of agrarian mass is exported only with minimal or no degree of processing.

Figure 2: Cluster analysis results based on the following inputs (export value per farm, average farm size, export value per hectare of agricultural land and per farm worker)



Source: UN COMTRADE, EUROSTAT, own processing 2019

4. Conclusion

The results of the analysis proved the significant differences existing in the area of value development and especially in the area of agrarian trade value dynamics at the level of individual EU28 countries. The observed aggregates 00, 01, 02 and 04 show a significant dominance of the old Member States over the new Member States. EU15 countries control more than 83% of the value of realized exports, but in addition they are able to dominate the new Member States in terms of factor productivity. The recalculated values of agricultural exports per hectare of agricultural land, or per one AWU unit are significantly higher for the old Member States compared to the new Member States. However, the average hectare size (often discussed as the key to doing business in agriculture) is definitely not the key to export success. Countries having much smaller farms only few employees per farm are able to compete. They are even able to dominate over countries having larger farms and employing more people (even for lower wages).

The key to export success in this respect is the ability to generate higher value added, or to use agriculture not as a source of exports, but primarily as a source of raw materials for manufacturing industry. In conclusion, the differences among the EU28 countries will not be easy to eliminate, and in particular the new Member States will be forced to continue the process of restructuring their agrarian sector in the coming years. It is necessary for EU13 countries to increase especially export/AWU performance, and to support the higher level of coherence between the agrarian sector and the food sector. They have to be able to compete primarily through the growth of processed food export and not to be dependent on export of non-processed/raw agrarian output.

In conclusion, it can be stated that the farm size is not the main determinant of agri-food export. The differences in productivity of EU13 and EU15 Member States can be considered as much more important factors determining agri-food export of EU countries.

Finally, the processed paper analysed differences existing among individual countries only in relation to selected factors (labor, land, farm). There are also many other factors affecting individual countries agrarian exports productivity. The important element affecting the level of individual countries' productivity is public support (national or EU). The influence of subventions and subsidies supporting individual EU countries' agri-food export and agrarian sector performance have to be taken in consideration. Among individual EU countries, the significant differences in agrarian sector public support have been existing. The impact of the subventions on individual EU countries' agri-food export have to be analysed as a next step of our research.

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SURVEY OF SOCIAL MEDIA USAGE IN THE CZECH AGRICULTURAL SECTOR

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Annotation: In the past decade technical advances in information communication technologies have driven changes to virtual collaboration in agricultural industries around the globe. The paper proposes a conceptual project in which a survey of social media usage in the Czech agricultural sector is aimed at discerning whether a community of practice exists, and if not, can one be implemented? The topic is timely, as a new generation of agricultural communities cognizant of the power of social media face new challenges. The paper will focus on the methodology of survey data extraction and the sociomaterial approach called the Mangle of Practice, to elaborate on the

Key words: Social Media, Communities of Practice, Virtual Communities, Best Practices, Knowledge Sharing, Agriculture, Survey

JEL classification: D38, C31, O33

1. Introduction

Social media has given rise to virtual communities allowing members to share knowledge about specific topics that can improve the quality of life across horizontal knowledge transactions. (Chiu et al., 2006; Ridings et al., 2002; Wasko and Faraj, 2000; Preece, 2000). They are held together by a common interest in a body of knowledge and are driven by a desire or need to share problems, experiences, insights, templates and tools, which together are called best practices. As entities of social interaction, virtual communities imply changes in how knowledge sharing occurs within and across organizations. However, their value fundamentally depends on the level of involvement and engagement by its members (Hsu et al., 2007).

In general, knowledge sharing presumes a two-way relation between at least two parties (i.e., subjects capable of 'knowing', individuals or collectives), of which one communicates knowledge and the other perceives knowledge expressions and makes sense of them (Hendriks, 1999). Kotlarsky and Oshri (2005) identified two basic approaches towards sharing, namely, *transactive memory* (implying knowledge about who knows what) *and collective knowledge* (invisible structures built on language and shared experiences).

A virtual community refers specifically to an online social network in which people with common interests and needs interact repeatedly within certain boundaries (Chiu et al., 2006; Porter, 2004; Preece, 2000; Slevin, 2000). Virtual communities take a variety of forms, ranging from interest-based open groups (de Valck et al., 2007) to organization-hosted groups of practitioners and professionals (cf. Ardichvili et al., 2006; Usoro et al., 2007). Accordingly, knowledge sharing in virtual communities has attracted growing interest in the literature (Chiu et al., 2006; Hsu et al., 2007).

1.1 Communities of Practice and Best Practices

We focus on communities of practice that are essentially "a group of people who share a concern or a passion for something they do and learn, and how to do it better as they interact regularly (Wenger-Trayner and Wenger-Trayner, 2015, p. 1)". Communities of practice create best practices through knowledge sharing. These are often methods or techniques that are generally accepted as standard to any alternatives because they produce superior results (Rhoades and Aue, 2010). However, the use of modern information communication technologies or 'ICTs' for improving agricultural standards through knowledge sharing and best practices has remained a challenge. For instance, while most agricultural organizations in the United States and Europe rely heavily on websites, they are only moderately on social networking and microblogging sites, rarely using online media to share information with each other. This is a lost opportunity, as most people agrarian businesses and communities see the benefits of such tools but are still leery to adopt them in fear of losing time and resources (Lubell and Hoffman, 2014).

Public sector programs have attempted to overcome information-related barriers to technological adaptations to agriculture, but such programs have been widely criticized for their limited scale, sustainability, and impact (Zuiderwijk and Janssen, 2014). Yet, the rapid spread of mobile phone coverage in developing countries, and central and eastern Europe in particular, provides a unique opportunity for the growth of new communities of practice through social media (Aker, 2011). We espouse this concept for the Czech agricultural sector, which is now becoming more populated with the latest generation of agricultural workers that have come of age with modern-tech-savvy skills.

1.2 Czech Agricultural Sector

The entrance of the Czech Republic to the EU marked a period of fundamental chances to agrion culture and economy for the country. Agriculture had to adapt not only to conditions of the common EU market, but also to the conditions of a globalising world. Profits in agriculture have increased; however, the total volume of agricultural output has decreased significantly. The Czech Republic has lost food self-sufficiency and the problem of uncultivated land has become a persistent challenge. The import of cheap agricultural products from abroad has also affected the development of agriculture and led to the decrease in employment and wages (Svatoš and Smutka, 2009; Kołodziejczak and Kossowski, 2011).

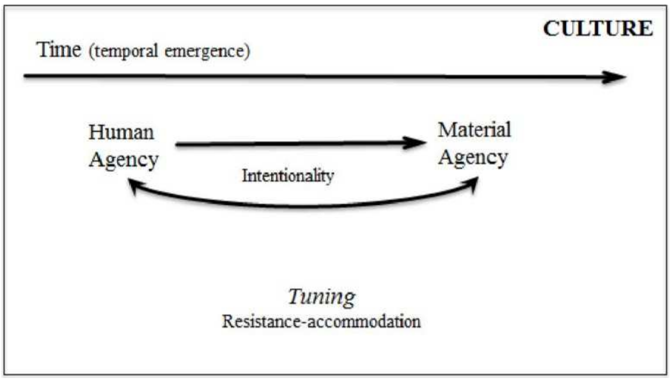
To preserve some dimension of agrarian culture and national self-sufficiency, it is important to support the diversification of new job roles involving young people and a virtual infrastructure that can effectively convey transferable sharable across the Czech agricultural sector (Vanek et al., 2010). Diversification plays a significant role in the multifunctional understanding of the sector and its relationship to the EU Common Agricultural Policy, which is focused on keeping farmers in rural areas with cost-efficient technology adaptations (Věžník, Král, and Svobodová, 2013). In that spirit, we propose the development of a community of practice holistically by encouraging members to participate in the development of a community of practice via a dedicated social media platform. However, we must first gauge the existing usage of social media among agriculture producers to see whether a sufficient level of awareness and training exists for creating a 'virtual community of practice', as well as gaining an accurate representation of the sector's relevant stakeholders.

2. Materials and Methods

A sociomaterial approach is focused on understanding the constitutive entanglement of the social and the material in organizational life (Hoppen, Klein and Rigoni, 2017). Pickering's mangle of practice concept (1993) will be considered in order to understand the mutual interdependence between social and technical elements when developing a virtual community of practice. It concerns the interplay between material and human agencies that evolve over time through a continuous dialectical process of resistance and accommodation called 'Mangling' (Pickering, 1995).

In relation to ICT, the interaction process between human and material agents results in the intangibility of products – platforms with services and informational content and their use by different people in a diverse range of organizational and interorganizational work practices. In this context, the mangle of practice approach may help to explain why the design of an information system, in our case a virtual community of practice, can be potentially problematic. Unintended consequences and unforeseen social actions can emerge to create alternative uses of a social media platform through an appropriation process (Jones, 1998). Figure 1 shows the main elements that constitute the mangle of practice process:

Figure 1. The Mangle of Practice Process



Source: Pickering, 1993.

More recent work in this domain has drawn on institutional theory to argue that on the one hand, technology can become inscribed with institutional forces that set the rules of rationality (Powell and DiMaggio, 1991). On the other, it contributes to the structuring of organizations as they evolve with changing environments (Scott, 1995). For example, Silva and Backhouse's (1997) case study of the London Ambulance Service considered how ICTs became institutionalized, as new rules and meanings embedded into the existing information systems' design.

We organize our work under the banner of "sociomateriality" as a distinctive move away from seeing actors and objects as primarily self-contained entities that influence each other (Slife, 2005). Instead, we will focus on agencies that have so thoroughly saturated each other that previously taken-for-granted boundaries are dissolved. Our analytical gaze is drawn away from discrete entities of people and technology, or ensembles "of equipment, techniques, applications, and people" (Orlikowski and Iacono, 2001). Another way to put this is that this is a move away from focusing on how technologies influence humans, to examining how materiality is intrinsic to everyday activities and relations.

Similarly drawing on a relational ontology, Latham and Sassen (2009) point to the emergence of whole new sociotechnical relations and domains— digital formations—which they argue need to be constructed as objects of study. These "sociodigitized" structures "exhibit dynamics of their own that derive from technological capacities that enable specific patterns of interaction" (ibid, p. 5). In this view, data, information, and knowledge are 'mangled' together creating a new institutional life (habitat) that reconstitutes the organizational reality. Thus, everyday practices are configured and reconfigured by the introduction of new forms of communication and the multiple meanings that are fused together in that process. Eventually, resistance to ICTs will soften, as the usage of social media will enable more robust knowledge sharing. In turn, broader exchange of knowledge across networked communities will generate best practices that become tacit instruments of sectoral change and improvement.

3. Results and Discussion

From the survey results, we expect to derive consensus on the relationship between technical competencies and the essential linkage to performance standards. These will be helpful for essential knowledge, skills and attitudes towards social media usage. Since our survey will gauge the respondent's perspective on the usage of social media in the Czech agricultural sector for knowledge sharing [ostensibly via a community of practice], we will apply a standard set of questions across all the feedback surveys that we conduct to have a common basis for comparison.

The survey data will be collected using a web-based questionnaire, allowing respondents up to three weeks for responses. Following this rough timetable, we can then proceed with further work aimed at encouraging the development of a community of practice among the relevant stakeholders. During the data analysis, comparisons will made between the survey results and between the responses from the public associations mentioned earlier, as well as their counterpart enterprises. Following the example by Serrat (2017), the quantitative portion of our questionnaire will then be plotted on bar charts that use percentage response rates to facilitate comparison between the surveys.

The areas of inquiry will enhance references to critical success factors in dealing with the creation of a community of practice through virtual means. In this way, we will observe the issue of sociomateriality in organizational life by seeking instances of the 'Mangling process' in the Czech agricultural sector.

The analysis of survey findings will be clustered under three headings as shown in Table 1: (i) community, (ii) organization, and (iii) functions.

Table 1. Analysis Clusters

Community	Organization	Functions
• A domain that energizes the core group and inner circle. • Skillful and reputable managers and facilitators. • Clearly defined roles among core groups and inner circles. • Involvement of members. • The details of best practices are addressed. • Regularity and mix of activities.	• Strategic relevance of social media in the domain. • Organization's business processes. • Judicious mix of formal and informal structures. • Available resources. • Consistency of attitudes towards best practices and knowledge sharing.	• Clearly delineated functions • Capacities, skills, resources and systems match functions. • Recognition given for achievement of functions.

Source: Serrant, 2017

The responses to free form questions will also provide a rich source of views and ideas about the industry. Responses to free form questions will likely be clustered under text headings or topics developed by the initial examination. We can then apply the same method to cluster the responses and draw on direct comparisons between them. The survey will include both multiple choice and free form answers. In this way, we aim to find promising opportunities to record a baseline from which we can measure the feasibility of a virtual-community of practice in the Czech agricultural sector.

To ensure we are submitting our survey in a GDPR compliant fashion, we will be sure to communicate clearly in the survey invitation the purpose of our survey. This will include *why* we are collecting the data, *what* we are going to do with the data, and *if* we will be sharing it with any third parties. We will not be collecting any personally identifiable information in the survey (name, email, phone, etc.), however if the respondents do submit such information, then we will be sure to communicate a post-survey follow-up with those individuals and keep such records secure and confidential ("GDPR Regulations", n.d.).

a. **Google Forms**

The purpose of our survey is to discern the level of engagement with social media and knowledge sharing among key stakeholders in the Czech Agricultural Sector. Using *Google Forms*, we will distribute an electronic survey to several agricultural enterprises and associations in the Czech Republic. These are delineated into two groups: public associations or communities and private enterprises. These will include: The Czech Ministry of Agriculture, The Agricultural Association of the Czech Republic (GFAR), *Association* of Private *Agriculture* of the *Czech Republic*, Association of Local food Initiatives, *Agro* C.S., Farmtech, A.S., Brandt Agriculture Products Ltd., and Skupina Coop. This initial group of stakeholders will be approached with the intent to secure a wider mailing list featuring additional enterprises, associations/communities pending further inquiries into the domain. We also want to build an accurate representation of the Czech Agricultural sector and its relevant stakeholders.

Overall, *Google Forms* is a tested and reliable platform for collecting the quantitative and qualitative data regarding the conditions needed for a community of practice in the Czech agricultural sector—facilitated via social media connectivity and usage ("Creating a form as easy as creating a document", 2019). With *Google Forms*, we will create a set of questions and invite participants via email to respond to our inquiries. The exact number of questions will be determined, but not to exceed 60. The purpose of the survey to a gauge the socio-technical landscape of the Czech agricultural sector before taking further action. Response types can include entering free-form text, selecting from a defined scale, or choosing from a restricted set of options. In Google Docs, a form can be stand alone or be used to collect responses that feed into a spreadsheet, which can then be used to manipulate the data gathered (Admin, 2018; Beck, 2019). *Google Forms* will automatically tally the responses, giving us data in the form of statistical percentages and semantic text.

4. Conclusion

The proposed work considers a conceptual description for a survey concerning the extent of social media usage for sharing sectoral knowledge about agriculture through communities of practice. Communities of practice are a useful approach to knowing, learning and improving organizational and community performance through the development of knowledge sharing networks. A sociomaterial approach will be used to understand the constitutive entanglement process brought on by the introduction of new forms of communication into an industry or sector. Therefore, we will apply Pickering's mangle of practice concept in order to understand the mutual interdependence between social and technical elements when developing a virtual community of practice.

In relation to ICT, this context, may help to in the future design of an information system, in our case a virtual community of practice facilitated by a dedicated social media platform or outlet. In this way, our work will contribute to existing literature with a new outlook on how communities share best practices through social media in the Czech language, society and culture. The work will be prepared, carried out and administered by the Department of Information Technologies in cooperation with the Faculty of Economics and Management of the Czech University of Life Sciences.

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GAINING COMPETITIVE ADVANTAGE THROUGH TEAM ATTRIBUTES: CASE STUDY OF KOSOVO

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Annotation: This paper aims to examine the perception of large versus small scale companies on the key team attributes required to gain competitive advantage. While the number of companies is consistently growing and the competition is higher than ever, gaining competitive advantage through the team is becoming a new strategy which companies are pursuing. Much of the current research on gaining competitive advantage through team attributes focuses on large companies, thus, failing to take into consideration small companies. Even less research is focused in developing countries let alone Kosovo. A qualitative approach specifically directed content analysis method was undertaken. Directed content analysis method allows for the identification of codes through an existing theory. Discussion is organized based on the Team Climate Inventory framework. Codes derived from the theory include: Vision, Participation, Task Orientation; and Support for Innovation. The study utilizes in-depth interviews due to the subjectivity of the topic. Findings show that large-scale companies believe that vision of a company should be set from the initial states of operation; however, small-scale companies are very flexible about the vision and believe that vision is built along the way. When it comes to participation, the general perception is that decision-making should be at the higher management level and should the employees like to be involved, they should consistently show initiative, in contrast to small-scale companies for which the decision-making is focused at the team and all team member opinions are considered. Small scale companies do not have a level of hierarchy into place as large-scale companies do. Large scale companies are very task oriented and offer very little room for adjustments due to the type of clients they work for. In a lot of cases the same holds true for small-scale companies but it is worth noting that small-scale companies also offer flexibility when it comes to the task being performed. Finally, finding show that, large-scale companies and small-scale companies are at the same level when it comes to the level of innovation. They both believe that their business concepts are not innovative since these concepts already exist in developed countries.

Key words: competitive advantage, companies, teams, attributes, Kosovo, developing countries

JEL Classification: L1, L26, M13

1. Introduction

With today's business environment where risk and instability are the new normal, gaining competitive advantage through team attributes has become a new trend (Lepsinger, 2018). Competitive advantage it referred to as a unique position which a company has in comparison to its competitors (Hofer and Schendel, 1978; Porter 1985). During the past, competitive advantage concept was mainly related to the economic characteristics specifically cost-competitive advantage through which a company is at an advantage over other companies in terms of keeping lower costs in producing a product or service. While there is a considerable research conducted on cost-competitive advantage, very little research takes into consideration the role of teams and their attributes in the process of gaining competitive advantage. Furthermore, much of the current research on gaining competitive advantage through team attributes focuses on large companies, thus, failing to take into consideration small companies

(Birley & Stockley, 2000). As such, this paper aims to examine the perception of large versus small companies on the key team attributes required to gain competitive advantage.

When it comes to the discussion of team attributes, the concepts of heterogeneity and homogeneity are essential. In one hand, heterogeneous teams are characterized with team members who have diverse beliefs and values which in turn means "consisting of dissimilar elements or parts" (Merriam-Webster, 2019). On the other hand, homogeneous teams are characterized as having "identical cumulative distribution function or values" (Merriam-Webster, 2019). Homogenous teams share similar beliefs and attributes; therefore, displaying cohesion which oftentimes translates into goal accomplishments and productivity.

In understanding team attributes, Tziner (1985) tackles two opposing theories i) Equity and ii) Similarity which tend to draw conclusions on how the performance of teams is affected by team composition and attributes. In one hand, equity theory as presented by Adams (1969, cited in Tziner, 1985) states that team performance is characterized with tensions which arise by team members who hold different positions with respective to their tasks. On the other hand, similarity theory tends to argue that homogenous team members tend to be more successful as they share common values, attributes and goals (Bowers et al., 2000).

Subsequently, research shows that "attraction" enables expressive relations, communication, shared norms and cohesiveness (Tziner, 1985). It goes beyond, by adding that heterogeneous teams are less productive due to different beliefs within the group which most of the time lead to tensions. Similarity theory fails to consider that oftentimes-different viewpoints lead to innovation and creativity, and in practice there are complex tasks, which require independence and a variety of expertise that could lead to the solution; subsequently, increase the overall performance of the team. Finally, when discussing teams, the concepts of achieved or ascribed characteristics are elaborated (Tolbert et al., 1995).

Achieved characteristics offer specific cues in terms of competences or accomplishments of an individual or a team including i.e. job title, hierarchy position, reputation and educational level (Tolbert et al., 1995). In other terms, achieved status is what we as individuals or teams accomplish during our lives (Schoepflin, 2010). In contrast, ascribed characteristics provide information of a more general nature in which the individual or the team has very little, if any, influence i.e. gender, race, ethnicity, social class (Tolbert et al., 1995).

Ultimately, following the tradition of research on teams, it is pertinent to understand that team attributes are highly correlated to the overall performance of the team and process of gaining competitive advantage. Throughout literature, these attributes include factors such as leadership, group size, communication patters and resource availability (Payne, 1990).

2. Materials and Methods

The purpose of this paper is to examine the perception of large versus small companies on the key team attributes required to gain competitive advantage. This study focuses on companies located in Kosovo. The country was chosen primarily for having a developing economy, where the private sector has significant implications to the overall success of country's economy. From the practical perspective, understanding key team attributes which lead towards competitive advantage is of high relevance for internal company stakeholders, such as founders, CEOs, managers and team members, but also for external stakeholders, such as incubators, consulting companies and investors. This study lays the groundwork and serves as a guideline for individuals and teams aiming to establish a company, letting them know where to place focus.

While this is the significance in terms of the geographical and practical perspectives, the implications for academia are also relevant since very little research considers developing countries. As the concept of competitive advantage through team attributes has been researched but mostly within the context of large-scale companies, this study aims to bridge the gap by providing answers on the perception of key team attributes including small companies as well.

For the purpose of this study, a qualitative approach specifically directed content analysis method was undertaken. Directed content analysis method allows for identification of codes before and during data analysis process through an existing theory (Hsieh and Shannon, 2005). Discussion is organized based on the Team Climate Inventory framework presented by Anderson, Hardy and West (1996). Codes derived from the theory include: Vision, Participation, Task Orientation; and Support for Innovation. The study utilizes in-depth interviews due to the subjectivity of the topic. The decision to use in-depth interviews is heavily based on the subjective nature of this research, as the method allows for the investigation of social meanings (Long et al., 2000; DiCicco-Bloom & Crabtree, 2006). In addition, studies exploring the topic of competitive advantage have proved that interviewing as a research technique is effective on understanding perceptions of the subject of study.

During the interview, respondents were presented with four codes and were asked to elaborate on each code concerning their company. This allowed the researcher to have a checklist of topics to lead the discussion rather than a set of predetermined set of questions. As such, the respondents shared relevant data; thus, avoiding scenarios with interviewer expected answers. Discussion was organized based on the following categories:

- Vision;
- Participation;
- Task Orientation; and
- Support for Innovation.

Recurring themes led to the inclusion of morale and motivation, risk and flexibility as factors in gaining competitive advantage.

10 companies in Kosovo were contacted, out of which 6 agreed to participate; therefore, making the response rate at 60 %. Three out of six companies in total are small companies and three others are large scale companies. All companies operate in the technology industry and all interviews were conducted in person. Companies' chief executive officers are at the center of this study, thus, being the subject of the interview. An overview of each participating company and its characteristics is presented below. Each company is coded with numbers from 1 to 6 to maintain the anonymity of the respondents.

Table 1. Description of Interviewed Companies

Company Code	Age	# Employees	Industry
1	1	17	Tech Industry
2	4	9	Tech Industry
3	2	5	Tech Industry
4	13	223	Tech Industry
5	18	374	Tech Industry
6	20	585	Tech Industry

Source: own research, 2019

3. Results and Discussion

3.1 Vision

The responses in this research are much in line with the extant literature when it comes to vision. However, it is very interesting to observe the difference between large vs small companies. All respondents do unanimously agree that having a defined vision and mission can be compared to a roadmap for a business but not all think that a vision should be set from the beginning. Company 4: "Clear mission and defined objectives serve as a roadmap in achieving long term goals".

Company 1 raises a very important aspect that is also the knowledge of the team on the need for a vision. The respondent goes further by also adding that vision can also be figured or change along the way. Company 3: "It is very important for the company to consider the future beyond the initial phases of operation and have a specific long–term vision in mind. However, at this stage a specific strategy in paper does not exist, maybe because of i) lack of necessary knowledge to come up with a long–term strategy or ii) this process is figured along the way or change along the way".

This is also supported by Company 2 that believe that the vision of a start-up team can change and that especially after the first cycle of the operation.

On the other hand, company 6 that has 20 years of experience believe that the vision of the company must be clarified at the beginning because it identifies goals and what exactly needs to be done. As such, one clearly can see the difference in the line of thinking between those who have drastically less experience in the market.

Interestingly, this is also supported by company 5 that is also the second in line when looked from the age perspective, with eighteen years since its founding. They state that they operate as a team with everyone having different tasks, which facilitates the process of fulfilling their vision.

Finally, patterns in responses of small-scale companies circled around the notion of risk. Oftentimes, the concepts "company" and "risk" go hand in hand, especially when the company is operating in a developing country such as Kosovo where for decades the country has undergone conflicts and economic difficulties. The market is volatile and unpredictable; therefore, the notion of risk came up as one of the factors which a team must possess in order to be able to operate. The notion of risk was mentioned by small scale companies rather than large scale companies.

3.2 Participation

When asked regarding participation of the team in the process of decision-making, respondents of small-scale companies believe that it is very important to share information with each other, rather than keeping it at the founder's level. This is mainly because of the small number of employees and the feel that the team has which equates to that of a "family"; therefore, everybody's opinions are valuable. The opposite holds true for large-scale companies.

Company 3: "It is extremely important to have a strong team participation within the workplace as within the start-up we consider ourselves as a family".

Company 1: "Currently we are a small company operating in one office. We do not have a hierarchy in the decision-making process meaning that the opinions of everyone are considered.

Company 6 adds to the discussion the concept of initiative by highlighting that it is very important for the team to feel involved as much as possible; however, decision-making should be at the management level and should employees want to be involved they have to show initiative.

When discussing participation, team morale and motivation that equates to the feeling of being valued at the workplace came up by all participants in the research. Respondents believe that high team morale leads to low turnover as well as influences the overall productivity.

3.3 Task Orientation

All respondents from small-sale companies agreed that task orientation and creativity in completing tasks is crucial for the survival of the company and its growth. This is mainly because of the nature of the field in which these companies operate and the speed of the technology.

Company 1: "In our company it is very important to have the right technical skills because it all depends on the skills and abilities to use certain technologies. Sometimes we must follow strict requirements defined by our clients; therefore, there is no place for creativity whatsoever. But there are cases when the client gives us the liberty to come up with the concept".

Company 3: Having the appropriate staff in terms of skills and capabilities eases the path toward success by 50%. In today's world without the technology and creativity you will not be able to penetrate any market".

In contrast, company 6 states that they strictly follow requirements and there is no room for creativity because of the type of the clients they provide services.

Due to high risks which small-scale companies face on daily basis, flexibility came up frequently as a trait which one team must possess. It is believed that with the constant changes in the tech industry, team members must be able to respond on the go especially when the risk is high and level of information from time to time is low. Again, this did not come up in the discussion with large-scale companies.

3.4 Support for Innovation

The innovation factor has presented very interesting results. When asked to elaborate on the innovativeness of their company, almost no respondents thought that their company is innovative, even though the products/services offered by these companies are the first offered in the Kosovo market. This is mainly because their idea is a replication of an existing successful business in a developed country.

Company 1: "We do not provide a high degree of innovation as a business considering that such companies exist in Czech Republic called Seznam; in Russia exists Yandeks, and there is another one in Japan. However, we provide important information that are geographically focused and target those who speak the Albanian language".

4. Conclusion

The main objective of this paper is to examine the perception of large versus small companies on the key team attributes required to gain competitive advantage. The study is focused on companies operating in Kosovo. The findings of the study are based on a qualitative approach specifically directed content analysis method. The method allows for the use of an existing theory as a benchmark. For the purpose of this study, codes derived from Team Climate Inventory framework is used and include: i) vision, ii) participation, iii) task orientation; and iv) support for innovation. In terms of vision, findings show that large-scale companies prefer a set vision from the early stages, however the opposite holds true for small-scale companies, which believe that vision can change and is built along the way. When vision was discussed with small-scale companies, the term risk came up frequently. Findings show that small scale companies face constant risks but are also risk takers thus setting them apart from large scale companies. Large scale companies believe that decision making should be at the management level of hierarchy whereas small scale companies view the company as a family therefore decision making is focused at the entire team. It is safe to say that both large- and small-scale companies are very task oriented; however, the main difference lies in the flexibility allowed to alter and be creative. This is a result of the client base and their requirements. Finally, because of the country's development history, large-and-small scale companies unanimously believe that their business concept is not innovative at all. This is mainly because it is a replication of a business, which already exist in developed countries. Further study will be devoted in building a comprehensive analysis on the key team attributes, which could lead to competitive advantage by broadening the sample size of the study and including more countries with a similar history and economy.

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CHANGES IN CONSUMER AND PRODUCER NOMINAL PROTECTION COEFFICIENT FOR MILK BETWEEN RUSSIAN FEDERATION AND SELECTED COUNTRIES BEFORE AND AFTER INTRODUCTION OF RUSSIAN IMPORT BAN

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Annotation: Paper attempts to study the changes in Consumer and Producer Nominal Protection Coefficient for milk in Russia and selected countries due to Russian import ban, introduced in 2014, in order to assess the impact of import ban on agricultural enterprises, farmers and consumers in Russia. Dataset covers 22 countries, both OECD and non-OECD members, for the period of 1995-2017 and is analyzed using descriptive statistics and difference-in-differences approach. Main findings support the opinion, that the cost of Russian import ban was allocated to consumers of milk, and part of farmers' support was reallocated from taxpayers (state) to consumers. Excess increase of Consumer NPC is estimated within the range of 0.083-0.138, while excess increase of Producer NPC is estimated within the range of 0.095-0.145. Russian Federation has increased Percentage SCT after 2014, however these changes are not extreme in comparison with other selected OECD and non-OECD countries.

Key words: Russian import ban, agricultural policy, consumer support estimate, producer support estimate, milk.

JEL classification: Q18, F14, F51.

1. Introduction

The topic of Russian import ban, that was introduced in 2014 as a countermeasure to European sanctions, is widely discussed in the economic literature. Several attempts have been made to estimate the impact of import ban on Russian and European economy, however there is no definite answer to this question. Policy department of European Parliament projected that Russian import ban will affect 73% of EU export to Russia (Kraatz, 2014). Kutlina-Dimitrova (2017) presented the results of CGE modelling, which showed that for the exports of the EU, the USA, Norway, Canada and Australia the impact of ban is limited, but several products on disaggregate level, such as vegetables and fruits, dairy products and other meat, are experiencing two-digit percentage declines. Dreve et al. (2015) concluded, that loss of Russian market will cause too small effect on job market of European Union, as share of agriculture in GDP of most of the countries is low. Some of the researchers point out that Baltic states should be considered as the most affected by Russian import ban, however re-export should be considered. Oja (2015) has argued, that the overall impact of the sanctions on GDP, once intra-EU supply chains are taken into account, is below 0.5% of GDP in all the Baltic states. Smutka et al. (2016) have showed that the most affected product groups are perishable vegetables and fruits, while they also showed the evidence of decreased competition on Russian market, which among with rouble depreciation and increase in transaction costs has led to growth of food prices, from 2.66% in 2013 to 14.1% in 2014. Wengle (2016) pointed out on increases in production of pork and decreases in diary, beef and fish due to effect of import ban. Wegren and Elvenstad (2018) presented an evidence of increased Russian self-sufficiency in food and seafood and discussed the fact that Western trading partners for food and seafood were replaced by partners from Asia and Central Asia, with no easy prospects for Western food exporters to recapture the share on Russian market even after import ban.

Increase of self-sufficiency was one of the implied aims of Russian import ban, as Wegren et al. (2016, 2017) pointed out different understanding of food security by Russian political leaders, where Russian variant of food security connects food trade and national security, therefore increased self-sufficiency improves national security. Due to this fact, it is important to assess the cost of improved self-sufficiency, and answer the question of who paid the cost of self-sufficiency, related to import ban.

The aim of this research is to identify excess changes in Consumer and Producer Nominal Protection Coefficient, Percentage SCT for milk in the period before and after import ban and compare these changes with other OECD and selected non-OECD countries. Excess changes of chosen indicators reflect how transfers between consumers and producers (agricultural enterprises, farms) has changed in Russia after import ban in comparison to other OECD and selected non-OECD countries due to market price differential, i.e. difference between domestic and border price of agrifood products. Import ban, being an example of significant policy change, provide empirical material for the purposes of such studies.

Assessment of changes in chosen indicators adds to the ongoing discussion of how the position of agricultural enterprises, individual farms has changed as a result of Russian import ban. As it stems from the definition of chosen indicators, they estimate the level of support to agriculture coming from market prices, rather then from government sources. Another discussion exists on which type of support is the best solution for different economics, but the case of Russian import ban gives a unique opportunity to see how exceptional restrictive measures can impact farmers, agricultural enterprises and, last but not least, consumers.

2. Materials and Methods

Data for the research originates from OECD Producer Support Estimate Database (OECD, 2018). Data covers 22 countries, from which 14 are OECD countries, including Australia, Canada, Chile, Iceland, Israel, Japan, Korea, Mexico, New Zealand, Norway, Switzerland, Turkey, United States and European Union, and 8 are non-OECD countries, including Russia, Brazil, China, Colombia, Costa Rica, Kazakhstan, South Africa and Ukraine. For all countries in scope of the research OECD calculates Producer Support Estimate and Consumer Support Estimate for milk, indicators for European Union are calculated as one country. Data used in the research covers period of 1995-2017, with special focus on 2013 and 2017, as Russian import ban was introduced in 2014, and the most recent available data is for the year 2017.

Consumer Nominal Protection Coefficient (Consumer NPC), Producer Nominal Protection Coefficient (Producer NPC) and Percentage of Single Commodity Transfer (Percentage SCT) are used to analyze the effects of import ban on consumers and producers in Russian Federation in comparison to other OECD and non-OECD countries. Consumer NPC is the ratio between the average price paid by consumers (at farm gate) and the border price (measured at farm gate) (OECD, 2019). Producer NPC is the ratio between the average price received by producers (at farm gate), including payments per ton of current output, and the border price (measured at farm gate) (OECD, 2018). Percentage SCT is the Single Commodity Transfer (SCT) expressed as a share of gross farm receipts for the specific commodity (including support in the denominator). Consumer Single Commodity Transfers (consumer SCT) is the annual monetary value of gross transfers from (to) consumers of agricultural commodities, measured at the farm gate level, arising from policies linked to the production of a single commodity (OECD, 2019).

In general, Consumer NPC, Producer NPC and Percentage SCT are calculated as follows:

$$Consumer\ NPC = \frac{Average\ price\ paid\ by\ consumers}{Border\ price} \tag{1}$$

$$Producer\ NPC = \frac{Average\ price\ received\ by\ producers}{Border\ price} \tag{2}$$

$$Percentage\ SCT = \frac{Single\ Commodity\ Transfer}{Gross\ farm\ receipts} \tag{3}$$

Dataset is analyzed using methods of descriptive statistics, including calculation of mean, median, standard deviation, skewness and kurtosis for each of the time series. The effect of introducing import ban is estimated using difference-in-differences model, firstly introduced by Ashenfelter and Card (1985). Time series of each variable for Russia is considered as "treatment group", while time series for the same variable for other countries in the dataset is considered as a control group.

3. Results and Discussion

Results of comparison show increase in Consumer NPC after introduction of Russian import ban. Four-year average value of Consumer NPC (averages for 2010-2013 and for 2014-2017) for milk in Russian Federation has changed by 11.9 percentage points from 1.176 to 1.295. For the same period in OECD countries this indicator has grown by 3.5 percentage points from 1.129 to 1.164, as shown on Table 1.

Table 1. Consumer NPC in 2010-2017, difference-in-differences

Country or Group	Average 2010-2013	Average 2014-2017	Difference-in-difference
Russian Federation	1.176	1.295	0.119
OECD countries	1.129	1.164	0.035
difference to Russia	0.047	0.131	**0.083**
European Union, EU28	1.000	1.009	0.009
difference to Russia	0.176	0.286	**0.110**
Non OECD countries	1.119	1.100	-0.019
difference to Russia	0.057	0.195	**0.138**

Source: OECD, 2019, own calculations

In comparison to OECD countries, Consumer NPC in Russian Federation has grown by 8.3 percentage points, while comparison to non-OECD countries in scope of current paper shows growth of 13.8 percentage points. Remarkable difference is in comparison of Russian

Federation and European Union, where difference is estimated at 11 percentage points. Consumer NPC shows, that average price of milk paid by consumers (estimated at farm gate) has been rising in Russia faster, then in OECD countries, European Union and non-OECD countries in scope of current research. This fact can be an evidence of import ban effect, the cost of which has been allocated to consumers, while agricultural enterprises benefited from higher prices and, as a result, from higher margins.

It is important to mention, that OECD methodology for Consumer NPC calculation compares producer prices at farm gate, so actual increase of consumer price can be different due to the nature of price transition.

Producer NPC shows similar dynamics to Consumer NPC. As can be seen on Table 2, changes in Producer NPC between Russian Federation, OECD countries, European Union and non-OECD countries in scope of current research have difference in the range of 0.3-1.2 percentage points to Consumer NPC. This difference can be described by the fact, that Producer NPC include payments per ton of current output.

Table 2. Producer NPC in 2010-2017, difference-in-differences

Country or Group	**Average 2010-2013**	**Average 2014-2017**	**Difference-in-difference**
Russian Federation	1.204	1.328	0.123
OECD countries	1.110	1.138	0.028
difference to Russia	0.094	0.19	**0.095**
European Union, EU28	1.008	1.018	0.010
difference to Russia	0.196	0.31	**0.113**
Non OECD countries	1.125	1.104	-0.021
difference to Russia	0.079	0.224	**0.145**

Source: OECD, 2019, own calculations

Another insight on the changes due to import ban in Russia comes from Percentage SCT data. As can be seen on Table 3, average 4-year Percentage SCT in Russian Federation increased from 18.95 to 25.35 after 2014, which is equal to 6.4 percentage points. For the same period in OECD countries Percentage SCT increased by only 2.56 percentage points, while in European Union it has increased by only 1.87 percentage point. Non-OECD countries in scope of current research have shown decrease by 4.52 percentage points. Comparison between Russian Federation and other countries shows, that Russia outperformed OECD countries by 3.843 percentage points, European Union by 4.531 percentage points, and non-OECD countries in scope of current research by 10.925 countries.

Table 3. Percentage SCT in 2010-2017, difference-in-differences, in percentages

Country or Group	Average 2010-2013	Average 2014-2017	Difference-in-difference
Russian Federation	18.95	25.35	6.40
OECD countries	10.11	12.67	2.56
difference to Russia	8.84	12.68	**3.843**
European Union, EU28	1.42	3.29	1.87
difference to Russia	17.53	22.06	**4.531**
Non OECD countries	9.16	4.63	-4.52
difference to Russia	9.79	20.72	**10.925**

Source: OECD, 2019, own calculations

At the same time, values for Russian Federation are not the highest values among selected sample. Nine countries out of 22 in 2013 and seven countries out of 22 in 2017 had higher Percentage SCT values than Russian Federation.

Differences in changes of Percentage SCT shows, that milk producers in Russian Federation have been benefited from import ban, and the cost of this benefit has been paid mostly by consumers. Average excess increase of Percentage SCT between Russian Federation and all countries in scope of current research is 6.433 percentage points.

In terms of Consumer NPC value ranking, in the group of 22 countries, for which OECD reports Consumer NPC estimation, Russian Federation was on 3rd place with 1.04 in 2013 and on 4th place with 1.24 in 2017. First place with the lowest Consumer NPC for milk was occupied by Ukraine in 2013 and in 2017 with the value of 0.75. Another neighboring country for Russian Federation, Kazakhstan, was on 2nd place in 2013 and in 2017 with 1.00. There were 11 countries with consumer NPC lower than or equal to 1.00 in 2013, and 12 such countries in 2017. As consumer NPC of 1.00 means that domestic producer price for commodity is equal to border price at farm gate level, these countries did not experience transfers from consumers to producers as a result of domestic and import price difference.

Table 4. Countries' ranking as per the value of Consumer NPC in 2013 and 2017

Ranking	Value in 2013	Countries in 2013	Value in 2017	Countries in 2017
1	0.75	Ukraine	0.75	Ukraine
2	1.00	Kazakhstan, Chile, Mexico, New Zealand, Switzerland, Turkey, Brazil, South Africa, Australia, EU28	1.00	Kazakhstan, Chile, Mexico, New Zealand, Turkey, Brazil, South Africa, Australia, EU28, Colombia, Costa Rica
3	**1.04**	**Russia**	1.08	Switzerland
4	1.05	United States	**1.24**	**Russia**
5	1.07	Costa Rica	1.25	United States
6	1.09	Iceland	1.32	Israel
7	1.22	Israel	1.36	Norway
8	1.27	Colombia	1.41	China
9	1.36	China	1.71	Iceland
10	1.4	Norway	1.72	Canada
11	1.68	Canada	2.15	Japan
12	1.74	Japan	2.35	Korea
13	2.03	Korea	-	-

Source: OECD, 2019, own ranking

Ranking for Percentage SCT shows, that Russian Federation was on 9th place in 2013 with 9.34% and on 8th place with 22.34% in 2017. There were 12 countries with lower than Russian Percentage SCT in 2013, and 14 such countries in 2017. On the other side, there were 9 countries with higher than Russian Percentage SCT in 2013, and 7 such countries in 2017. It is important to mention, that except Costa Rica, Colombia and Norway, all other countries with higher than Russian Percentage SCT have showed increase in Percentage SCT in 2017.

Table 5. Countries' ranking as per the value of Percentage SCT in 2013 and 2017

Ranking	Value in 2013, %	Countries in 2013	Value in 2017, %	Countries in 2017
1	-26.47	Ukraine	-32.19	Ukraine
2	-1.99	Turkey	-0.97	Turkey
3	0.00	Chile, Mexico, New Zealand, South Africa, Australia	-0.65	Colombia
4	0.33	Brazil	0.00	Chile, Mexico, New Zealand, Brazil, South Africa, Australia, Costa Rica
5	1.48	EU28	1.89	Kazakhstan
6	1.74	Kazakhstan	2.29	EU28
7	5.65	United States	19.73	United States, Switzerland
8	6.24	Costa Rica	**22.34**	**Russia**
9	**9.34**	**Russia**	24.28	Israel
10	13.15	Switzerland	28.76	China
11	17.48	Israel	37.74	Norway
12	21.7	Colombia	41.95	Canada
13	25.44	China	56.57	Japan
14	40.57	Canada	57.38	Korea
15	41.03	Norway	61.16	Iceland
16	44.5	Iceland		
17	45.4	Japan		
18	50.68	Korea		

Source: OECD, 2019, own ranking

At the same time, changes in Percentage SCT in Russia is not extraordinary among other countries in scope of current research, as 10 countries out of 22 have increased the Percentage SCT during the period of 2013-2017 – and this fact may lead to a conclusion, that increases in Percentage SCT is due to other factor, then introduction of Russian import ban in 2014. Factors influencing changes in Percentage SCT should be investigated as a part of further research.

4. Conclusion

Changes in Consumer and Producer NPC, as well as in Percentage SCT show, that significant portion of import ban cost has been allocated to consumers. Russian import ban has resulted in increase in transfers from consumers to producers. Excess increase of Consumer NPC is in the range of 0.083-0.138. In case of milk, share of transfers due to market price differential in total farms' receipts grew from 9.34% in 2013 to 22.34% in 2017. This fact can be considered as evidence of reallocating farmers support due to policy change from taxpayers (state) to consumers. At the same time, agricultural enterprises producing milk can be considered to be the main beneficiaries of Russian import ban, as they were able to charge 8.3%-13.8% higher prices for the same product. Nevertheless, in terms of Percentage SCT the position of Russian Federation is not extreme in comparison to other selected countries, as there are countries with significantly higher Percentage SCTs. These results are not unexpected; however, the magnitude of the change resulted from Russian import ban has been discussed a lot in scientific literature and there was no consensus on the value of the impact in specific branches, as well as there is no consensus on who benefited the most from the import ban.

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THE EVOLUTION OF SUGAR PRICES IN THE WORLD ECONOMIC FINANCIALIZATION PROCESS AND THE INFLUENCE OF SPECULATION – THE IMPACT ON EU SUGAR BEET PRODUCERS

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Annotation: Sugar prices during the period of 2000 to 2017 experienced unprecedented fluctuations. The sugar price fluctuations then adversely affected the prices of sugar crops across the globe, including the EU**.** The main aim of this paper is to analyze the price development in the global sugar market within the process of financialization of the world economy, to identify changes in the price of sugar and to evaluate these prices in the context of the behavior of speculators/hedge funds. The results of the above-mentioned analysis of sugar price developments have then been interpreted in relation to the development of European sugar beet production, growing areas and, last but not least, the number of farms engaged in the sugar beet production. In relation to sugar price development – it is possible to highlight the following: Short-term price fluctuations have shown significantly higher relative and absolute values compared to long-term averages. Global price volatility is a very strong incentive for speculators who are eager to make quick profits and show increased interest in the agricultural markets. This may destabilize sugar prices in the future and bring uncertainty to traditional supplier-customer contracts. Furthermore, the results of the analysis show that the current evolution of sugar prices has a negative impact on the production of sugar-producing crops, whose market prices also fall significantly over time. This trend is then negatively reflected in the volume of production realized, as well as in a decrease in the number of sugar beet growers globally. The average size of the farm does not seem to be a key factor in determining whether or not the grower will choose grow sugar beet.

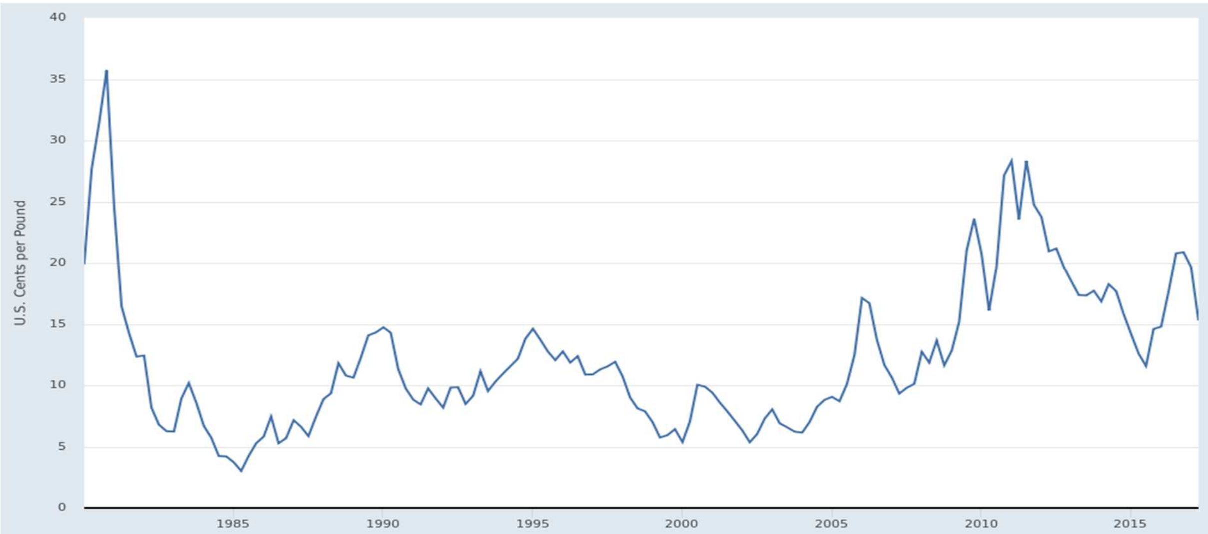
Key words: Financialization, futures, world commodity exchanges, volatility, derivatives market, EU, sugar beet producers, sugar beet.

JEL classification: Q02, Q14. Q17

1. Introduction

Financialization in the world economy has its historical roots in the early 1970s, when the Bretton Woods and the Smithsonian agreements disintegrated (Epstein, 2005). This has resulted in freely floating currency rates and a gradual deregulation of financial markets, allowing for enough space for individual and institutional speculation (Du et al., 2011). For example, in the agricultural commodity markets, the price of underlying assets has become increasingly disconnected from market fundamentals, and the historical price volatility of numerous commodities has increased and has become a potential financial incentive for speculators (Dave, 2009). The sugar market has long been resistant to speculation thanks in part to country protection (Svatoš et al., 2013). In the context of the financial crisis of 2008/2009, this market segment did not avoid the influence of speculative capital. The price of sugar has recently surged upward, influenced not only by speculators but also by an increasing demand for biofuels. Sugar prices in the period of 2000 to 2017 experienced extraordinary volatility. The global price of sugar has risen from about 11 cents (early 2000) a pound for raw sugar to more than 65 cents (at the end of 2010/2011). This fluctuation was mainly due to speculative funds (hedge funds), which in recent years have executed transactions that average approximately 20 million tonnes of sugar per year. Their influence causes extensive volatility in the price of sugar, because these hedge funds are attempting to profit on this price fluctuation (speculation on a price drop or rise) (Irwing, Sanders, 2010). Within the last two decades, global sugar prices have recorded significant changes in its value development (Řezbová et al., 2016). These substantial oscillations have affected sugar prices and sugar market stability. Even more, the long-term sugar price development has resulted in price stagnation (Trostle, 2008). Just within the period of 2011 to 2018, according to the FAO global sugar price index, there was a value reduction from 360 points to 160 points. The period of significant global sugar price growth (2000-2010) was replaced by nearly a decade of continual global sugar price reduction. The realized sugar price reduction considerably affected sugar crop production volume all around the world (Meyers, Meyer, 2008). The negative influence of last years' price development is evident in the majority of sugar producing regions including European Union.

Figure 1. World sugar price development in US cents/lb



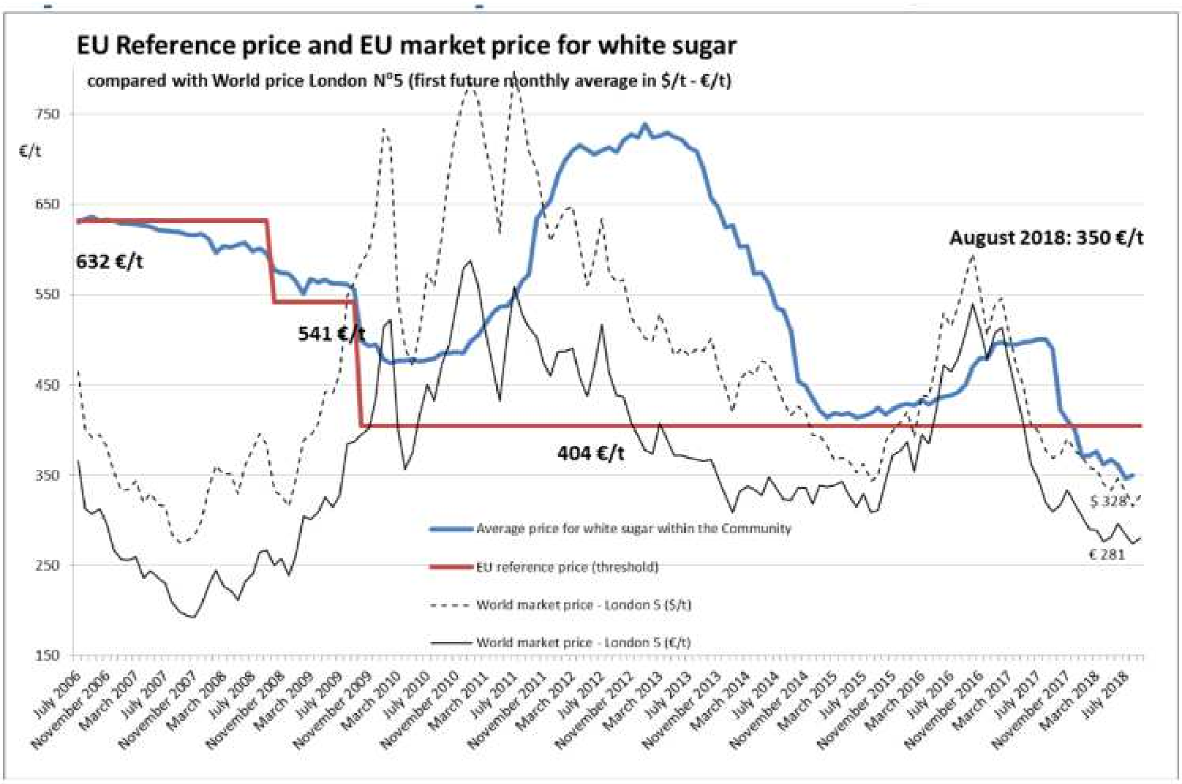
Source: IMF, 2019

The global sugar price reduction has dramatically affected the economies of many European producers. Just within the last few years, the average price of white sugar has decreased from more than 700 EUR per ton to less than 300 EUR/ton. EU sugar price development has been even more affected by running sugar market reform, as only few years ago the European Commission decided to cancel the Common sugar market organization and the system of production quotas and restrictions were removed (Maitah et al., 2016; Kotyza et al., 2018).

The decreasing sugar price development has resulted in significant growth of competition among individual sugar producing regions, countries and companies. The growth of competition has not only affected sugar producers, but also sugar crops producers (Řezbová et al., 2016). The global volume sugar production has halted growth and its volume has stabilized to about 180 mil. tonnes a year. In regards to European sugar production, its volume within the last ten years has increased to 20 million tones, but the growth of production volume has resulted in another price reduction. Constantly decreasing sugar price is also affecting the price of sugar crops. The world price of one ton of sugar cane has dropped within the last decade from about 150 USD/ton to about 70 USD/ton. The global price of sugar beet has also recorded a reduction from cc 100 USD/ton (in 2011) to less than 30 USD/ton (in 2018).

The specific sugar beet price development can be seen in the case of EU countries, as the average EU sugar beet price (main commodity for own sugar production) within the last ten years has decreased by more than fifty percent and its current value is also below 30 USD/ton. There is little doubt that negative price development has been the cause of the reduction in sugar beet production profitability and the number of sugar beet producers has decreased (Řezbová et al., 2016).

Figure 2. Development of sugar prices in EU countries



Source: DG Agri, 2019

2. Materials and Methods

The main aim of the paper is to analyze the price development in the global sugar market within the process of financialization of the world economy, to identify changes in the price of sugar and to evaluate these prices in the context of the behavior of speculators / hedge funds. In this respect, it is mainly about the analysis of price development through basic statistical indicators such as average value, median, minimum and maximum value, coefficient of variation, mean deviation, percentage deviation from variation, and variation range. The results of the above-mentioned analysis that focus on the problems of price developments in the sugar market are subsequently interpreted in relation to the development of European sugar beet production, growing areas and, last but not least, the number of sugar beet farms. In this regard, the article aims to identify the impact of a change in world sugar prices on sugar beet producers in individual EU countries.

The frequencies of fluctuations are analyzed on the basis of ten-year average of raw sugar prices. In this respect, a variation band is determined by observed period alongside with number of price fluctuations (according to monthly averages) which exceed the range of variation determined by their range.

Global sugar prices (according to the methodology of World Bank, contract no. 11) were analyzed in the context of its development from 1960 to 2016. The price (from the average monthly price of raw sugar) used in the analyses is the price published by ISA (International sugar agreement). The analysis works with price movements on the world's most important commodity exchange (New York Commodity Exchange ICE / Raw Sugar Trade). The price of sugar is analyzed in the context of long-term development and in the context of the evolution of sugar prices in the individual decades of the period under review (1960-1969; 1970-1979; 1980-1989; 1990-1999; 2000-2009; 2010-2017 March). The sources of our data for the analysis of sugar price development are the World Bank Commodity Price Data, F.O.Licht and Trading Economics databases. Price analyses were conducted in pounds (1 pound = 0.452 kg), transactions were analyzed at current prices in USD. Data for the sugar price analysis was collected on a daily, monthly and annual basis. The fluctuation frequencies were analyzed on the basis of ten-year average fluctuations in raw sugar prices. In this regard, the variation band(s) typical for the reference period is determined and the number of price fluctuations (by monthly averages) exceeding the range of variation determined by the range is monitored. The analysis of sugar price development in relation to sugar crops production within the EU is based on data provided by FAOSTAT, CEFS and DG Agri. The analyzed period encompasses the last decade of development. Only those EU countries producing sugar beets were involved in the analysis.

3. Results and Discussion

The world price of sugar has been developing in a very specific way over the last hundred years. The value of sugar has of course increased significantly during the above-mentioned period, which is obvious, especially in relation to continuous inflation of every currency. However, what is interesting is the growth rate of the price and especially the frequency of fluctuations and extremes that occurred on the sugar market during its historical development, in particular after the Second World War. The sugar market has always been characterized by some fluctuations from the average price, but the frequency of these fluctuations has increased significantly, especially since the 1960s. The specific period in this respect was the price fluctuations of the 1970s and early 1980s, when sugar prices briefly doubled and tripled as a result of world market crises. After this relatively turbulent period, the second half of the 1980s and the 1990s represented a period of relative calm and stabilization in sugar prices. Nonetheless, this was only the calm before the storm. After this period, there was a significant fluctuation in the world sugar market, particularly in the years 2000 to 2016, which was exacerbated mainly by the development of the global economy after 2001 (the crisis in Japan and attacks in New York) and also again in 2008-2011 (global economic and financial crisis). With the onset of new technologies and especially speculators, the world sugar market has become more volatile. The increase, that is higher frequency, can be seen in Figure 1 and 2, giving an overview of the development of the price of raw sugar in the world and EU. During this monitored period, there was a distinctively higher frequency of fluctuations, and especially in regard to their intensity, as compared to the average of the previous period. Higher frequency of fluctuations can be demonstrated in the example of the last period, ie January 2016 - March 2017. In the mentioned period, the world and EU sugar market recorded the increasing frequency of price fluctuations and their higher intensity. It is the higher frequency of fluctuations that contributes to the gradual destabilization of prices, although they are relatively stable in the long term. The increasing destabilization of world sugar prices is specifically evidenced by the increase in variation ranges and the average and standard deviations. On the other hand, the average growth rate and the gradually decreasing value of the variation coefficient point to the fact that prices tend to stabilize over the long term. However, the frequency of fluctuations higher than the average value between monthly changes remains unchanged in the long term, pointing to the fact that sugar prices on world stock exchanges are moving both significantly upwards (speculation on price increases) and downwards (speculation on price decline) . The analysis results show one very interesting fact and that is the extreme volatility of the sugar market, where, for example, between 1960 and 1969 the sugar price recorded an average change of more than 8% in two months (in absolute terms, ie regardless of whether if it was a price increase or a decrease in price). However, if we were to take the average of the whole period we would find that the actual monthly growth rate reached only -0.01%. Hence the extreme frequency of price fluctuation, regardless of its long-term development is barely affected by the very high fluctuations. A similar fact can then be observed in other decades as well (for details see Table 1 and 2 and Graph 1).

Table 1 provides a general statistical overview of global sugar price development in individual decades. The price extremes in individual decades are recorded together with other characteristics. Based on average inter annual growth rate analysis of recorded sugar prices it is possible to predict the long term price stability for decades, but on the other hand the other statistics indicate the significant price volatility and oscillations within individual time periods.

Table 1. Sugar world price development in the course of 1960 (January) - 2017 (March)

US cent/lb	Average	Max	Min	GEO-MEAN	AVG inter annual growth rate	Average Deviation	Standard Deviation	Variation Coefficient	Average Volatility	Variation Margin
1960 -1969	3.34	11.54	1.30	2.864	0.999	1.521	2.246	0.672	0.455	10.24
1970 - 1979	11.24	56.19	3.13	9.125	1.0133	5.981	8.862	0.789	0.532	53.06
1980 - 1989	10.77	40.59	2.78	8.908	0.9955	5.410	7.623	0.708	0.503	37.80
1990 - 1999	10.46	15.37	5.38	10.179	0.9924	1.898	2.335	0.223	0.181	9.99
2000 - 2009	10.37	23.55	5.12	9.724	1.0127	3.035	4.022	0.388	0.293	18.43
2010 - 2017	10.33	29.64	11.51	18.845	0.9969	3.578	4.389	0.227	0.185	18.13

Source: Own elaboration based on data from „World Bank Price Commodity Data", 2019

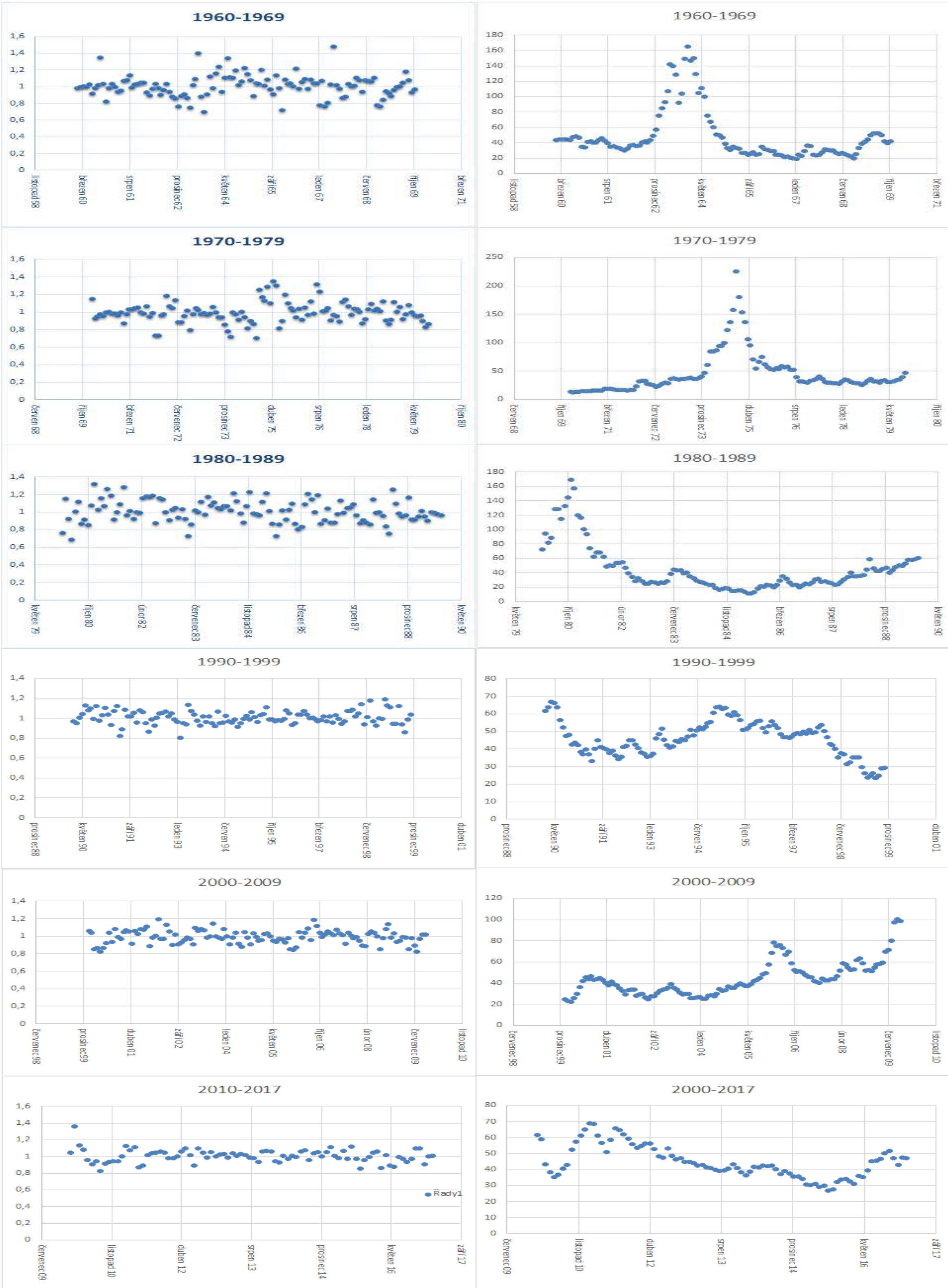
Table 2 provides an overview of inter-month changes and the frequency above standard price volatilities. Based on available data analysis the significant price oscillations and especially high frequency of oscillations are typical for sugar market, but on the other hand from the long term point (last about 47 years) of view the global sugar market has been oscillating close to 10 US cents/lb (see Table 1 – the average sugar price per lb).

Table 2. Average inter-monthly price development changes and average inter-monthly rate of growth in tracked periods

Sugar world price in US cents/lb	Average month by month price change (absolute)	Average rate of growth in given period (monthly)	Frequency of above-standard volatilities in the course of tracked months
1960 -1969	8.67%	-0.07%	38.00
1970 - 1979	6.30%	1.33%	39.00
1980 - 1989	8.12%	-0.44%	45.00
1990 - 1999	4.25%	-0.76%	46.00
2000 - 2009	4.85%	1.27%	46.00
2010 – 2017	4.60%	-0.31%	33.00

Source: Own elaboration based on the data from „World Bank Price Commodity Data", 2019

Graph 1. World sugar price development according in individual decades (in US)



Source: Own elaboration based on data from „World Bank Price Commodity Data“, 2019
Note: inter-monthly trend raw sugar prices rate of growth changes can be observed in the left column and sugar price frequency development related to average price in given period in the right column

The above mentioned data imply that the global sugar market is a very specific entity that, in the long run, does not (apparently) suffer from extreme price fluctuations, however with more detailed monitoring these fluctuations are more than obvious, especially in relation to their frequency. It is a well-known fact that most, (ie 75-80%) of the current global sugar production is the subject to international exchange based on long-term contracts and only 20-25% of sugar production is traded on world commodity exchanges. Of this volume of production, (ie about 36 mil. Tons) 50% - 18 mil. Tons, is the subject of speculative operations on derivative markets where the sugar commodity serves as an underlying asset. Derivative markets are the second largest market in the world in terms of financial assets and its volume makes up to twelve times more than the total world gross domestic product. It is a paradox that it is these markets that are the reason behind the high frequency of price fluctuations of the world. Although sugar freely traded on world stock exchanges with agricultural commodities accounts for about a fifth of the global production, a small change in production or consumption of sugar is reflected more strongly in the business sentiment with this so-called soft commodity on residual free markets. A slight change in supply and demand, (ie market fundamentals) can thus trigger a relatively high level of historical price volatility of sugar, especially with futures and options contracts on major global stock exchanges such as the New York, London and Tokyo commodity exchanges. Trading platforms with historical price volatility can thus become a tempting source of motivation for stock market speculators, whose main priority is financial motive, as one of the four dominant features of the financialization of the global economy and not hedging against implicit price volatility. The results of the analysis also show that because of the speculators incursions, stock trades suffer a much higher frequency of fluctuations than compared to the traditional long-term (for details see Graph 1). It is the speculators who are responsible for the relatively high degree of instability, especially in the sugar market.

Impacts of sugar price reduction on European sugar beet growers

The sugar beet production in EU countries has undergone significant changes over the last ten years. It is the constantly falling prices of sugar beets that have forced many producers of this raw material to rethink their plans and business strategies. Between the years 2005 and 2017, the size of sugar beet growing areas fell from 2.1 million hectares to 1.3 million hectares. However, the sugar beet production in EU countries has only decreased from about 137 million tonnes to about 131 million tonnes. On the other hand, the number of sugar beet growers has decreased across EU countries from around 305,000 to less than 140,000. Reduction in the volume of sugar beets grown, and in particular the number of growers, does occur at the same rate across Member States. It is clear from the available data that the number of sugar beet growers is determined by installed/remaining sugar producing capacities. Furthermore, the results of the analysis show that the size of the average farm, or the volume of sugar beet hectares, does not automatically mean that these growers will not be affected by the reduction in the number of beet producers. The following Table 3 gives a basic overview of the development of sugar beet production, while taking into consideration that even though the average size of farms vary considerably from one EU country to another. Based on available data it is possible to set up the following statement related to EU sugar market. The EU sugar beet and sugar production is not determined by the average size of sugar beet producing farms.

Table 3. Overview of basic characteristics related to sugar beet production in EU countries

	Sugar beet producers		Changes between 2005 and 2017	Sugar beet production		Sugar beet area		ha/farm		Changes between 2005 and 2017
	2005/2006	2016/2017		2005/2006	2016/2017	2005/2006	2016/2017	2005/2006	2016/2017	
Austria	9 318	6 992	-25%	3 083 792	2 993 710	44 196	45 593	4.74	6.52	37%
Belgium	14 301	7 515	-47%	5 983 173	5 941 783	86 655	53 691	6.06	7.14	18%
Denmark	4 370	1 205	-72%	2 762 600	2 454 600	47 000	24 800	10.76	20.58	91%
Finland	2 170	781	-64%	1 181 300	430 300	31 100	12 500	14.33	16.01	12%
France	29 500	26 000	-12%	31 149 552	34 381 064	380 430	349 600	12.90	13.45	4%
Germany	46 676	28 509	-39%	25 284 700	34 059 900	418 820	282 700	8.97	9.92	11%
Greece	15 532	1 431	-91%	2 552 671	384 000	41 965	4 885	2.70	3.41	26%
Ireland	3 700	0	-100%	1 380 000	75 000	31 000	0	8.38	0.00	-100%
Italy	40 000	8 000	-80%	14 155 683	2 453 568	253 043	38 124	6.33	4.77	-25%
Netherlands	14 466	8 007	-45%	5 931 000	7 924 267	91 459	58 579	6.32	7.32	16%
Portugal	385	0	-100%	604 879	16 398	3 581	0	9.30	0.00	-100%
Spain	19 000	6 550	-66%	7 291 092	3 292 750	102 000	35 675	5.37	5.45	1%
Sweden	3 470	1 780	-49%	2 381 200	1 963 500	48 200	19 000	13.89	10.67	-23%
UK	6 646	2 995	-55%	8 687 000	8 918 000	125 900	74 200	18.94	24.77	31%
Czechia	901	844	-6%	3 495 611	4 399 521	63 170	53 600	70.11	63.51	-9%
Hungary	809	267	-67%	3 515 865	1 075 625	58 334	15 513	72.11	58.10	-19%
Latvia	386	0	-100%	519 900	0	14 000	0	36.27	0.00	-100%
Lithuania	1 580	361	-77%	798 500	956 947	17 300	12 300	10.95	34.07	211%
Poland	72 790	34 243	-53%	11 730 554	15 732 952	277 979	171 430	3.82	5.01	31%
Slovakia	387	207	-47%	1 734 612	1 230 793	32 263	21 707	83.37	104.86	26%
Bulgaria	20	0	-100%	24 731		1 106	0	55.30	0.00	-100%
Romania	18 483	1 177	-94%	729 658	1 174 500	19 034	23 600	1.03	20.05	1847%
Croatia	1 363	490	-64%	1 337 750	1 295 459	32 851	16 200	24.10	33.06	37%
Total/AVG	306 253	137 354	-55%	136 575 918	131 154 637	2 226 434	1 313 697	7.27	9.56	32%

Source: own calculations based on data provided by FAOSTAT, CEFS, 2019

4. Conclusion

Sugar prices have shown high volatility over time. Short-term price fluctuations show significantly higher relative and absolute values compared to long-term averages. The global sugar market saw significant price oscillations over the last sixty years: sugar prices fluctuated between 1.3 US cents per pound of raw sugar and 0.56 US cents per pound, with nominal sugar prices increasing between January 1960 and March 2017 by approximately 700% (from about 3 US cents / lb to about 20 US cents / lb). Although the average month-to-month change in raw sugar prices was approximately 7.75% in absolute terms, the real growth rate was only 0.28%. This suggests that the world sugar market is highly "volatile" and there are numerous factors affecting the price of sugar. This global price volatility is a very strong incentive for speculators who are eager to make quick profits and show increased interest in the agricultural markets (including the sugar market). This has been especially true since the year 2000. This increase in interest of speculators in the sugar market supports the hypothesis that they are sugar market speculators, who tend to cause sugar price fluctuations. This may destabilize sugar prices in the future and bring uncertainty to traditional supplier-customer contracts.

The evolution of sugar prices has had a negative impact on the production of sugar-producing crops, whose market prices had also fallen significantly over time. Decreasing sugar prices makes sugar crops production less attractive for farmers. This trend is then negatively reflected in the volume of production realized, as well as in the decreasing number of sugar beet growers in the world.

In the case of EU countries, where sugar beet is the most dominant sugar crop, the number of sugar beet growers has dropped by more than 50% over the last few years, and sugar beet growing area has been reduced by more than 800,000 hectares. The results of the analysis also show that the average hectare area of sugar beet growers has increased. However, it is also necessary to state that (with the exception of the Czech Republic), that a higher hectare area of beet growers is not a decisive criterion as to whether or not the grower will continue to produce sugar beets. It is the declining price of sugar beet and the stagnating demand for this commodity, which makes its production less attractive compared to that of other commodities, and that is also why in the last few years, many farmers have decided against producing sugar beets.

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FACTORS AFFECTING INCOMES OF SMALL AGRICULTURAL HOLDINGS IN POLAND

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Annotation: The level of income obtained from agricultural activity depends on many factors. The literature emphasizes that these are, among others: resources possessed by a given unit and their rational and effective use, specialization (the direction of production), farm location, natural conditions, prices of production factors and sales prices, as well as socio-economic and climatic factors. The force and direction of the individual factors' influence on farm incomes may vary, among others, depending on the type of activity and the size of the entity. Undoubtedly, however, it is the resources of land, labor and capital forming the basis of the farm's production potential, which to a large extent determine the development opportunities of agriculture and the scale of its operations and thus affect the value of production and the level of income obtained. There is an ongoing discussion in the literature about very small and small farms. Some researchers argue that there is a negative relationship between the income and the value of assets in this group of entities. Due to the observed relationships, it is important on the cognitive basis to conduct research on factors determining the level of agricultural income, with particular emphasis on small farms. The main objective of the study is to assess the impact of factors related to production potential and the efficiency of its use on income obtained by small farms in Poland. The basic source of data were the results of 239 small farms that in 2015 ran agricultural accounting for the needs of the Polish Farm Accountancy Data Network. It was assumed that a small farm is one whose economic size does not exceed 8,000 EUR SO. The logistic regression model was used to verify empirical factors affecting the income of small farms. The obtained results show that in the case of small farms included in the study, the productivity of plant production and livestock production, as well as the productivity of the labor factor, were of significant importance for the level of obtained income. Moreover, it was found that too high value of fixed assets per one employee and too high intensity of production (measured by the use of fixed and current assets per hectare) have a negative impact on the level of agricultural income.

Key words: logistic regression, family farm income, small agricultural holdings

JEL classification: Q1, Q12, Q14

1. Introduction

Our previous study (Strzelecka, Zawadzka and Kurdyś-Kujawska, 2018) showed that the production potential has a significant impact on the income generated by agricultural holdings. This confirms the results of the research presented in the literature, according to which the farm resources and their rational and effective use have an impact on the level of agricultural income (e.g. Sadeghi, Toodehroosta and Amini, 2001; Safa, 2005; Poczta, Średzińska and Mrówczyńska-Kamińska, 2009; Zawadzka, Ardan and Strzelecka, 2011; Średzińska, 2018). Potential factors affecting the income obtained from an agricultural holding include: direction of production (e.g. Orłowska, 2010; Szafraniec-Siluta, Zawadzka and Strzelecka, 2011; Kalabisova and Kristkova, 2007), location of the farm (e.g. Orłowska, 2017; Średzińska, 2018), natural conditions (e.g. Jóźwiak, Zieliński and Ziętara, 2016), prices of production factors and sales prices (e.g. Beckman and Schimmelpfennig, 2015; Bohacikova et al., 2017) and socio-economic and climate factors (e.g.. Balarabe, Kasim and Muhammad, 2018; Bohacikova et al., 2017). At the same time, it is pointed out that the impact of some factors on the income amount earned from agricultural activity may be diversified, depending on the economic size of the agricultural holding. The results of Średzińska's research (2017) prove that the value of assets of an agricultural holding (reduced by the value of land, permanent crops and production quotas) is a factor determining the amount of its income. This is consistent with the results of research presented so far in the literature (cf. Zawadzka, Ardan and Strzelecka, 2011). However, in the case of very small and small farms (separated on the basis of the economic size criterion), there is a negative relation between income and the value of assets (Średzińska, 2017). Due to the observed relations, it is important to continue the research on factors determining the level of agricultural income, with particular emphasis on small farms. The main objective of the study is to assess the impact of factors related to production potential and the efficiency of its use on income obtained by small farms in Poland.

2. Materials and Methods

The study used data from 239 small farms which ran their agricultural accounting in 2015 under the national Farm Accountancy Data Network (FADN). Due to the lack of an unambiguous definition of small farms (more broadly: Strzelecka, 2018), in this work economic size was adopted[2] as a classification criterion[3.] A small farm was defined as a farm whose economic size does not exceed 8,000 EUR SO[4]. This assumption is justified due to the research subject - agricultural income (Strzelecka, 2018), because the economic size determines the income potential of the farm and the possibilities of its development (Wilkin, 2013).

The logistic regression model was used to empirically verify the factors affecting the income of small farms. The dependent variable was the probability that the farm would achieve annual income exceeding the median level of the surveyed farms, amounting to PLN 4,943.58 in 2015[5]. It is a dichotomous variable that accepts two possible values: 0 - lack of a given trait (120 cases), 1 - having a given trait (119 cases). The minimum income level adopted in the study was based on the estimation of its average level for the group of small farms surveyed. It was established that the average family farm income for this group of entities in 2015 amounted to PLN 5,325.38 (arithmetic mean), however, half of the units achieved income equal to or lower than PLN 4,943.58 (median), thus lower than the average value. The choice of variables to estimate the parameters of the model was based on the analysis of current research results in the field of determinants of agricultural income[6]. Based on substantial grounds and available data, the following variables were adopted to assess the likelihood of a small farm to generate income exceeding PLN 4,943.58, referring to the production potential of the farm and the efficiency of its use: x_1 - agricultural area (ha); x_2 - share of arable land in the area of agricultural land (%),

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[2]*Economic size* is determined on the basis of the sum of Standard Output (SO) values of all agricultural activities that occur on a given farm and is expressed in EUR (Goraj and Olewnik, 2011). SO - *Standard Output* is an average value of production of a given agricultural activity (plant or animal), which was obtained in 1 year per 1 hectar or from 1 animal. 5 year average values are taken when calculating this parameter (Goraj and Olewnik, 2011).
[3]In the literature, among the criteria for discerning small farms, one can distinguish among others: the economic size of the agricultural holding, the area of arable land and the connection with the market (Dzun, 2013; Hornowski and Kryszak, 2016; Musiał and Drygas, 2013; Czudec, 2013; Żmija, 2016).
[4]Due to the basic source of statistical data which was used in this work, the analysis covered small farms with an economic size of 4,000 up to 8,000 EUR SO.
[5]It'sequal to EUR1,181.88 using average exchange rate (FADN conversion rate) for 2015: EUR 1 = PLN 4.1828.
[6]Variables were selected based on: (Poczta and Średzińska, 2007; Poczta, Średzińska and Standar, 2008; Poczta, Średzińska and Mrówczyńska-Kamińska, 2009; Zawadzka, Ardan and Strzelecka, 2011; Floriańczyk, Osuch and Płonka, 2016; Średzińska, 2017; Orłowska, 2017; Średzińska and Standar, 2017; Średzińska, 2018; Strzelecka, Zawadzka and Kurdyś-Kujawska, 2018).

x_3 – livestock density (LU[7]/ha); x_4 - plant production per hectare (PLN/ha); x_5 - livestock production per 1 LU (PLN/LU); x_6 - assets minus land, permanent crops and production quotas (PLN '000); x_7 - productivity of total assets (relation of total production value to total assets, in %); x_8 - technical equipment of labor (relation of fixed assets to the number of full-time employees, PLN '000/AWU[8]); x_9 - productivity of labor (relation of total production value to the number of full-time employees, PLN '000/AWU); x_{10} - type of production (1 - mixed, 2 - specialized); x_{11} - expenditures of fixed assets per ha, measured by the value of depreciation per ha of arable land (PLN '000/ha); x_{12} - expenditures of current assets per ha, measured by the value of intermediate consumption per ha (PLN '000/ha); x_{13} - marketability of production.

In order to find the best combination of factors significantly affecting the incomes of small farms in Poland, the method of backwards elimination was applied. The assessment of the degree of fit of the logistic regression model to the empirical data was carried out using the statistics of *Cox-Snell* R^2, *Nagelkerke's* R^2 and Count R^2. Verification of the significance of individual model parameters was made using Wald Test. To assess the goodness of fit of the obtained model, the AUC - *Area Under Curve* value was used. The quality of the logistic regression model was also evaluated using the ROC (*Receiver Operating Characteristic Curves*) curve.

3. Results and Discussion

This section consists of two parts. The first one contains the characteristics of the researched farms. The second one presents the results of logistic regression analysis. Half of the surveyed entities reached the economic size at the level equal to or greater than 6.97 thousand EUR (minimum and maximum values amounted to: 4.28 thousand EUR and 7.99 thousand EUR). The average area of arable lands of the examined small farms was 7.58 ha. The arable land dominated in the structure of the agricultural production space. In more than half of the farms, the share of arable land in the structure of agricultural land amounted to 80.93%. The value of the asymmetry coefficient indicates the existence of a strong left-side asymmetry, which means that the units with above average values predominate. The surveyed farms mainly ran specialized production, and given the low livestock density (average number of livestock units per ha was 0.63), it can be concluded that these were mainly farms with plant production. In half of the farms surveyed, farmers were only producing on land owned by them. The value of total assets in small farms was on average 319.61 thousand PLN. In these farms, a high level of fixed assets was maintained (on average 295.81 thousand PLN). Total labor expenditures and farmer's family members own labor oscillated around 1 full-time employee. The revenues from agricultural production were characterized by high diversification and ranged from 2.89 thousand PLN to 282.47 thousand PLN. Average income from crop production amounted to PLN 3,670.98/ha, while the average income from animal production amounted to PLN 2,249/LU.

The amount of received subsidies related to production was on average 8.84 thousand PLN. The difference between the minimum and maximum amount of subsidies received amounted to 31.65 thousand PLN. The diversity of the surveyed population in terms of the amount of income from agricultural activity is very strong (coefficient of variation = 213%). The income from the farm per one full-time family employee was slightly higher than

[7]LU - *Livestock Unit* - animal conversion unit. Average yearly count of equidae, cattle, sheep, goats, pigs and poultry kept on an agricultural holding.
[8]AWU- *Annual Work Unit* – labor conversion unit.

the average total income and constituted 5.82 thousand PLN on average. In the majority of small farms, farm income per one full-time family employee was below average. A coefficient of variation of 247% indicates a high variability of the examined feature.

In order to find the best combination of variables significantly affecting the income of small farms, by using the backwards elimination method, subsequent predictors were eliminated from the initial model and the change in the values of criteria adopted for the assessment of the model quality was made. Finally, seven independent variables were included in the final model, four of which had a statistically significant positive impact on the probability tested (variables: x_3, x_4, x_5, and x_9), while three variables had a statistically significant negative impact on the analyzed phenomenon (variables: x_8, x_{11} and x_{12}). The results of the final model determining the impact of selected factors on the incomes of small farms in Poland are presented in Table 1.

Table 1. Results of the estimation of model parameters

Variable	**Variable parameter**	**Standard error**	**z^2 Wald test**	**Significance level**	**Odds ratio**
x_3-livestock density (LU/ha)	0.451	0.220	4.218	0.040	1.570
x_4 - plant production per ha (PLN '000/ha)	0.001	0.000	25.804	<0.001	1.001
x_5 – livestock production per 1 LU (PLN/LU)	0.0003	0.000	7.375	0.007	1.0003
x_8 – technical equipement of labor (PLN '000/AWU)	-0.006	0.001	16.874	<0.001	0.994
x_9– productivity of labor (PLN '000/AWU)	0.106	0.024	19.249	<0.001	1.111
x_{11} - expenditures of fixed assets per ha, measured by the value of depreciation per ha of arable land (PLN '000/ha)	-0.883	0.351	6.314	<0.001	0.414
x_{12} - expenditures of current assets per ha, measured by the value of intermediate consumption per ha (PLN '000/ha)	-1.896	0.313	36.778	<0.001	0.150
Intercept	1.911	0.582	10.777	0.001	6.760
AIC = 210.19 Cox-Snell R^2= 0.4366; Nagelker's R^2= 0.5822; count R^2= 0.8243 AUC = 0.902 LR = 137.13 (df=7; p<0.01)					

Source: Own study based on FADN data, 2019

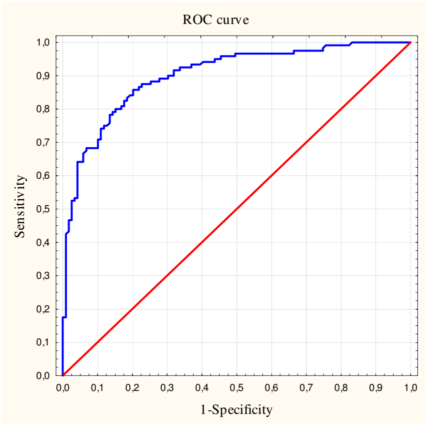
The estimated final model determining the impact of selected factors on the incomes of small farms in Poland is the following:

$$Prob(Y=1) = \Lambda(0.451x_3 + 0.001x_4 + 0.0003x_5 – 0.006x_8 + 0.106x_9 – 0.883x_{11} – 1.896x_{12} + 1.911) \quad (1)$$

where: $\Lambda(x) = \frac{e^x}{1+e^x}$ distribution function of logistic distribution

The model is statically significant at the 1% significance level. Based on the model, 82.43% of cases were correctly classified. The quality of the constructed model was based on the Cox-Snell R^2 ratio (0.19), *Nagelkerke's* R^2 (0.25), as well as using the ROC curve, which is presented in Figure 1.

Figure 1. ROC curve for the model



Source: Own study based on FADN data, 2019

The area under the ROC curve (AUC) is 0.825. Because a field larger than 0.5 and close to 1 was obtained, this indicates a good quality of the constructed model. Assuming constancy of other factors included in the final model (*ceteris paribus*), the probability that the farm in 2015 will exceed the income level of PLN 4,943.58 will: increase by 57% when increasing livestock density by one unit per 1 ha, increase by 1% with an increase in productivity of plant and animal production PLN '000/ha and 1 LU/ha and increase by 11% by increasing the productivity of labor PLN' 000/AWU. In turn, the chance of obtaining income exceeding the median value for the sample of farms will decrease with the increase of technical equipment of labor and an increase in expenditures of fixed assets per hectare (measured by the value of depreciation per ha of arable land), as well as with an increase in expenditures of current assets per hectare (measured by the value intermediate consumption per hectare of agricultural land) by 1%, 59% and 85%, respectively.

4. Conclusion

The study proves that the most significant positive impact on the level of income obtained by small agricultural holdings in Poland in 2015 had their potential of agricultural production in terms of livestock density, productivity in crop and animal production, and human factor productivity. The research confirmed that the negative impact on the income level of the examined small farms was related to the cost of agricultural production (technical labor equipment, expenditure of fixed assets per hectare of arable land, expenditures of current assets per hectare of agricultural land). The reason for such a high cost of production in these farms may be the fact that they do not have modern agricultural machinery and equipment. Therefore, they do not have the possibility to reduce production costs by replacing human labor with specialized technologies. In addition, the small scale of agricultural production prevents reduction in unit costs. This results in a lower, compared to larger farms, efficiency of agricultural production. There seems to be an interesting variation in the observed relationships with respect to the type of agricultural production, especially in relation to the problem of cost burden of production in these farms. This issue will be taken at further stages of research.

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THE INFLUENCE OF INFORMATION TECHNOLOGIES ON COMPETITIVENESS

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Annotation: Today, almost all companies work with data and information, or knowledge. However, their influence on the quality of the decision-making process is very different. Employees of companies with information systems work on a daily basis, nonetheless, to obtain reports from information systems is dependent on a number of factors, though systems are not often user-friendly. The quality of the decision depends precisely on the source of data and information - that is, on the company information system. Most companies have currently information systems that do not suit the possibilities of getting every-day quality reports, supporting the image of the company, its competitiveness, increasing productivity, and improving market position. The ability to make the right decision depends precisely on the quality of the data output, information, knowledge that can be obtained from the information system. The quality of the information system is positively influenced by the existence of the information system and the correct position of the information manager in the organizational structure. This article deals with this issue in a selected sample of enterprises.

Key words: Information systems, competitiveness, informatics management, information strategy

JEL classification: Q19, C83, I25

1. Introduction

Data and information enhanced by knowledge is the driving force nowadays. To be able to succeed in the fight against competition, data and information must flow to the right place in the decision-making process wherever they are required. Knowledge is necessary for their processing, which is usually owned by a person who needs to use its current data and information - the owner of the company, employee, participant of a certain process. Information is a corporate resource with specific features. Unlike other business resources that are consumed whilst being used, it is a renewable resource that even generates itself. Thus, we can say that whoever does not have the required information at the time required he/she loses their momentary position, as well as their competitiveness. “Radical chase is needed to facilitace the agroecological intensification of small holder farming. We propose that large-scale participatory approaches, combined with innovations in information and communications technology (ICT), could table the effective matching of diverse options to the wide spectrum of socio-ecological kontext that characterize small holder“ . Along these lines, we can talk about critical information needs that define the necessary requirements of a management entity to ensure successful activity within the establishment. Whoever owns the information resources in time often creates the advantage of accessing other information and increases the quality of his/her position in the whole market environment. Nowadays, the quality of information is fully dependent on their source, on the quality of the information system and on the possibilities of their access. Keřkovský and Drdla (2003) states that without information we cannot further develop the company and increase its competitiveness. The issue of the importance of data processing for agriculture is also addressed, among other things Stočes, Šilerová and Vaněk (2018). Modern management concepts are of great importance to corporate information and management. Information has become a strategic weapon in the business field and an important source of competitive advantage. The quality of the information system depends directly on the ability to create an appropriate information strategy in the company that fully supports the requirements of individual users of information supporting their needs - needs of the economic department, business department, production, human resources, management and other departments of the company. The information strategy is commonly one of the company's basic documents. The information strategy is an important element of the whole life-cycle of the information system and significantly affects the quality of the implemented and operated system.

The process of creating an information strategy in companies is influenced by a number of factors:

- composition of the team involved in its creation - the team should be composed of employees of the company and employees of an external company, which deals with the creation of information systems within the same business focus. Among the employees of the company there should be represented a manager of the company, which includes a manager of the informatics department and representatives of the users from individual departments who will be regularly working with the system

- the economic situation of the company - the amount of funds that the company is able to invest into the information systems and information and communication technologies themselves. In the early years of the introduction of new investment into the information system, it often exceeds the average annual amount invested in informatics, which is usually around 6% of all expenditure. In the first year, the amount invested in implementing an information system is often about 25% of all annual expenditure.

- the existence or non-existence of documents necessary for the creation of a strategy – the information strategy must be based on company standards, that is to say, it must support business processes. The quality of the information system and the quality of the information obtained for the continued existence of the company is fully dependent on the quality of the corporate documents - such as the organizational rules, the Financial Regulations, the Study and Examination Regulations and other documents depending on the company's focus.

When creating a strategy, it is always necessary to respect the specific requirements of the company. Every business must have its own information strategy. It is therefore important to have it in a document format that will be used throughout the life cycle of the information system.

The information system strategy can be understood as a set of the most important visions, rules and principles related to the functioning of the information system in the company, approaches to satisfying the information needs and requirements of important partners and the development of the information system. Integration and continuity are important aspects of the concept.

The information strategy should be set in such a way where the different layers of management, authority and responsibility are clearly defined.

The quality of the whole information system is significantly influenced particularly by the initial phases of the information system life cycle. There are many examples that are almost identical where the initial phase problems are also the same after an implementation. There is a lot of informal information being spread before the systems are implemented, whose quality is very diverse - from true to semi-true information. Managers have to submit a timeframe for the solution in time, not forgetting the correct composition of the team involved in the process and passing on information on all staff training and commissioning procedures. Tvrdíková (2016) states that it is possible to use a cloud solution, where we can face a problem of releasing data out of the company as we are using applications stored outside the company. In that way, the data is being shared and we don't have 100% control over it.

“Nowadays the information system management is a specific yet integral part of business management. The understanding of IT as a purely servicing activity which brings several problems to the further development of the company, as well as the superiority of the IT department to all other departments. In large companies, the information manager is usually seen as a "second function" after the CEO himself. However, this situation is not ideal because it may appear that the IT department is superior to others and thus its position in the enterprise has a "more prominent function" (Cienciala et al., 2011). “Information systems used in farming systems are characterized by high complexity. They should be composed of inter-related economic and biological components capable of working in a dynamic and continuous manner, receiving data and producing results within an organized production process” (Tanure, Nabinger and Becker, 2013). It addresses the importance of the decision-making process of information technology farmers and its evaluation under Precision Agriculture (Fountas et al., 2006).

The issue of proper IT management is also dealt with by Hallová, Polakovič and Slováková (2017) and Hennyeyová and Depes (2010). The correct distribution of organizational structure is addressed by Drucker (2002).

The aim of this article is to confirm or disprove following hypotheses:

H1 - In the selected sample of companies there is 66% of them that have created an information strategy. The existence of an information strategy in agricultural enterprises is around 1%.

H2 - Assumes that in the organizational structure, a computer science worker in non-agricultural firms is included in senior management in 46% of them, whilst on the other hand it is in 5% in agricultural holdings of monitored firms.

2. Material and Methods

Information systems and information and communication technologies (ICT) are becoming an important source of competitiveness. The quality of each information system and the way in which information is being gathered is determined by a number of factors, which can be judged by measurable and non-measurable benefits. One of the measurable benefits is the quality of information and knowledge provided for management. This indicator is based on the ability of users to define requirements for their needs and the ability to further use and work with the information they received. The quality of the entire information system depends entirely on the ability to manage the IT department, manage the creation of information strategy, create the architecture of information systems and the whole life cycle of the information system. The aim of this article is to define the requirements for the organizational structure of the company in relation to the integration of the IT manager, the ability to develop an information strategy, its existence, or its absence within the enterprise and the ability to obtain information. Requirements for the integration of an IT worker in the organizational structure, ways of obtaining information and the existence of an information strategy in the company will be presented in the research within the selected sample of enterprises.

The ever-increasing amount of information, both external and internal, creates requirements to ensure its quality. This requires an effective set up of information channels in the company, to aggregate the data appropriately and to determine distinctive values. It is precisely for the reason of optimizing and exchanging data, information and knowledge among the various organizational units of the company that the processes in the company are supported by various information system modules and related organizational procedures. The quality of this process is directly dependent on the way the corporate unit is being managed, which ensures the development and operation of information systems and information and communication technologies.

This article was based on scientific methods - using holistic methodology, analysis, synthesis, induction and deduction. The theoretical part was based on the study of secondary sources, the study of scientific and professional articles. Based on the hypotheses, a questionnaire was formed, consisting of 12 questions - 8 questions were closed, and 4 questions were open. A total of 152 companies were approached, of which 38 were agriculture firms - the return on questionnaires was 79.61% (121 companies responded to the questionnaire, of which 32 were agriculture orientated). Based on the results of the questionnaire survey, further direct questioning was conducted in 79 enterprises. Those were chosen according to the results of the questionnaire survey. Inquiries during the direct questioning were based on long-term experience of the authors of this article with corporate information systems management issues. The outcomes of the questionnaire survey were used to draw conclusions from the hypotheses and to suggest optimal solutions supporting the development of companies.

3. Results and Discussion

The question often asked is "What is the current position of the ICT department in the company?" Historically, the main task of the data processing department was to ensure data processing in time - mainly data from accounting, payroll, stock and similar agendas, depending on the company's focus. In that period, when the economic data was mainly processed, it was necessary for the data processing unit to report directly to the economic unit to process it. Most of the data processed came from the economic department. At that time, the data processing unit was usually called the information systems department and was providing data for users at a certain time interval (so-called batch processing). The length of the time interval was directly dependent on the focus of the company - the most frequent processing interval in the economic unit was ten days or one month. With the development of information and communication technologies, it turned out that the potential of data processing is elsewhere - the amount of data stored in the company increased and it was possible to use this data to perform analyses, forecasts and decisions. In several companies, the response to this situation was to keep the ICT department within the scope of the economic unit where it was historically included. Within companies the situation was being solved very differently, more often than not ICT remained part of the department that was in charge of it, or in a department that used ICT the most. From this it is also possible to deduce the division of organizational integration of the IT department in companies:

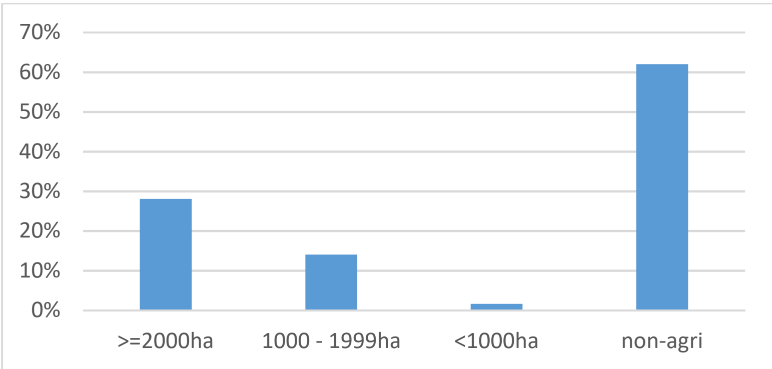
1. The ICT department remained within the economic unit
2. The ICT department was put under the charge of another department in the company - business, technology, manufacturing
3. The ICT department became an independent unit whose manager was in the top management of the company.

Welch and Welch (2007) report that the management of the whole company significantly influences the correct integration of the ICT department in the organizational structure of the company and the existence of an information strategy - according to which the whole computer science is being managed.

Results from the H1 questionnaire survey show the situation in non-agricultural and agricultural firms. It is clear from Chart 1 that 62% of the monitored firms in the non-agricultural sector have created an information strategy. For agricultural firms, the situation is very different. Enterprises with a size of over 2,000 hectares have created an information strategy for 28% of them, enterprises whose size is between 1,000 and 1,999 ha, have created an information strategy for 14%, and enterprises up to 1,000 hectares have an information strategy developed in 1.6%. Developed information strategies have mostly multinational companies, large enterprises (measured by the number of employees and company’s turnover) and businesses that are interested in using up-to-date data, information and knowledge. Direct questioning was conducted for companies that did not possess an information strategy. There were questions focused on the way of managing the informatics in the company, processing and utilization of data and information and development of ICT. Based on the questionnaire, it can be stated that the situation is very similar in agricultural and non-agricultural enterprises. The management of these companies (not having an information strategy) is in 75%, subordinate to an economist. The remaining 25% of companies manage informatics randomly, according to current needs (e.g. need to change software based on a legislative requirement, already unsatisfactory hardware – because of insufficient memory capacity, not being able to communicate with others, and so on and so forth. Companies without an information strategy do not put much emphasis on the further processing and use of data and information for management.

For a high-quality enterprise information system, its appropriate functionality and an intuitive interface, it is necessary to properly integrate the employee who manages the IT department in the organizational structure, where the IT department should be directly a part of the top management, though not superior to other departments (as already mentioned), which is to say directly under the "director" of the company (who represents the company and bears responsibility for it). If the “informatics” department is directly under the company's director in the organizational structure, there are often situations where other departments (e.g. economic, human resources, manufacturing, business, and others, depending on the company's focus) submit to the IT department's proposals. However, because of the need of quality information for particular departments of the company, it is desirable for the IT department to support other company departments and for the employees not to "blindly" subordinate to the requirements artificially created by the IT staff. The whole area of informatics is only a supporting activity in the company. Therefore, it has to meet the requirements of the company employees for data and information. There is no such case that the employees of the company submit to the processes set in the information system, having to go through the stage of "getting to know" the processes set in the information system and trying to maximize the functionality of the system. In such a case, business processes very often adapt to the processes set up in information systems and the company cannot ideally support the managing processes. Sodomka (2006) has long been involved in the inclusion of the ICT department in the organizational structure. It recommends the inclusion of the IT department in senior management. Currently, most businesses have a senior management department in the IT department. As is clear from the survey carried out on the farm, it is different.

Graph 1. Created information strategy



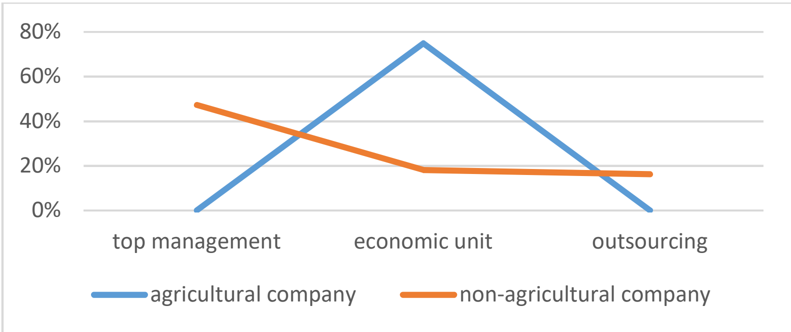
Source: own processing, 2019

Graph 2 shows the organizational integration of the IT department in companies. The graph shows that the classification of the IT department in companies is very different. In large companies, the IT department is most often an independent unit whose manager is directly in senior management - 47.26%. Historically, one of the highest IT departments remains a part of the economic unit, where this unit is incorporated - 18.15%. Also high is the percentage of displacement of IT management from a company that currently has 16.21% and does not need to manage IT in the company. Such companies only control the relationship with the supplier. Further incorporation of the IT department in the organizational structure of the company is entirely random, depending on how the company evolved, who was in the charge of the IT in the company (of its own interest) or whether the owners of the company retain the management of the IT department in their own competence. The situation in agriculture establishments is very different. An employee who is engaged in computer science management is only in 7.42% of the monitored companies and is included in the economic department. There is no separate position of the information manager directly in the top management of the selected sample of enterprises.

All managers require quality information for their decisions, which should be as responsible and reality reflecting as possible. However, context-free information has little value. The context is given by a specific content or question that requires active intervention.

Another question, that the respondents answered, was - how do business managers get information for their management. Businesses that do not have an information strategy do not even have an employee who directly manages IT. The answer to the question of how they use the data and information from the information system - "the stored data and information are only of a record character and are frequently being used only to created required reports."

Graph 2. Management of the IT department



Source: own processing, 2019

For H1 it can be stated that it was fulfilled only in the part of the existence of an information strategy for agricultural enterprises, where it has been created for monitored enterprises over 2,000 ha - 28%, for enterprises 1,000 – 1,999 ha it was 14% and for enterprises up to 999 ha 1.6%. In the case of non-agricultural enterprises, only 62% of the monitored companies have created the information strategy, assuming 66%.

In H2, 46% of companies and 5% of monitored firms were supposed to include an employee of the IT department in top management. The hypothesis was fulfilled only in non-agricultural companies, where 47.26% of the informatics department is a separate department, directly on the same level as other managers, and in agricultural holdings it is not included in the top management role of informatics. In the reviewed sample of companies, 7% of them report directly to the economist; in other companies, the management is very random (usually an employee interested in information and communication technologies).

Information needs in companies and institutions are directly dependent on their focus and on the capabilities of workers who use information resources as a management and planning tool. The focus of the activities of companies and institutions is over a long period given by the determined corporate strategy, mission and objectives of each entity. It is from this that the process of creating an information strategy develops.

The aim of the IT department is to provide the right information at the right time, if the IT department is in the organizational structure at the right level of management, then the information and knowledge get to the right user in time. The management of the IT department is also reflected in the financial complexity of the unit, the complexity of knowledge and skills of the user. The quality of the information system and provided information is fully dependent on the manner and quality of the IT department's management.

Companies need to build a system that allows managers to inquire upon a specific situation:

- context-based information - managers should be provided with information on the current situation for their effective decisions,
- individually created alerts - each manager has to have a specifically addressed alert to be able to act based on a situation that has arisen
- developing rules and procedures based on experience.

To create a paradigm creating corporate values, it is necessary to create an information infrastructure that respects the central role of managers. Managers should be able to personally choose the way in which they want to participate in creating this corporate value. The approach to building information systems is currently focused on the implementation of portal solutions that enable web access to information and applications with efficient management and administration capabilities. There are groups of users with relatively specific information needs, for which the dedicated portal is very suitable. It virtually offers all the services and information they need to do their job in one place - so they don't have to waste time searching for this information and services elsewhere, and they can dedicate themselves more to their own activities.

The information system strategy is an important part of the whole information system life cycle. The quality of the entire system is also significantly influenced by adhering to the individual steps of the life cycle methodology. In enterprises where the emphasis is not on creating information strategy and IS/ICT architecture, the support of all business processes is also smaller and vice versa. The quotation by M. Della can be used: "If you take a bad business and do it online, it is a bad business online." So, any change in the corporate information system must be based on a corporate strategy and embedded in an information strategy. Otherwise, even in a well-functioning business, problems may gradually occur. The role of each module of the information system increases significantly with the possibility of using the information and knowledge provided by the system for the management. According to Vymětal, Diačiková and Váchová (2006), the right organizational structure is necessary for the proper management of the IT department. Hallová et al. (2019) also addresses the issue of data and information security, which is very important throughout the process.

4. Conclusion

Agriculture is gradually becoming a knowledge-based sector where the key factor in profitability is what the employees will know (what data and information they will receive). Managers particularly require up-to-date data and information for their decisions. The quality of the data and information obtained depends on the quality of the information system and also on the quality of the correct management of information and the existence of an information strategy. Stail and Reaynolds (2011) report that the quality of the information system and thus the quality of the data obtained depend on the quality of the information system. The investigation concluded that the quality of the information system is significantly influenced by the quality of management of the initial phases of the information systems life cycle, that implies the existence of an information strategy and the correct inclusion of the information manager in the organizational structure.

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INFLUENCE OF THE SIZE OF THE AGRICULTURAL HOLDING ON TECHNICAL AND SCALE EFFICIENCY

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Annotation: It is assumed that larger size of the firm can bring competitive advantages resulting from economies of scale, higher innovation potential due to capital strength etc. The paper focuses on the efficiency of production of agricultural holdings and calculates technical, pure technical and scale efficiency. The aim is to find out whether the size of the agricultural holding measured in terms of the acreage of agricultural land influence the technical and scale efficiency of the farm. A non-parametric Data Envelopment Analysis is used. Particularly was chosen input oriented BCC model which assumes variable returns to scale. Differences in technical, pure technical and scale efficiency were tested by non-parametric Kruskall-Wallis test. Accounting data were obtained from Albertina database and data about acreage from Land Parcel Information System. The most technically efficient were according to the expectation large farms (from 74.35%), then medium (69.79%) and small (57.56%). Similarly, the highest pure efficiency of production was noted in large farms (82.88%). Pure efficiency in middle farms (73.97%) and in small farms (73.14%) was almost similar. Regarding the scale efficiency, middle farms were the best with 94.68%. Surprisingly large farms were efficient only from 90.11%. Small farms had again the lowest scale efficiency (79.14%). All differences were statistically significant. There were also the most 100% technically efficient firms in category of "large" farms (8 farms 100% technically efficient, 26 farms 100% pure technically efficient and 8 farms 100% scale efficient). Theoretical assumption about higher technical and pure technical efficiency of larger companies and agricultural holdings was confirmed by our study. However, scale efficiency was higher in middle-sized firms than in large companies. It might be due to the fact that there were the most farms exhibiting decreasing returns to scale in "large" category, so the scale of their operation is above optimum.

Key words: agricultural holding, data envelopment analysis, scale efficiency, technical efficiency

JEL classification: C01, C12, C21

1. Introduction

It is assumed that larger size of the firm can bring competitive advantages resulting from economies of scale, higher innovation potential due to capital strength etc. Larger farms have higher bargaining position as well as have a better ability to access input and output markets. (Michalek, Ciaian and Pokrivcak, 2018). Also, large agricultural holdings in terms of acreage can profit from more efficient usage of resources – e.g. usage of technical equipment on larger fields. The article focuses on the efficiency of production of agricultural holdings and calculates technical, pure technical and scale efficiency. In general, "efficiency refers to the relationship between all outputs and inputs in a production process" (Speelman et al., 2008). While technical efficiency measures the efficiency of transformation of inputs to outputs under the assumption of constant returns to scale, pure technical efficiency supposes variable returns to scale. The scale efficiency score indicates whether a firm operates at the most productive scale size. A unit is scale efficient when its size of operations is optimal so that any modifications on its size will render the unit less efficient.

Technical efficiency of agricultural companies in relation to the size was examined by many studies and context. Literature reviews brings the results of research performed by Data

Envelopment Analysis (DEA) in the member states of the European Union. Stavros et al. (2019) examined the technical efficiency of milk companies in Greece using DEA with output oriented constant and variable returns to scale models. Their results showed that 87.2% of the farms in the sample were inefficient, so the farms, at the level of inputs used, shall increase their output (milk yield) for improving their competitiveness. Regarding the amount of output, Adenuga et al. (2018) found out that farmers that take records of their milk output and with larger farm areas tend to be more efficient.

Baležentis and De Witte (2015) showed on their sample of Lithuanian family farms that the output efficiency positively correlates with time trend and negatively with the share of the subsidies in the total output. Latruffe et al. (2012) assessed the differences in technical efficiency and productivity change, and the technology gaps between French and Hungarian farms in the dairy and cereal, oilseed and protein crops sectors during the period 2001–2007 and found out based on metafrontier DEA that Hungarian technology was the more productive in both sectors.

2. Materials and Methods

The aim of the paper is to find out whether the size of the agricultural holding measured in terms of the acreage of agricultural land influence the technical and scale efficiency of the farm. Non-parametric Data Envelopment Analysis (DEA) method was chosen to calculate the technical, pure technical and scale efficiency of the farm. DEA assigns to each decision-making unit (DMU) which are the agricultural holdings in our case the total deviation from the production frontier to inefficiency. DMUs lying on the frontier are 100% efficient. The level of the technical inefficiency shows the deviation of the observed productive activity of a unit from the activity of the best unit or units in the sample. This deviation is attributed exclusively to differences in management ability between production units (Stavros et al., 2019).The advantage of the method is that it is deterministic and non-parametric and hence does not require any assumption about the production function. It also enables to take into consideration more inputs (*i*) and outputs (*j*).

Farrell (1957) defined the technical efficiency as the ability of a farm to produce the maximum feasible output from a given set of inputs or (from other point of view) to use minimum feasible inputs to produce a given level of output. On the basis of chosen definition, the approach of the DEA models can be input or output oriented. In our case we choose input oriented which maintains the production while minimizing the use of resources. Efficiency score than tells how efficiently can each DMU use the production factor (capital, labour, land) to produce certain amount of production. BCC model named after Banker, Charnes and Cooper (Banker et al., 1984) that assumed variable returns to scale was estimated in a form (1)

$$
\begin{aligned}
&\min h_0\\
&\text{subject to}\\
&\sum_j x_{ij}\lambda_j \le h_o x_{io}, \forall i\\
&\sum_j x_{rj}\lambda_j \le y_{ro}, \forall r\\
&\sum_j \lambda_j = 1 \qquad \lambda_j \ge 0, \forall j \qquad h_o \in \Re
\end{aligned}
\tag{1}
$$

where x_{ij} is the input i of DMU j, and y_{rj} is the output r of DMU j. The model seeks to minimize h_o, which is the proportional decrease of the inputs and represents the efficiency of DMU$_o$. First constraint ensures that the decrease of the inputs is limited by the efficiency frontier, where λ_j is the contribution intensity of benchmark j for the target of DMU$_o$. Second constraint states that the outputs of DMU$_o$ is limited by the efficiency frontier. Sum of λ_j is equal to 1 that secures that the DMUs are compared with similar DMUs in scale and size and guarantees variable returns to scale. Other constraints characterize the nature of the decision variables (Rebolledo-Leiva et al., 2019). The calculation is done for every DMU j–agricultural holding.

As a result of this DEA calculation, the efficiency scores for all DMUs are obtained (h_j for all DMU j). It enables to identify as well as the identification of benchmarks (best-practices) and the targets for the operational inputs used in the assessment. The model enables to calculate technical efficiency (TE – under constant returns to scale), pure technical efficiency (PTE – under variable to returns to scale) and scale efficiency (SE) as the division of those two (2).

$$SE = \frac{TE}{PTE} \tag{2}$$

Accounting data were obtained from Albertina database and data about acreage from Land Parcel Information System (LPIS). Outputs of production function were sales (y_1) and total revenues (y_2) in thousand CZK. Inputs were consumption of material and energy (x_1), external resources (x_2) in thousand CZK, number of employees (x_3), and agricultural land (x_4) in ha. There were three groups of agricultural holdings according to their size: "small" (up to 500 ha), "medium" (501–1,000 ha) and "large" (over 1,001 ha). There were 562 observations – agricultural holdings – for year 2014. To ensure homogeneity of the DMUs (because DEA is sensitive to outliers), only farms with sales between 50 to 100 million CZK were included in a sample. The description of the output and input variable is displayed in Table 1.

Table 1. Descriptive characteristics of the sample (thousands of CZK)

	Whole sample			**Small**			**Medium**			**Large**		
Obs. (nr.)	562			122			249			191		
Char.	**mean**	**min**	**max**	**mean**	**min**	**max**	**mean**	**min**	**max**	**mean**	**min**	**max**
y_1	26,907	10,007	49,971	19,921	10,030	49971	24,881	10229	49,767	34,010	10,007	49,969
y_2	40,126	8,894	108,928	25,849	8,894	61199	35,936	10453	98,916	54,708	21,722	108,928
x_1	14,439	305	39,920	7,997	305	32586	13,092	1373	30,014	20,309	3,025	39,920
x_2	28,912	141	336,072	16,769	141	203623	28,066	439	336,072	37,770	2,733	190,363
x_3	20	1	72	13	1	52	17	1	60	29	1	72
x_4	855	1	4,081	231	1	497	750	504	1,000	1,391	1,003	4,083

Source: Albertina database, 2014; LPIS, 2014; own calculations, 2019

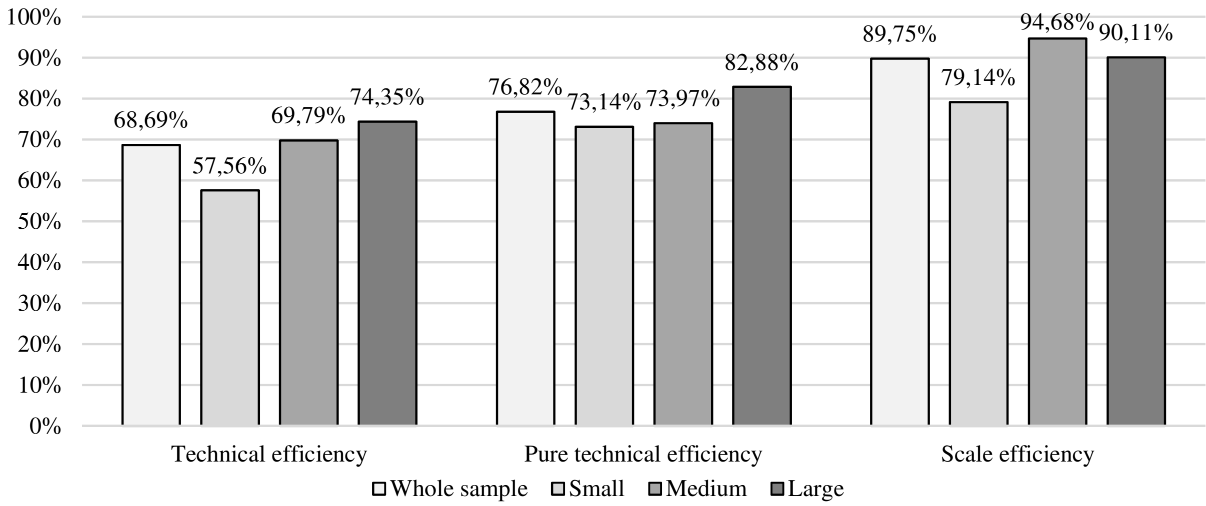
It can be seen, naturally, that the large group has the highest average sales, revenues, energy consumption, number of employees and acreage – all values are above average of the whole sample. The weight of the large companies is so significant that the values of middle and small farms are below average of the whole sample. As technical, pure technical and scale efficiency are not normally distributed, the differences among different size groups were tested by non-parametric Kruskall-Wallis equality-of-populations rank test. Null hypothesis assumes equality.

3. Results and Discussion

The results of calculation for the whole sample and each size group are displayed in Figure 1. Under constant returns to scale, the DMU in a sample were efficient from 68.69%. Pure technical efficiency under variable returns to scale was higher (76.82%) as there were more 100% technically efficient unit. It is a nature of the BCC model as the envelope under variable returns to scale includes more units. It is due to the shape of envelope of the data. While under variable returns to scale it is conical, in BCC model it changes on convex and include more units to the frontier (Pechrová, 2014). While there are 16 100% efficient DMU under constant returns to scale, there are already 46 of them in the second model. 100% scale efficient firms are only those which are both, technical and pure technically 100% efficient. Hence, there are 16 of them.

The most technically efficient were according to expectations large farms (from 74.35%), then medium (69.79%) and small (57.56%). Similarly, the highest pure efficiency of production was noted in large farms (82.88%). Pure efficiency in middle farms (73.97%) and in small farms (73.14%) was almost similar. Regarding the scale efficiency, middle farms were the best with 94.68%. Surprisingly large farms were efficient only from 90.11%. Small farms had again the lowest scale efficiency (79.14%).

Figure 1. Comparison of technical, pure technical and scale efficiency of the whole sample, small, middle and large agricultural holdings



Source: Own calculations, 2019

Testing by Kruskall-Wallis test revealed that differences were statistically significant. There were also the most 100% technically efficient firms in category of “large” farms (8 farms 100% technically efficient, 26 100% pure technically efficient and 8 100% scale efficient).

Theoretical assumption about higher technical and pure technical efficiency of larger companies and agricultural holdings was confirmed by our study. In all cases the probability that the populations are equal was close to zero (p-value = 0.0001). However, scale efficiency was higher in middle-sized firms than in large companies. It might be due to the fact that there were the most farms exhibiting decreasing returns to scale in “large” category, so the scale of their operation is above optimum.

Our findings are in line with Adhikari and Bjorndal (2012) who examined technical inefficiency in Nepalese agriculture. They also observed decreasing returns to scale in a category of large holdings. “Among the three farm sizes in the data set, medium size farmers achieve a higher technical efficiency than large and small farm sizes, suggesting that productive efficiency can be increased with the encouragement of creating medium size holdings” (Adhikari and Bjorndal, 2012). They suggested that productivity gains could be achieved by breaking up of large farms into small family farms. That solution would not be possible in Czech agriculture due to different size and ownership structure. The core of agricultural production is concentrated within the group of large agricultural holdings, which farm almost two thirds of the agricultural land of the Czech Republic and account for 76% of the total number of livestock (in livestock units) (Czech Statistical Office, 2018).

For the Czech case would be more relevant the research of Ren et al. (2019) who analysed the characteristics that would improve the performance of Chinese agricultural holdings. They found out that increasing farm size has a positive impact on farmer's net profit, as well as economic, technical and labour efficiency. It might be due to the fact that at larger farms it is easier to adopt new technologies and more time and money can be spent on the pursuit of agricultural knowledge. According to Hu et al. (2019), farmers with larger farms can pay more attention to productive technology rather than processing technology. From their regional analysis they found out that “it seems the regions with larger farms have a much higher technology progress rate overall, and while the effect varies depending on scale, there are remarkably positive impacts in large-farm regions, slightly negative impacts in medium-sized farm regions, and notable negative impact in small-farm regions” (Hu et al., 2019). Similarly, research of Kirner and Bartel-Kratochvil (2007) shows that bigger holdings obtained a higher income from agriculture and forestry than smaller holdings. Hence, the size of the holding seems that clearly have positive effect on its economy. However, the attention must be paid to the optimal size and scale.

4. Conclusion

The aim was to find out whether the size of the agricultural holding measured in terms of the acreage of agricultural land influence the technical and scale efficiency of the farm. A non-parametric Data Envelopment Analysis was used to calculate the efficiency and Kruskal-Wallis test to assess the differences among different size groups. The most technically efficient were according to expectations large farms (from 74.35%), then medium (69.79%) and small (57.56%). Similarly, the highest pure efficiency of production was noted in large farms (82.88%). Pure efficiency in middle farms (73.97%) and in small farms (73.14%) was almost similar. Regarding the scale efficiency, middle farms were the best with 94.68%. Surprisingly large farms were efficient only from 90.11%. Small farms had again the lowest scale efficiency (79.14%). All differences were statistically significant. There were also the most 100% technically efficient firms in category of “large” farms (8 farms 100% technically efficient, 26 100% pure technically efficient and 8 100% scale efficient).

Theoretical assumption about higher technical and pure technical efficiency of larger companies and agricultural holdings was confirmed by our study. However, scale efficiency was higher in middle-sized firms than in large companies. It might be due to the fact that there were the most farms exhibiting decreasing returns to scale in “large” category, so the scale of their operation is above optimum.

The challenge for future research is to examine in detail the determinants of technical efficiency, especially subsidies, which are important for agricultural holdings and ensures higher income or viability of the farms.

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INFLUENCE OF CONTROL SUBSYSTEM ON PRODUCTION-TECHNICAL AREA OF ORGANIZATIONAL SYSTEM

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Annotation: This contribution deals with the influence of the control subsystem (CSS) on the production-technical area (PTA) of the organizational system. First, a company is defined as an organizational system (OS), then the control subsystem (CSS) and the production-technical area. By determining the distinguishing level, subsystems of the 1st order of the OS were defined. The intention of the authors is to identify the influence of the CSS on the production-technical area. The aim is to confirm the appropriateness of the application of the systems approach and confirmation of the newly formulated theory of management of the OS. For this purpose a questionnaire survey was carried out, a total of 561 respondents (managers), this file will be gradually increased. The information collected is statistically evaluated, first by determining the frequency of answers to the questions according to different criteria. Subsequently, other dependency, will be investigated for the purpose of comparison with the theory. In the area of influence of the CSS on the PTA has been confirmed the CSS dependency on vision/strategy, the production subsystem (PSS), the technological subsystem (TS1) and the technical subsystem (TS2).

Key words: Management, company, organizational system, distinguishing level, control subsystem, production-technical area

JEL classification:E19, M11, L20

1. Introduction

The engineering tradition stipulates that if one solves a given problem and is able to demonstrate a viable solution, the "job" is indeed done. Social sciences are more complex. Here, we seek a theory or set of theories that offer predictive value (i.e. that provide the ability to predict the relationship (causation) between two variables). So what is this elusive "theoretical contribution" (Boer et al. 2015)? In our contribution we will deal with the influence of the Control Subsystem (CSS) on the Production-Technical Area (PTA) of the organizational system (OS). We follow up on the previous work of Hron (2014), who has been dealing with the issue of organizational system since 1970s. He described the OS as a certain abstraction of a real object, which can be defined, while respecting the objectives, with certain elements (properties) and links between them. System access and control theory a number of authors have already dealt with in the second half of the last century. System theory and control theory, however, understood as a general approaches, characteristic for Cybernetics and Mathematics. Organizational System (OS), in our understanding, represents an abstraction of the company. In the 1980s, however, we can register the departure from a systemic approach. It was replaced by an empirical and strategic-marketing approach of Peter Drucker, Philip Kotler in Gunther (2009) and Michael Porter (1980), and a procedural approach of Steve Jobs in Elliot, Simon (2011). However, the increasingly complex world requires return to the systemic approach. Systemic thinking is, according to Hieronymi (2013), very important for better understanding of the complexity of the world in connection with its increasing interconnection. Boulding (2009) deals with the hierarchy of systems and the main ranks of the earth-physical, biological and social, each includes its subsystems. According to Ramasesh and Browning (2014) subsystem consists of individuals, groups, teams, or other organizational units doing the work. According to Karpavicius, Cvilikas and Gatautis (2007), the development of the system management concept conditioned a new understanding of the management of the organization. One of the new theories is the systemic view of control and economic processes. Balanced IS scorecard can be the foundation for a strategic IS management system provided that certain development guidelines are followed, appropriate metrics are identified, and key implementation obstacles are overcome (Martinsons, Davidson and Tse, 1999). From the perspective of the system it is necessary at first characterize the structure of each organization. This is the basis for the further development of systems theory in the field of management. According to Boonstra (2013) top management support is an important determinant of information system project success. This is especially the case in complex and large-scale IS projects. The authors summarize the different views on the system management of the organization. The analysis of the various approaches have found that the system can be considered as the unit of elements that are mutually dependent by the same character connection that works as a standalone object of environment. Management of organization can be considered as a complex process of information in a context of systems' theory (Boulding, 2004; Karpavicius, Cvilikas and Gatautis, 2007). Dey, Engel and Liu (2011), his research focused on examining the performance of companies that combine the role of Chief Executive (CEO) and Chairman of the Board (duality). Companies that divide these two positions, as a result of pressure from investors, have significantly lower income and subsequent performance, and also contributions of investments for the shareholders. The research of Ang, Cole and Lin (2000) deals with the influence of ownership structure and management on the absolute and relative costs of the joint stock company. Kooskora and Piigli (2016) made comparative research for EU countries, where the average number of women represented on the boards of director of 16.6% (social groups in management– men x women). The authors of the Nahm, Vonderembse and Koufteros (2004) deal with the influence of organizational culture in relation to the production and performance. Results of this research indicate that high levels of customer orientation lead to a set of managerial beliefs that are collaborative and integrative. Safizadeh et al. (1996) analyzed of data collected from managers at 144 U.S. manufacturing plants shows. Results of this research indicate a strong correlation between process choice, product customization, and competitive priorities. Most of the authors presents a systemic approach, but in reality it is rather about examining individualities within a system or subsystem. With distinguishing levels do not work at all. Therefore, we focused on these issues, formulate the theory of organizational systems management and collecting and evaluation enough data. Based on this, we want to confirm the theory.

2. Materials and Methods

For the purposes of our research, we have created the set of 561 managers (so far), from companies with Tangible Production (TP), Intangible Production (IP) and Mixed Production (MP).

In this paper we will cover only the information given by managers of the business with TP, which was 212 (37.8%). The file has the following structure: men 82%, women 18%, ownership share 25.5% of managers. A lower level of management is held by 32.1% of managers, middle

21.5%, higher by 22.8%, a member of the Board of Directors is 11.4%, 3 staff positions are 12.2%. The structure of the respondents by education as a percentage of: Secondary vocational education 23.4%, Secondary general education 7.0%, College of Humanities branch 7.0%, College of Technical branch 29.9%, College of Economics 28.9%. Age structure: from 20 to 30 years – 11.1%, from 31 to 40 years – 23.1%, from 41 to 50 years – 34.2%, from 51 to 60 years – 26.1%, from 61 to 70 years – 5.5%, from 61 to 70 years – 0.4%. As a member of the select (non-formal) management is considered to be 65.0%. Due to the size and composition of the management structure, we can consider the file as representative.

The purpose of the initial analysis is to make the data accessible graphically, tabularly and by calculating various statistical characteristics so that their statistical properties are clearly visible. If we consider categorical variables, then the frequency distribution table can be created by arranging the individual categories into the growing sequence and then assigning the numbers of the corresponding statistical units to each category, which we call absolute frequencies. The absolute frequency indicates how many times given category exists in the file. The sum must be equal to the range of file *n*, i.e.:

$$n_1 + n_2 + n_3 + \ldots + n_k = \sum_{i=1}^{k} n_i = n \qquad \textbf{(1)}$$

Furthermore, it is possible to indicate the relative frequency of the *fi*, which reflect the proportion of number of occurrences of the given category in the total range of the file, i.e.:

$$f_i = \frac{n_i}{n} \qquad \textbf{(2)}$$

If we multiply the relative frequency values by 100, they can be expressed as a percentage. If a variable has multiple values, the frequency distribution table does not provide an appropriate summary description for each value variant. In this case, the values are sorted into intervals and the frequencies of the intervals are determined. After obtaining all the frequencies, we will look for further statistical links between the subsystems, areas and processes of the OS in further research. All used abbreviations are explained in the Scheme 1 – 4.

3. Results and Discussion

OS is a certain abstraction of the real object, which can be defined, while respecting the objectives, with certain elements (properties) and links between them (Hron, 2014), see Scheme 1. These elements and links define the 1st order subsystems of the OS. The OS at the specified distinguishing level can be symbolically written as follows:

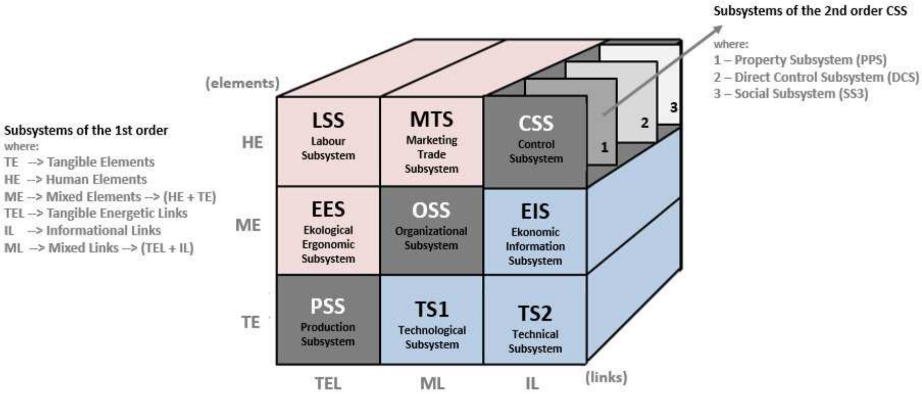
OS = {[PSS, TS1, TS2, EES, OSS, EIS, LSS, MTS, CSS][TEL, ML, IL]} **(3)**

The record indicates that the OS is defined by the set of subsystems and links between them, through which the OS implements the resulting behavior (i.e. transforms the inputs into the OS into outputs from the OS). Subsystems are mutually indispensable and conditioned, in exact proportion, have different stability, flexibility and competence and in respect of disjunction or conjunction. The listed properties are changed depending on the focus and size of the company. When the size of the company belongs to the factors affecting the performance and growth of the company (Hedija, 2017; Fiala, 2017). Due to the limited possibilities of this paper, we will deal only with tangible production companies, which is in our file 212 (37.8%).

3.1 Distinguishing level and subsystems of higher (2nd) order

From the total of 212 managers reported 172 (82.7%), that it is necessary to work with the distinguishing level or to increase it when analyzing and solving problems (production, organizational, commercial and management) and subsequent removal of the identified causes of problems.

Scheme 1. Organizational System (OS) --> (elements, links, distinguishing level)



Source: Authors, 2019

Similarly, 186 (86.5%) managers reported that they engaged in solving the problems the cause of the problem, 82 (67.8%) managers goes on and looking for the cause of causes. 142 (69.3%) managers (executives) said that such an approach may be applied in resolving any management problems. Consciously or subconsciously uses a distinguishing level of 194 (95.1%) management personnel. They use it for a better orientation, overview, and determining the hierarchy of importance of the problem, which needs to be solved. For the correct definition of the OS and the subsequent application of the system approach, it is necessary to introduce the third dimension, the distinguishing level, for the reasons mentioned above. The OS structure is then determined by elements, links, and degree of distinguishing level. Increasing the degree of distinguishing levels allows to define subsystems of higher orders (degrees 2, 3, 4). The representation of the OS using the distinguishing level is shown in Scheme 1. Increasing the distinguishing level has allowed us to define the second-order subsystems.

3.2 Control Subsystem (CSS)

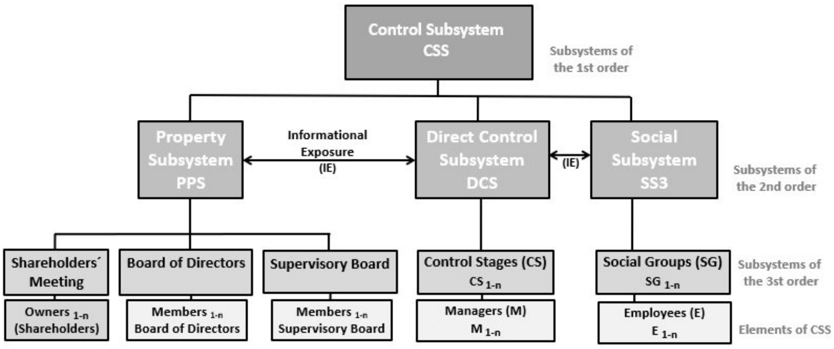
The CSS is the most important subsystem of the entire OS. It is built up in the hierarchy, the most flexible, but at the same time the least stable. If the control is understood as an information interaction between the subject control and the object control, the CSS entity represents the management and the other subsystems act as the object of the management. Decisions concerning the CSS and other subsystems are made by human elements within the CSS.

The questionnaire survey found that the submitter of new development programs is one of the owners in 21.1% of cases, someone from the Board of Directors in 21.5% of the cases, someone from the Sales Department, Marketing or Service in 40.1% of the cases, someone from the Production of 17.3% cases. These are suggestions for what the company should produce, thus supporting decision making, which accounts for 42.6% of Property Subsystem and 57.4% for Marketing-Trade Subsystem and Production Managers. The opposite is in the case for the major decisions, when it was examined, who decides on new development programs in the company (implementation of a new product). In such a case is decided by the Property Subsystem in 65% of cases and DCS (business executives including managers and specialists) only in 35% of cases. In fact, the ratio will be even more inclined to the Property Subsystem, because in the case of smaller companies, the interviewed managers did not sufficiently distinguish between the Director and the Owner or the Chairman of the Board, if it was one person. This person is often understood only as the Director.

3.3 Increasing the distinguishing level of the CSS

The impact of the decision on the OS, the risks associated with it, the definition of the powers and competences, all this is forcing us to increase the distinguishing level of the CSS. Increased distinguishing level enables you to specify the hierarchy of subsystems of the 2nd order CSS OS, see Scheme 2.

Scheme 2. CSS and its subsystems of higher order (increasing the distinguishing level)



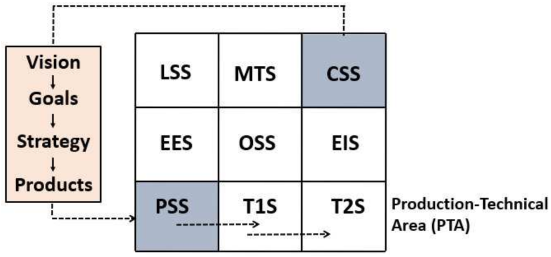
Source: Authors, 2019

The information activities between the PPS and the DCS represent the control commands given by the General Meeting, the Board of Directors, or the Supervisory Board for the implementation of the DCS (TOP management in this case). The CSS subsystems´ hierarchy will be substantiated by the results of the questionnaire, identified for the Production-Technical Area under investigation, in the following chapters of this paper.

3.4 Effect and influence of the CSS on the Production Technical Area of the OS

The structure of the Production-Technical Subsystems is determined by the CSS, which sets vision, goals and strategy. Technical-economic changes are not only reflected in the field of technical progress, but are also inseparably linked to changes in management, organizational structures, methods of communication, behaviour and value categorization (Dvorsky et al., 2016). The strategy is implemented through the new development programs, i.e. new specific products. When asked whether respondents have a strategy in their business and how to implement it, 183 (88.4%) answered positively, negatively answered 24 (11.6%), with 113 (53.1%) argues that the strategy is based on the current market situation, and 100 (46.9%) from the progressive fulfilment of the vision. The relatively high percentage of market response to the strategy is due to the structure of the managers interviewed, as 53.6% are in middle or lower management positions. These managers have an idea about the vision and strategy only mediated, therefore it do not give such importance. Senior executives (TOP managers), along with members of the Board of Directors or of the Supervisory Board (the German model) have an accurate understanding of the vision and strategy of the company and represent 46.4% of the surveyed managers. The effect of the CSS on the PTA is shown in Scheme 3.

Scheme 3.The influence of CSS on the structure of company products

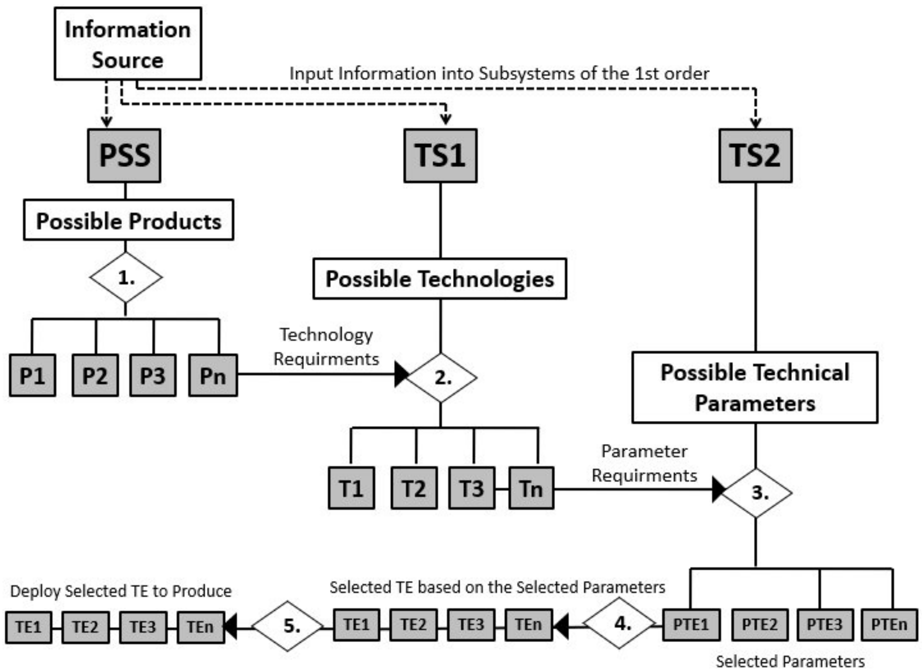


Source: Authors, 2019

The strategy is decisive for the product structure. Each product corresponds to the specific technology, it means that the CSS specifies the PSS and that specifies the TS1. Technology is determined by the technological procedure and technical resources that are capable of the technology secure. In other words, products generate requirements for technology and technology generate requirements for the technical parameters of the Tangible Elements (TE).

Ensure technology and technical resources requires investment, which can be a limiting factor for the development of the PTA. It was found that the decisions about the technology used to mean the CSS in 61.4% (30.5% of PPS to 30.9%) and specialists in 38.6%. The task of the specialists is to identify the information needed to make decisions, to prepare variants, but the actual decision provide the CSS, but the actual decision will be made by the CSS or by the responsible line managers. The selected technology is in the case of companies, one of the main sources that it is necessary to allocate to the production. In deciding on the allocation of resources (it is necessary to allocate tangible, human, financial, time and space resources) the CSS plays an even more significant role, because it was found that resource allocation is decided by the CSS in 87.5% (54.3% of the PPS, 33.2% the DCS) and specialists only in 12.5% of the cases.

Scheme 4. PTA dynamics when introducing a new product



Source: Authors, 2019

The inherent dynamic process of introducing a new product and the role of each subsystems can be captured by Scheme 4. In the scheme we can see five decision-making blocks. Decision block 1 represents the decision which products the company will implement. Information for this decision will be provided by specialists or the MTS staff. The decision is made by the CSS, to be more precise the MTS and the DCS (line managers), see details above. Decision block 2 represents the technology selection based on product requirements. The necessary information and the consequent issue of technology and appropriate technical equipment, decision block 3, shall carry out specialists. This is to support decision making, where the Development Department (25.0%), Scientific, Technical and Economic Information (16.5%) and specialists participate, i.e. technologists, production specialists, or the MTS staff (58.5%). The decision block 4, one of the main decisions, is again made by the CSS (87.5%) and represents the final approval of the purchase of the necessary technical equipment, that is decisions on the allocation of financial resources. Decision block 5 represents the decision to allocate the acquired technical resources to the organizational unit that will realize the production.

3.5 The CSS Hierarchy

In our conception, the CSS represents the interaction of HE through IL. HE play a different role in the management of the company and create second-order subsystems. These subsystems have their hierarchy, which we can express in sequence: PPS --> DCS --> SS3. In the hierarchy of the CSS subsystems, the property subsystem (PPS) stands at the top, which decides in most cases on the structure of production (65%). Only one third of the cases (35 %) are decided by the DCS. As well, we can evaluate the importance of subsystems for the allocation of resources, the PPS 54.3%, the DCS 33.2%. Specialists and the MTS staff participate in getting information and support decisions. Respondents said they are involved in the decisions about resource assignments only in 12.5% of cases.

4 Conclusion

Vision, objectives and strategies are the result of the activities of the CSS. The strategy determines the production. Its structure is decided by the CSS, not the MTS, as it is often presented. The MTS and the specialists are involved in obtaining the necessary information and supporting decisions (formulate possible options, are not responsible). The CSS itself has its hierarchy. The highest is the PPS, followed by the DCS, which is further divided into management levels and the lowest is SS3, which is divided into social groups It follows, that more attention should be paid to the PPS and its functioning from a management perspective, especially communication between the PPS and the DCS.

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IMPACT OF FOREIGN DIRECT INVESTMENTS IN V4 COUNTRIES - FOCUS ON SLOVAKIA

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Annotation: International capital is currently the highest level of internationalization of business activities. Foreign direct investment as one of the forms of international capital plays an important and growing role in global business. They includes rapid and huge transfer of money internationally, which allows companies to use it more efficiently. It is very important for a foreign investor to know the business environment of the country in which he plans to invest his capital. The country is attractive to the investor if it has favorable business conditions and prospective economic growth. Currently, V4 region is one of the most attractive European countries for foreign investors. This paper focuses on the analysis of the impact of foreign direct investment in the V4 countries over the period of 20 years from 1998 to 2017. The main aim is to determine the relationship of selected factors as the corruption perception index, labor compensation per hour worked, tax and unemployment rate with inflows of foreign direct investment for V4 countries. Focusing on Slovakia the dependence between these factors on inward flow of investments will be examined through an ordinary least-squares regression.

Key words: foreign direct investments, V4 countries, unemployment rate, corruption perception index, dependence, inflow

JEL classification: F21, F43, J01, C20

1. Introduction

Several authors announces that foreign direct investment (FDI) does not have a perfectly precise definition. The simplest way is to describe them as an investment where domestic investors can physically deposit their long-term financial resources into the capital of a foreign enterprise (Blaine Harisson, 2009). In such case, the mother company creates a multinational company together with foreign affiliates. Within direct foreign investment, the investor owns at least 10% of the ordinary shares or voting rights and gains managerial control. UNCTAD, (2019) underlined the international context of FDI and define them as an investments made by a resident enterprise in one economy with the objective of establishing a lasting interest in an enterprise that is resident in an another economy, which implies the existence of their long-term relationship which includes significant degree of influence on the management of the enterprise.

Sharp increase of FDI flows worldwide, has led to a fierce debate about the effects of globalization and consequently, concerns about the growing power of multinational companies (Fisher, 2003). Through FDI multinationals gain control over companies and economies which is strongly visible in transition countries. From the perspective of the host country, FDIs are widely seen as one of the main driving forces for successful transition to market economy (Kaminsky and Riboud, 2000; Blomstrom and Kokko, 2003).

Former planned economies in Central and Eastern Europe (CEE) started transition process towards market economy in 90s. Opening of these countries gave multinational enterprises access to new markets and cheaper production opportunities and labor force (Protsenko, 2003) Consequently, FDI in this region increases immediately. The investment flows brought capital, know-how and contributed substantially to a successful transition. (Frankfurter Allgemeine Zeitung, 2002). At this stage cost seeking vertical FDI enter the market and increase local wages and the income of the host country. During the catching-up process, higher purchasing power makes the host country more attractive for the market seeking horizontal FDI which leads to a further increase of wages and income. At the same time higher wages reduce the comparative advantage of the host country (Protsenko, 2003). Similar phenomenon describes Brainard and Riker (1997a, 1997b) who investigate whether US multinationals reduce labor demand at home when they expand production abroad. The impact of FDI on employment depends substantially on the type and motivation of foreign activity. For example, cost seeking investments lead to reallocation and therefore have a much bigger impact on home employment than market seeking FDI. Last but not least, every foreign investment is a strategic decision, which pros and cons have to be assessed. One of the main indicator for examination foreign business opportunities is Corruption Perception Index (CPI). Transparency International (2019), use it for description of the current political situation and the perception of political status of countries. CPI began its existence in Berlin and is being evaluated as early as 1995. It reflects the level of perception of domestic and foreign analysts and manager and consists of six institutions (The World Economic Forum-WEF, Freedom House, The Economist Intelligence Unit, IMD Management Institute, Bertelsmann Foundation and IHS Global Insight).

2. Materials and Methods

Visegrad Goup consist of four countries from Central European region (Czech Republic, Slovakia, Hungary and Poland), which have similar historical and socio-economical background. We examine inward financial flows in millions of US Dollars at current prices in millions and as a share of GDP (Gross Domestic Product), from UNCTAD stat in the period 1998-2017. Factors as the corruption perception index, labor compensation per hour worked, tax and unemployment rate were examined and compared between V4 countries. The corruption index is based on a scale of 0 to 100, with 0 being the most perceived corruption in the country, and 100 being the least perceived corruption. By 2012, this scale was measured on a scale of 0 to 10, where the value of 0 was the most perceived corruption and the value of 10 points was almost free of corruption. Labor compensation per hour worked is defined by EUROSTAT as compensation of employees in national currency divided by total hours worked by employees. Compensation of employees is the sum of gross wages and salaries and employers' social security contributions. This indicator is measured in terms of annual growth rate. For the indicator of tax we use EUROSTAT data of total receipts from taxes and social contributions (including imputed social contributions) after deduction of amounts assessed but unlikely to be collected as a percentage of gross domestic product (GDP).

The assumption of relationship of the selected factors to an inflow of FDI was set and examined through the correlation analysis for all the V4 countries. Methodically excel correlation analysis was applied to show correlation between two variables. Either positive, negative or none correlation. To interpret correlation coefficient which can rank from -1 to +1, certain ranges were set: strong correlation (1 – 0.7), moderate correlation (0.7-0.5), weak correlation (0.5-0.3), no linear relationship (0.3-0). This ranges can gain both positive and negative linear relationship. By the regression analysis the dependency of these factors on inward flow of investments was tested for Slovakia. An ordinary least-squares regression made in GRETL was made to determine the dependencies of a chosen factors for Slovakia. The Durbin-Watson test which assesses whether there is autocorrelation among the residuals or not was made.

The Durbin-Watson test statistically tests the null hypothesis that the residuals from an ordinary least-squares regression are not auto correlated against the alternative that the residuals follow an AR1 process. The Durbin-Watson statistic ranges in value from 0 to 4. A value near 2 indicates non-autocorrelation; a value toward 0 indicates positive autocorrelation; a value toward 4 indicates negative autocorrelation.

3. Results and Discussion

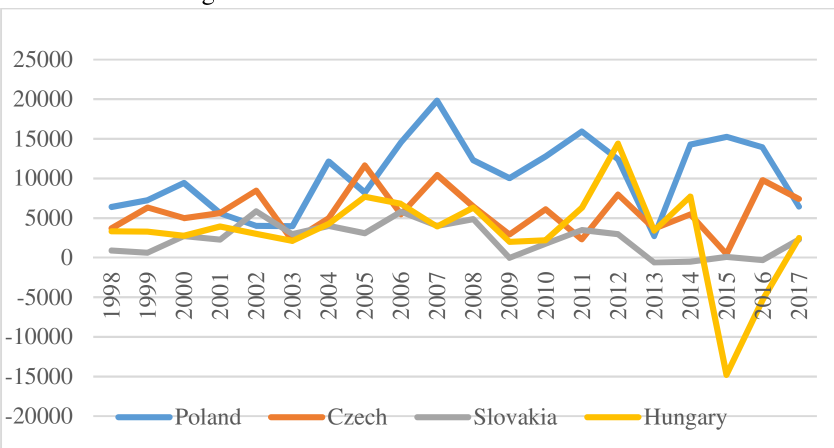
Foreign direct investment is one of the forms of international capital movements that have a significant impact on the national economy, economic growth and performance. V4 countries are not just open to foreign investments, but they depends on them in several ways.

Poland has the highest FDI inflows compared to V4 countries. In 2004, FDI inflows grew by 67% compared to the previous year, reaching 12,140.25 mil. USD, thanks to favorable business conditions and transparent tax and legal systems. Poland is in third place in the global rankings behind China and the US as the best place for production projects. Within Europe, Poland is after Germany the second best country to invest foreign capital. Recently its inflow dropped by half comparing previous year to 6433.52 mil. USD in 2017.

At the beginning of the examined period, the inflow of foreign investment increased mainly due to privatization in the Czech Republic. Trangas company was privatized and entering of Toyota also contributed to the increased share of foreign capital, which in 2002 amounted to 8,482.05 mil. USD. In 2005, the Czech Republic had the highest volume of FDI of 11,653.25 mil. USD. Unlike Slovakia, which was marked by the financial crisis, the Czech Republic did not feel a significant decline in FDI inflows into its country.

FDI inflows ranged throughout the whole period mostly from 2 mil. USD to 8 mil. USD in Hungary. The period of the economic crisis in 2009-2010 affected FDI inflows and since then FDI has been low until 2012, when it peaked and recorded a FDI inflow of 14 409.22 mil. USD. In 2015, surpluses surpassed investment, leading to a negative inflow and reaching a negative value of – 14,750.6 mil. USD. It was the fifth lowest FDI inflow in the world according to UNCTAD statistics. The reason for the negative inflow of foreign capital is the stagnation of the country's competitiveness thanks to government measures against banks and increased taxation and amendment. These were special taxes imposed on foreign companies, which Parliament approved in 2014. The measures concern the most tobacco industry, retailers, mass media companies and advertising tax. Hungary is trying to promote mostly domestic businesses.

Figure 1. Inward flow of FDI in mil. of USD



Source: Authors own processing based on UNCTAD stat, 2019

Slovakia has a very weak inflow of foreign direct investments compared to other V4 countries. In the first observed years, Slovak Republic higher FDI inflows were thanks to its privatization activities in particular by privatization of the banking sector. In addition to the banking sector, other sectors, such as the energy industry, have also been privatized. In 2002, the value of FDI inflows reached 5,864.88 mil. USD, which is the highest FDI inflow over the reviewed period. This year, IT company DELL Computer entered the Slovak market and in 2003 and 2004 two other important companies PSA and KIA entered also. Together with Volkswagen, Slovakia has become one of the countries with the highest industrial share in the automotive sector. The second highest inflow of capital was recorded in 2006 with a value of 5,803.09 mil. USD when another foreign investor came to Slovakia - SONY Slovakia. During the financial crisis, FDI inflows began to decline significantly. In 2009, Slovakia reached negative values and reached -6.08 mil. USD and gained economic stability just after adopting a new euro currency. Than economy developed until 2013, when again the inflow of FDI resulted in negative numbers and next year also. According to the latest available data, the inflow in 2017 is positive with the highest amount of 2,276.7 from 2012.
Within the examined period factors as the CPI, labor compensation per hour worked, tax and unemployment rate were examined and compared in V4 countries. The assumption of relationship of these factors to an inflow of FDI was set and examined through the correlation analysis for all the V4 countries and between these indicators.

Table 1. Correlation analysis of the selected indicators for Poland

Poland	**Inward FDI**	**Corruption index**	**Unemploymen t rate**	**Tax**	**Labour**
Inward FDI	1				
Corruption index	0.418627857	1			
Unemployment rate	-0.430190452	-0.775870712	1		
Tax	-0.108136889	-0.20166612	-0.05230866	1	
Labor compensation	-0.145791334	-0.03963245	-0.10902977	0.58019349	1

Source: Authors own processing, 2019

From the table 1. we can conclude for Poland strong negative correlation between corruption perception index and unemployment rate, which can tell us that the more unemployment in Poland results in lower corruption index, which actually means higher corruption. Also Al-Sadig (2009) show similar results in his study and stated that the corruption level in the host country has an adverse effect on FDI inflows: a one-point increase in the corruption level leads to a reduction in per capita FDI inflows by about 11 percent. Moderate positive correlation for labor and tax can be interpreted as higher tax lead to higher labor compensation per hour worked.

Table 2. Correlation analysis of the selected indicators for Czech Republic

CZ	Inward FDI	Corruption index	Unemploymen t rate	Tax	Labour
Inward FDI	1				
Corruption index	0.0540119	1			
Unemployment rate	-0.138601	-0.832295944	1		
Tax	0.26613266	0.313693496	-0.359103002	1	
Labor compensation	0.04297312	-0.471901881	0.236060278	-0.123254362	1

Source: Authors own processing, 2019

Inflow of FDI show with the indicators of corruption index and unemployment weak correlation. This can be interpreted as the higher unemployment the lower inflow of FDI. And the higher corruption index (which means lower corruption) the higher inflow of FDI vice versa- higher corruption lower FDI inflow.

Table 3. Correlation analysis of the selected indicators for Hungary

HU	Inward FDI	Corruption index	Unemployme nt rate	Tax	Labor
Inward FDI	1				
Corruption index	0.268874	1			
Unemployment rate	0.353538	0.229325136	1		
Tax	-0.32379	0.334454997	-0.167801954	1	
Labor compensation	0.150177	-0.266450816	-0.310341875	-0.1977	1

Source: Authors own processing, 2019

For Czech Republic table 2. strong negative correlation for corruption perception index and unemployment rate can be seen, what means that the more unemployment in Czech Republic results in higher corruption. Moderate correlation is found between tax and corruption index, unemployment. For the inflow of FDI there is no linear relationship for all the indicators.

Table 4. Correlation analysis of the selected indicators for Slovak Republic

SVK	Inward FDI	Corruption index	Unemploymen t rate	Tax	Labor
Inward FDI	1				
Corruption index	-0.242540758	1			
Unemployment rate	0.266173499	-0.834577065	1		
Tax	-0.208482039	-0.469609188	0.268126293	1	
Labor compensation	0.459036385	-0.614817861	0.458422232	0.583287	1

Source: Authors own processing, 2019

Hungary shows only moderate correlation. The higher tax the lower inflow of FDI and at the same time higher corruption index (so the lower corruption). Higher labor compensation results in lower unemployment and thus lower inflow of FDI.

Table 5. Model 1: OLS, using observations 1998-2017 (T = 20)
Dependent variable: inflow FDI in mil. USD

	Coefficient	**Std. Error**	**t-ratio**	**p-value**	
Const.	15,449.8	10,806.9	1.430	0.1733	
Corruption index	26.0469	128.184	0.2032	0.8417	
Unemployment rate	75.0854	184.854	0.4062	0.6903	
Tax	−586.670	178.221	−3.292	0.0049	***
Labor	482.373	135.626	3.557	0.0029	***

Mean dependent var	2,392.096	S.D. dependent var	1,939.280
Sum squared resid	31,415,679	S.E. of regression	1,447.197
R-squared	0.560345	Adjusted R-squared	0.443104
F(4, 15)	4.779419	P-value(F)	0.010954
Log-likelihood	−171.0496	Akaike criterion	352.0992
Schwarz criterion	357.0779	Hannan-Quinn	353.0711
rho	−0.194036	Durbin-Watson	2.286313

Source: Authors own processing, 2019

In Slovakia strong negative correlation for corruption perception index and unemployment rate can also be seen. But in Slovakia labor compensation has weak to moderate relationships with all other indicators. Positive weak correlation with inflow of FDI and unemployment rate and positive strong relationship with tax, thus higher labor compensation results in higher tax, higher unemployment and higher inflow of FDI simultaneously. Higher corruption index (lower corruption) would result in lower unemployment rate, tax and labor compensation.

By the ordinary least-squares regression made in GRETL, the dependency of the corruption perception index, labor compensation per hour worked, tax and unemployment rate were examined on inward flow of investments for Slovakia. We looked for an autocorrelation among the residuals of a linear regression model using Durbin-Watson test. Depending on the sample size, number of regressors, and level of significance we can conclude that the errors are uncorrelated. The overall regression model regarding to the P-value was significant, but relating to the indicators, only tax and labor were significant. For the tax, the inverse relationship was observed which can be interpreted as if the tax increase by one percent inflow of FDI will decrease by 586.670 mil. USD.

4. Conclusion

Economic strength of the country has been a very actual topic in recent years. In the century of globalization and multinationalization it depends on whether foreign investors will come to invest in the country or whether they prefer to invest in neighboring countries because of better economic conditions. We analyzed the impact of FDI (as the mayor contributor of economic growth) on the countries of the four Visegrad Group for the years 1998-2017.
The inflow of FDI in the V4 countries is mostly associated with the automotive, engineering and electrical industries and outsourcing of services. In the early examined years, the FDI inflow was higher in all countries regarding to privatization activities. Poland is one of the most attractive FDI countries within the European Union, as it has strong economic and political stability, skilled labor market and a large domestic market. From 2001 until the financial crisis,

Hungary has maintained approximately the same FDI volume. On the other side, Slovakia has a very weak inflow of FDI compared to other V4 countries. Comparing Slovakia's investments in the Czech Republic, it account for 3.4% of the total FDI in the Czech Republic. In the last examined year 2017 was CZ country with the highest inflow among V4 countries.

Based on an outcome from the correlations after the examined assumption that selected factors as the corruption perception index, labor compensation per hour worked, tax and unemployment rate impact inflow of FDI, we cannot conclude same impact on FDI for all the V4. For Czech Republic the results show that none of these indicators impact FDI due to low calculated correlation. On the other side this assumption is proved in case of Poland for two indicators, CPI in positive way and unemployment rate in negative correlation. Similar results show study of Al-Sadig (2009) whose results show that the country's quality of institutions is more important than the level of corruption in encouraging FDI inflows into the country. For instance, ceteris paribus, a country with sound institutions is able to attract as much as 29 percent more per capita FDI inflows than a country with poor institutions. For Hungary there can be seen positive correlation of FDI with unemployment rate and negative with the tax. This is confirmed also according to Gordon and Hines (2002), who stated: "Tax policies are obviously capable of affecting the volume and location of FDI, since, [. . .] higher tax rates reduce after-tax returns, thereby reducing incentives to commit investment funds". Surprisingly indicators with significant impact on FDI for the rest of V4 countries does not impact Slovakia, but labor compensation is an indicator which impact FDI just in Slovakia in positive manner.

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SOCIAL NETWORKS AS A FUTURE TOOL OF EMPLOYEE SOURCING IN THE FIELD OF AGRICULTURE

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Annotation: The main aim of this research is to evaluate approaches to the recruitment process in the field of agriculture in the Czech labour market. An important issue is to ensure that all techniques for sourcing employees are used by agricultural enterprises with reference to the current situation in the Czech Republic. A subsidiary aim of the research is to identify techniques for the recruitment process in the field of agriculture. Currently, it is considered that these techniques are important for the success of an enterprise. The research for this article was developed using quantitative research methods. Data were obtained by means of an electronic questionnaire (N=980). For data evaluation a mixture of statistical methods was used. Firstly, nominal variables were analysed according to frequency. Then Chi-squared test and correlation analysis were used for testing hypotheses. It was found that agricultural enterprises (86.4%) do not use social networks for sourcing employees. If they are used, then it is mainly by small enterprises (52.3%). Moreover, the survey revealed (p=0.861) that using social networks for sourcing employees does not depend on the area of production (i.e. animal husbandry, plant husbandry). Implementation of new recruitment strategies at the right time and in the right place can help all enterprises in the battle for talented human resources.

Key words: human resource management, employee recruitment and techniques, social networks, agriculture

JEL classification:Q19, M54

1. Introduction

The Czech labour market must deal with a record low unemployment rate, which in February 2019 was 3.2%, although according to EUROSTAT methodology it was as low as 1.9%. Thus there is insufficient workforce in the labour market. Research on the Jobs Index indicates that every 6th Czech employee has changed their job within the last 12 months (LMC, 2018). Employers have to adapt to the situation by changing the job specifications for candidates, offering more attractive opportunities.

The agriculture field in the Czech Republic includes agriculture, forestry, and fisheries and accounts for a total of 3.6% in the national economy (Kučera, 2014). The agricultural sector is a very important part of the national economy, and plays a crucial role in economic growth (Ansari and Khan, 2018; Svobodová and Urbancová, 2016). The overall position of Czech agriculture in the labour market can be illustrated by its share in the labour force. Over more than twenty years, this has fallen by 2.5 percentage points. In 1993 almost 6% of employees were employed in agriculture, whereas in 2016 it was only 3% (TREXIMA, 2018).

In the Czech Republic in 2017, 182,294 employees (including 104,480 full-time) worked in agriculture and most were 45 years old or more (CSO, 2016). These data show that in the agriculture field the average age of employees is high. The level of management in Czech enterprises was largely made up of those with an apprenticeship in agriculture, without any specialized education (CSO, 2016). As noted by Spěšná et al. in 2014 (reported by Venclová, Kříž and Jindrová, 2018) "*Almost every Czech agricultural enterprise tries to ensure they have enough qualified employees for a successful business*". From these data, it can be concluded that an outflow of agricultural employees can be expected in the coming years and the retired, experienced employees will have to be replaced by a new generation. Šnýdrová (2014) notes the need for changes in the approach to recruiting staff, using modern technologies and methods – in particular social networking.

By 2020, employment in the agriculture field is predicted to fall by around 10% (Truhlíková et al., 2017). Kołodziejczak (2018) adds that "*…the situation in agriculture influences the employment rate in farms, since modernization and retrofitting processes in this sector enforce gradual reduction of labour inputs.*" Successful employee recruitment can be defined as the search for staff from external and internal sources, where the organization finds strongly motivated individuals and is able to make an attractive offer. The recruitment methods can include direct applications and referrals, e-recruiting, head hunters' services, cooperation with high schools/universities, labour offices and other professional associations, personnel leasing or outsourcing the process (Noe et al., 2017).According to Wenzelmann, Muehlemann and Pfeifer (2019) and Rafaeli, Hadomi and Simons (2005) in recent years "*…the costs of job postings increased by 53%*" thus the costs of recruiting for vacant job positions are twice the monthly salary.

At the beginning of 2013, 15% of enterprises used social networks for recruitment in the Czech Republic, while a year later, more than a third of enterprises (36%) use a social network (EUROSTAT, 2019b). Large enterprises are especially active in social networks in the Czech Republic. Unfortunately agricultural businesses were not monitored in the context of social networking (CSO, 2015; EUROSTAT 2019b).

The main aim of this research is to evaluate approaches to the recruitment process in the field of agriculture. An important issue is to ensure that all techniques for sourcing employees are used by agricultural enterprises with reference to the current situation in the Czech labour market.

2. Materials and Methods

A quantitative survey was conducted in the Czech Republic from December 2018 to January 2019 to identify the recruitment processes adopted in the field of agriculture and evaluate attitudes towards them. A subsidiary aim was to check the extent to which all sources of employee recruitment were currently used by agricultural enterprises in the Czech labour market. The quantitative survey was carried out on the basis of a questionnaire survey comprising of 15 questions, five of which were qualitative in nature. 9 questions were based on multiple choice.

The sample group consisted of 980 agricultural enterprises. The questionnaire return rate was 12.04% (118), of which micro-enterprises (up to 9 employees) accounted for 15.3%, small enterprises (from 10 employees to 49 employees) for 53.4%, and medium-sized enterprises (from 50 to 249 employees) accounted for 31.4% of the sample. The classification of enterprise size was according to the recommendation of the European Commission (No. 2003/361/ES).

The data obtained were processed by means of absolute and relative frequencies. Testing was carried out using the Pearson Chi-Square test in contingency tables. To interpret the strength of relationship coefficients (Cramer's coefficient), a scale according to was used. For testing statistical hypotheses and the subsequent analysis the level of significance $\alpha = 0.05$ was used. The conditions for testing by means of the Pearson Chi-Square test in contingency tables were confirmed (no more than 80% of cells had an expected count of less than 5, other cells had an expected value count lower than 1). The practical calculations were made using MS Excel and the statistical software SPSS (version 24).

3. Results and Discussion

3. 1 Employee sourcing

The survey has shown that 81.4% agricultural enterprises use internal sources for the recruitment process in their enterprise. If they use external sources, the method they mainly use is either referral by employees (94.1%) or employee advertising (86.4%). *Thus, recruiting through employee referrals is likely to be less costly than recruiting through employment advertising (*Rafaeli, Hadomi and Simons, 2005).

Subsequently, testing of hypotheses (H_{01} – H_{02}) was carried out for in-depth analysis. The results of testing confirmed that the use of internal sources or employee referral for recruitment is not dependent on the size of an agricultural enterprise**.** On the other hand, the results of testing (H_{03}) have confirmed that using the method of advertising for an employee depends on the size of an agriculture enterprise (Table 1). In particular, small-sized enterprises (53.9%) and medium-sized enterprises (36.3%) use the advertising method to source new employees.

Table 2. The results of the qualitative characteristics test for hypotheses 1, 2 and 3[9]

Number of hypothesis	Null hypothesis (H_0)	P-value	Rejection of H_0	Value of Cramer's coefficient
1	The use of internal sources for recruitment does not depend on the size of an enterprise	0.066	No	
2	The use of external sources – employee referral for recruitment does not depend on the size of an enterprise	0.122	No	
3	The use of external sources – employee advertising does not depend on the size of an enterprise	0.000	Yes	0.362

Source: Authors' survey, 2019

However, according to the current situation in the labour market it is not sufficient to use only this method. The effectiveness of the employee sourcing methods could be connected with employer branding. According to Sokro (2012) the employer brand might help organizations compete effectively in the labour market. It is needed for the organization to communicate with potential candidates through traditional as well as social media platforms (Ahamad, 2019). According to Jeske and Schultz (2019), social media can also be used for screening candidates.

The survey revealed that agricultural enterprises use the services of the Labour Office of the Czech Republic (80.5%). In-depth analysis was carried out by means of testing H_{04}. (Table 2). This has shown that external sourcing by means of the Labour Office depends on the size of an agriculture enterprise. Small and medium sized enterprises often face different challenges

[9]degrees of freedom = 2

and barriers compared with larger enterprises, as their financial capabilities are more limited (Mittal et al., 2018). Thus small-sized enterprises (54.7%) mainly use this approach.

Currently, this is not effective because there are only 0.7 registered applicants per job (MPSV, 2019). In addition, agricultural enterprises of all sizes often collaborate with other professional associations (H_{05} Table 2).

Table 2.The results of the qualitative characteristics test for hypotheses 4 and 5[10]

Number of hypothesis	Null hypothesis (H_0)	P-value	Rejection of H_0	Value of Cramer's coefficient
4	The use of external sources – labour office for recruitment does not depend on the size of an enterprise	0.001	Yes	
5	The use of external sources – collaboration with other professional associations for recruitment does not depend on the size of an enterprise	0.054	No	0.343

Source: Authors' survey, 2019

3. 2 On-line advertisement

This survey has shown that agricultural enterprises (49.2%) advertise on the internet. Rani (2016) agrees and adds that job seekers can easily find advertisements. If agricultural enterprises publish advertisements on-line, they mainly use job portals such as jobs.cz (29.7%) and prace.cz (24.6%). Medium-sized enterprises mostly use job portals for advertisements (Table 3). The reason for the differences shown could be the fees charged for job portals and the financial status of enterprises. Ahmed (2012) concluded that cost issues play an important role for employee sourcing.

Table 3. External sourcing – on-line advertisement technique via job portals

Use of Job portals		**Enterprise size**		
		Micro-sized enterprises	Small-sized enterprises	Medium and large-scale enterprises
Yes	Relative Frequency	6.8%	45.5%	47.7%
No	Relative Frequency	20.3%	58.1%	21.6%

Source: Authors' survey, 2019

Agricultural enterprises definitely do not use the following Czech job portals: proudly.cz, kariera.cz, pracezarohem.cz. In 2016, a smart phone with internet access was used by 58% of Czech citizens and 42% are online as frequently as they use a computer (research on Google, 2017). If agricultural enterprises advertise on-line, then they will publish information on employer/employers (94.9%), type of contract as regards time (93.2%), job description (91.5%), the content of the contract – agreement, indefinite deliveries (89%), contact details of recruiter (89.8%), salary offer (73.7%) and employee benefits (64.4%). Khan, Awang and Ghouri (2013) add, that salary is the most influential motivator as regards interest in the job.

[10]degrees of freedom - 2

3. 3 Social networking

Social networking as an external recruitment source has been rarely used by agricultural enterprises (13.6%). Mainly, it is small-sized enterprises (52.3%) that use social networks as an external source. Moreover, the use of social networking does not depend on the production field (animal husbandry, plant husbandry) or the size of an enterprise (Table 4).

Table 4. The results of the qualitative characteristics test for hypotheses 6 and 7[11]

Number of hypothesis	Null hypothesis (H_0)	P-value	Rejection of H_0	Value of Pearson Chi-Square/ Fisher's test	Degrees of freedom
6	The use of external sources - social networking for recruitment does not depend on the size of an enterprise	0.397	No	1.848	2
7	The use of external sources - social networking for recruitment does not depend on the production field	0.861	No	0.542	2

Source: Authors' survey, 2019

Social networks, as a search tool, are gaining in importance because of low unemployment and high economic growth. This is evidenced by the results of international studies that show a trend towards the use of social networks by enterprises (Školudová, 2015). The use of social networking in businesses is increasing. Within the EU, only 9% of enterprises used social networks to recruit in 2013 - this increased to 23% in 2017. 72% of large enterprises used social networks to recruit, while only 45% of small enterprises used social networks as a tool for recruitment (EUROSTAT, 2019b).

If agricultural enterprises advertise on social networks, then they use Facebook jobs (7.6%) (Table 5). However, according to research by TREXIMA (2014), 29% of enterprises in the Czech Republic use social networks for hiring managers and specialists, but only 7% of enterprises use them for employees' positions. The most used network is LinkedIn.

The use of social media for recruiting reduces the cost and time factors (Hou and Li, 2017). It was proved that Facebook is an effective tool for recruiting low earning women through posting advertising and surveys on Facebook. *„The reason why using social media sites for recruitment is the fact that there is no limitation by earning, education or geography on internet“* (Lohse in Hou and Li, 2017). Recruiting costs are nine times less than traditional methods (Melanthiou, Pavlou and Constantinou, 2015).

Social media should be beneficial for small and medium sized agriculture enterprises. This tool is effective and inexpensive. Digital companies use new technologies as a kind of competitive advantage. Unfortunatelly for small and medium-sized enterprises, new technologies are very expensive. Most of them therefore adopt a waiting tactic waiting for technology to become cheaper, or until they find a suitable subsidy. For small entrepreneurs, investment in technology is a major strategic decision, often associated with existential risk (Kuliš, 2018). But the use of social media is available to them from many sources.

[11]degrees of freedom = 2

Table 5. External sourcing –social networking technique (Facebook jobs)

Facebook jobs		Enterprise size		
		Micro-sized enterprises	Small-sized enterprises	Medium and large-scale enterprises
Yes	Relative Frequency	11.1%	77.8%	11.1%
No	Relative Frequency	16.7%	33.3%	50%
In total	Relative Frequency	13.3%	60%	26.7%

Source: Authors' survey, 2019

4. Conclusions

Nowadays, people are the most important resource for any enterprise in all fields. The method used for employee sourcing is important for the success of an enterprise, in order to gain a competitive advantage. Agricultural enterprises prefer using internal sources for the recruitment process. However, according to the current situation in the labour market it is not sufficient to use only this method. The Czech labour market must deal with a record low unemployment rate, which according to EUROSTAT methodology is 1.9% (February 2019). Agricultural enterprises use as an external source the services of the Labour Office of the Czech Republic (80.5%). Currently, this route is not effective because there are only 0.7 registered applicants per job (MPSV, 2019).

The survey conducted has shown that 49.2% agricultural enterprises advertise on the internet. It is mostly medium-sized enterprises (45.5%) that use job portals for advertisement. If agricultural enterprises advertise on-line, they mainly use job portals such as jobs.cz (29.7%) and prace.cz (24.6%). On the other hand, social networks are rarely used by agricultural enterprises (13.6%). Small-sized agricultural enterprises mostly use social networking (77.8%) because it is inexpensive. In addition, they do not have to invest substantial finances in ~~a~~ new technology. However, social networks are gaining in importance as a search tool because of current low unemployment and economic growth in the Czech Republic. The use of social media for enterprises has benefits such as free, unlimited use and good response time with respect to contact and activities (Eger, Mičík and Řehoř, 2018). In order to ensure they have employees at the right time and in the right place, an enterprise has to implement and apply new trends such as social networking. LinkedIn is often considered as the most useful network and this can give a competitive advantage for any enterprise.

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WIRELESS CONNECTION USABILITY IN RURAL AREAS

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Annotation: The article is focused on a stable internet connection as a competitive advantage in the agricultural industry. In the first part of the research, the current situation is analyzed in cooperation with the local association of farmers with a focus on differences between small and large sized enterprises. Typical technologies used to connect companies in rural areas will be determined and experience of enterprises in the real environment. The second part of the paper is the experimental observation of a typical wireless link used for connection of enterprise-grade customers in rural areas. The objective of this experiment is to determine whether commercially available SLAs should be used in the segment of small or large agricultural companies or can be omitted without losing desired functionality.

Key words: wireless, competitiveness, agricultural industry, rural areas, internet connection

JEL classification: D83

1. Introduction

As of 2019 to be connected is an essential part of running any type of an enterprise, including agricultural business. Those companies have several specifications based mostly on this close physical relationship to rural areas where they are also settled. The purpose of this article is to evaluate the current situation of internet connectivity among small-sized and large-sized enterprises in rural areas, technologies used and find out whether improving this aspect can be used as a competitive advantage.

As mentioned in (Pratomo and Affandi, 2016), implementing robust and high capacity networks in the rural areas is difficult – “It makes the big digital discrepancy between our people in rural and urban area”. Historically only wired-based communication networks were established in such areas designed only for basic voice/telephone services and no other 21st-century standard features. This causes a “digital divide” closely linking the telecommunications and economic development (Todd and Jaison (2002). This problem is not new, it was mentioned several times even in the early 1990s (U.S. Congress, 1991) and (Strover, 2001). This issue is closely developed all over the world while almost the same problems are solved a different ways (Jhunjhunwala et al., 2008) where the most used way how to overcome this digital divide is using some type of wireless (Oliva, 2005), “Wireless communication technology is preferred as a last mile when the users are dispersed or far away from the core or when it is not feasible to lay down a fixed cable service to the distant users” (Hameed, Mian and Qadir, 2018). This conclusion is valid worldwide and also in Central Europe / Czech Republic. In (Yu et al., 2018) the authors describe several ways how to increase capacity and reliability of wireless link while those two parameters act as contraries. We can get higher capacity –or- higher reliability (when other link parameters are kept the same). Although the authors calculate the results for very small distances (10s of meters) formulas described in the article are valid regardless of distance. For rural areas their conclusion “there may exist more interferers within d and outside φ, and the typical receiver suffers from more interference” is still valid but not expected to be such important as in urbanized areas. This is supported by research (Mardeni and Chimheno, 2013) which can be seen as an extreme example compared to Central Europe, but overall principles are the same and will be evaluated in our research.

Establishing a reliable internet connection is necessary for all types of agriculture enterprises due to government requirements, the law required reporting and several other reasons. Creating a list of those needs and requirements is not a topic of this article but is seen by the authors as a good topic for further research. For the current study, the authors see the need for connection as a fact without the need for future improvements. If there is a difference among different sizes of agriculture industry enterprises – is also the topic for our research. A good starting point for this can be found in (Żmija and Czekaj, 2016).

2. Materials and Methods

The paper is split into two parts – preliminary research followed by testing of the data link. In the first part, the authors analyse the current situation in internet connection among small and large agricultural companies while the classification is based on the amount of land used (less or more than 100 hectares – this threshold is based on a specific situation in the Czech Republic) or amount of LSU (livestock unit). As a source of contacts for companies, the Asociace soukromého zemědělství ČR (Association of Private Farming of the Czech Republic - APF) and those companies are asked questions regarding their internet connection, usage and how their performance depends in functional connection.

In the second part of the research, a typical wireless link on non-WiFi technology was observed for a period of 4 weeks and it's reliability and influences from environmental parameters were estimated. Also, alternatives methods of internet connection in rural areas are described and compared.

3. Results and Discussion

During the preliminary research part of the work, 168 agricultural enterprises (members of APF) were asked to participate in the research by filling a simple online form which was available for 3 weeks during the April 2019. 85 replies were gathered (return rate is 50.5%) and processed. This number is higher than expected while the research was conducted during the "high season" of agricultural works when one-man and similar small enterprises have plenty of work on the field. Results indicate that 38% of answers were from small-sized companies while the remaining 62% is considered as large-size. Distribution among districts ("kraje") is almost equal. Most of (69%) enterprises are settled in villages (up to 1,000 inhabitants) and only one company is to be found in the city (above 5,000 people).

Very interesting results were obtained when asking how many computers are connected to the internet; 83.3% companies answered that "whole company network" is connected, only 16.7% answers were focused on one or two "administrative" computers and no one answered that only the owner's (or similar) computer is connected. This distribution was indifferent to the size of the enterprise and even one-man enterprises have some kind of local network (which was not expected).

The following question was crucial – a type of internet connection ("last mile") used. No surprise was the most used technology – WiFi in shared bands (36.7% of answers), but second place for "professional microwave link" (23.3%) was unexpected. Moreover, this type of connection is most popular for small-sized companies (35.6%) while larger ones use WiFi more likely. Summed up, 70% of connections are made by some kind of wireless technology (when included 10% of LTE) and we can conclude that wireless issues are very important for this customer segment. This opens an opportunity for our following research on the usability of wireless links in the rural areas.

Only 16,7% of fixed-wires connection (A/DSL) is far less than expected and is used mostly (82%) by the large companies and practically by none (18%) of small-sized enterprises. This result was later deeply inspected by checking of DSL offers in various rural area locations.

All remaining questions were more-less statistical about the price of connection (average of CZK 1,415 per month including VAT) with very slight (and non-statistically influencing) difference between the small and large companies.

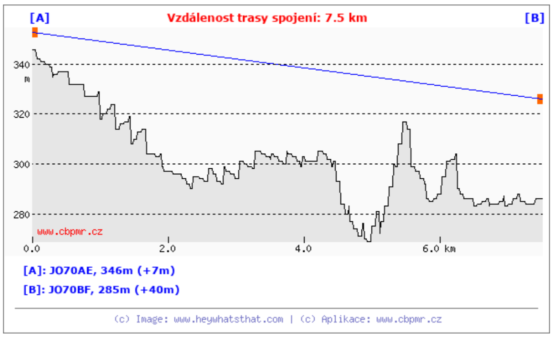
The vast majority (89.7%) of connections is provided by local ISPs and only 10.3% of companies use large ISPs. This result is closely related to the technology used, while almost all companies use A/DSL connection get their service from O2 company and on contrary – WiFi connection is always provided only by local small ISPs.

Companies were also asked about the importance of functional internet connection for their business, where 96.7% enterprises (98.7% large and 91.3% small) needs connection every day and 60% of companies answered that even short time (up to 6 hours) internet connection malfunction will cause them “serious problems”. This answer is different according to the size of the enterprise, but even small-sized ones see permanent internet connection as crucial (52%).

More than 78.6% of enterprises don’t have SLA signed with their ISP and in the segment of small-sized companies, it was 100%. This is not a surprising answer but when compared to the previous question (internet is necessary for our business) we got definitely a topic for further research.

As for the second part of the experiment – a typical microwave link was established as a simulation. This experiment was performed thanks to cooperation with company Agra Řisuty s.r.o. in their detached facility in Ledce village, Czech Republic. This link was not used as a primary connection, only simulated traffic was generated using Nping tool and Netstat was used to do create statistics. The far end of the link was settled on the grain silo in Slaný, Czech Republic. Both sites are actually used for a real-working link for connecting company, but the traffic on this link is more-less random and it was decided not to use it as experiment base. For link, an Alcoma AL10D-ME32 microwave link (10.5GHz band, which is unlicensed for p-2-p in the Czech Republic) was used with 60cm antennas on both sides. Calculated received energy level (with +3dBm Tx) was -63dBm, actually measured value in the time of installation (2nd April 2019) was -66dBm. The measured noise level on both sides was below -90dBm – fade reserve was above 20 dB. The link was locked on the 32Mbit/s link speed with QPSK modulation, 14 MHz channel width and disabled fallback. Physical parameters of the link are displayed on the enclosed image.

Figure 1. Tested wireless link physical parameters



Source: Author’s own work, generated on www.cbmpr.cz, 2019

On the same site, there was a professional meteorological station installed for Metheopress company and measured values were available for our experimental use. However, no significant values were acquired during the experiment period so our original intention to compare radio-link parameters to environment values was abandoned. This is still seen as a good idea for further research which needs to be much longer.
On tradic generator, a stable stream of mix UDP/TCP (50/50) packet was created with random snes from 64 bytes to 1,200 bytes (MTU for the link is actually 1500 bytes). Asymmetrical tradic was simulated while 80% of tradic was downstream and 20% upstream. Maximal data rate was limited to 30 Mbit/s (93% saturation) On both sites analysis of incoming tradic was running for 30 days calculating only pure incoming traffic, pings (round-trip od 32byte ping every 10 seconds) and network outages such as packet loss>10% and stream interruptions Langer than 5 seconds.
Researchers were afraid of possible power problems (blackout) but cooperating company Klfree Networks, s.r.o. was unwilling to provide UPS for Ledce site. During the experiment, no power problems occurred.
Measurements were taken all 30 days along with the following results:

Table 1. Measured link parameters

Parameter [unit]	Value site A/B	SLA level
Incomming max [Mbit/s]	5.8 / 30.0	N/A
Incomming min [Mbit/s]	0.0 / 0.0	N/A
Max PL in 1hour window [%]	1% / 1.2%	N/A
Total PL for the whole time [%]	0.00023% / 0.00024%	N/A
PL >10% total time [sec]	15,623 / 17,846	99.47% / 99.39%
Interruptions total time [sec]	7,463 / 7,846	99.75% / 99.73%

Source: Experimental measurement, 2019

Note: calculated for 30days window

Our research results can be compared to the other author's works in two ways. The first part, which is very local-specific for the Czech republic is very different from work of (Jhunjhunwala et al., 2008) where many times larger areas were studied and population density of both countries differs 20 times. Surprisingly – our results were almost the same when discussing the internet connection as the factor of competitiveness. On the other hand – not surprisingly the desired technologies for filling this digital divide gap is totally different, while the Czech Republic is well known for it's WiFi widespread usage.

4. Conclusion

During the first part of the research, we have provided an overview of the current situation of the agricultural industry. Most of the companies are connected to the internet using wireless technology, as expected. Many of those, including large-size enterprises, are still using WiFi which was never intentionally created for such purpose. Most companies don't use SLA agreement with their provider even though they see a stable internet connection as crucial. Surprisingly, among small companies, there is slightly higher awareness about SLA and how necessary the internet connection is for their business.

The objective of the experiment was to calculate the actual reliability of this typical link and to provide agricultural companies guide whether it is possible to achieve some level of SLA using even unlicensed technology as 10.5GHz. Real-word test of the actual link has been done and results indicate that at least 99.5% SLA can be reached with ease. Our suggestion to all companies regardless of their size is to potentially set up SLA with their providers and especially small-enterprises are able to reach it too.

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THE POSSIBILITY OF USING MIRROR STATISTICS IN THE ANALYSIS OF CZECH EXPORTS OF AGRICULTURAL PRODUCTS AND FOODSTUFFS TO THE RUSSIAN MARKET

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Annotation: The Russian market is the largest market for sales of goods from all EU countries. Therefore, a practical analysis of the state, conditions of sales and prices of goods exported to the Russian market is demanded and relevant for each country trading with Russia. Traditionally export analysis is based on national statistics of the exporting country. However, the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is no less important. Theoretically in mirror statistics export of goods of one country to another should be equal to the import of goods of the last country from the first and vice versa. In practice, however, the mentioned trade volumes usually differ. The asymmetry of the data is due to the difference in prices of the recorded flows, where customs statistics register the export of goods at FOB prices, and imports at CIF prices. In addition, the asymmetry of the mirror data can also be associated with various errors in determining the value, masking shadow operations and capital flight. The article presents the results of the study of the asymmetry of mirror statistics of the Czech Republic and Russia in the agricultural products and foodstuffs (APF) trade and analyzes the export of Czech APF to the Russian market using mirror statistics of Russian imports from the Czech Republic. The results of a comparative analysis of mirror data by APF product groups and then main products from these groups are discussed. Also, using the example of supplies of Czech beer, the problem asymmetry of statistics on natural supplies is considered and approaches to its possible solution are formulated.

Key words: Agriculture in International Trade, Export and import of goods, Mirror international statistics

JEL Classification: F14, Q17

1. Introduction

The Russian market is the largest market for sales of goods from all European countries, including for V4 countries. Therefore, a practical analysis of the state, conditions of sales and prices of goods exported to the Russian market is demanded and relevant for each country trading with Russia. Traditionally the analysis of a country's exports is based on national statistics. However the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is no less important. In general mirror statistics is closer to the real conditions of the sales market, as it captures the receipt of goods for sale in the domestic market of the importing country. This allows quantifying the competitive positions of foreign goods and their dynamics in the market of the host country, taking into account prices and volumes of supplies, which are carefully fixed by the customs service for calculating budget payments.

This publication examines the results of study of mirror statistics asymmetry for export of Czech goods to the Russian Federation (data of the Czech export statistics) and Russian mirror statistics of import in 2015-2017 to assess possibilities to apply the Russian customs import statistics for the analysis of deliveries of Czech APF goods to the Russian market.

2. Materials and Methods

As is known, international trade between two countries is simultaneously monitored by the customs services of these countries. The result is a two-sided display of trade data, which is commonly referred to as mirror statistics. Theoretically in mirror statistics export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one, whereas import of the former country from the latter one should be equal to export of the latter country to the former one. In practice, however, the mentioned trade volumes usually differ.

Price factor. First of all, this is due to the difference in prices of the recorded flows. As is known, according to customs statistics methodology (World Bank, 2018), the value of exporting goods of a country A to the market of a country B is represented by statistics of a country A in FOB prices, while imports of goods from a country A to a country B are represented by statistics of a country B at CIF prices, which additionally include the costs of insurance and transportation of goods. According to the IMF, the world average CIF/FOB value is 1.06 (Bogdanova, 2010). Currently, the Central Bank of Russia at the mirror comparing statistics for non-CIS countries applies coefficient 1.0588 (BOP, 2018). In addition to the difference in prices of trade flows, the asymmetry of the mirror data can also be associated with various errors in determining the customs value of goods, masking shadow operations and capital flight. In general, as experts note (MONSTAT, 2015) the reasons for the data asymmetry (discrepancies in the mirror statistics) can be various and should be considered separately in each case using available statistical data from trading countries.

Flow registration accuracy. Regarding the accuracy of registration of exports and imports, the UN statistics experts point out that for a given country, imports are usually recorded with more accuracy than exports because imports generally revenues while exports don't (World Bank, 2018). The general view of experts on the accuracy of data collected by customs offices is that import data are more reliable than export data because customs services are more serious about recording imported goods for purposes of tariff revenue collection, taxes, and other regulatory controls (Hamanaka, 2011).

The conclusion about a smaller asymmetry of import flows of mirror statistics was practically confirmed when comparing Czech export statistics on APF and mirror statistics on the import of Czech goods to Belarus (Yurik, 2017). Indeed, the mirror data of Czech imports from Belarus and Belarusian exports to the Czech Republic had rather large differences, while data on the opposite flow to Belarus, by contrast, differed slightly.

This publication will present the results of the study of the asymmetry of the mirror flows of Czech exports to Russia and Russian imports from the Czech Republic by groups of APF goods (HS 01-24). In addition, a mirror comparison of statistics for the main Czech APF exports to Russia will be carried out and possible causes of problematic data asymmetry are estimated using the example of beer supplies. As we know, similar studies for APF products in the Czech Republic's trade with Russia have not been conducted before.

Below we present the results of a comparison of Czech export statistics in the Russian Federation and Russian import statistics to assess the possibility of its practical use in analyzing the competitive positions of Czech goods in the Russian market. The focus of our research will be on the APF product group (HS 01-24), for which the causes of data asymmetry will be considered. The initial data of comparative studies is statistics from the UN COMTRADE database (UN COMTRADE, 2019), which is formed on the basis of customs statistics of foreign trade of Russia and the Czech Republic. The main goods of Czech imports to Russia are presented by the Federal Customs Service of the Russian Federation from its database. We note that the data of the national statistical services and the UN COMTRADE are homogeneous, since the UN COMTRADE combines the national foreign trade statistics of the countries of the world without changing them. Differences in the data are possible in view of the delay in technical adjustments, so all other things being equal, preference should usually be given to national statistics as more relevant, including the latest data refinements.

3. Results and Discussion

3.1. Total cost estimate of the asymmetry of mirror statistics of the Czech Republic and Russia for APF

Mirror comparison of the data of export and import of Czech goods to the Russian APF market showed the following (Table 1). Comparison of the general results shows that from 2015 to 2017 the cost estimate of Czech exports to Russia (prices FOB - Czech statistics) was higher than the estimate of imports to Russia from the Czech Republic (prices CIF - Federal Customs Service of the Russian Federation) by an average of 12% with a minus sign (Czech goods were exported to Russia less than Russian import statistics show). This unnatural data asymmetry requires additional analysis and indicates problems with errors in reporting and / or determining the customs value of goods that may mask shadow operations and capital flight. Such discrepancies should be studied by statisticians and customs officers in each particular case.

Table 1. Mirror comparison of APF trade data

HS	CIF: Russian import from the Czech Republic			FOB: Czech export to Russia			(CIF - FOB) / FOB		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
	$			$			%		
Total	2,679,134,129	2,766,511,012	3,216,554,357	3,199,489,631	3,074,515,354	3,539,595,373	-16%	-10%	-9%
01-24	100,482,076	109,183,144	125,876,176	95,555,906	104,739,446	115,664,815	5%	4%	9%

Source: Own calculations on the basis of data UN COMTRADE, 2019

In contrast to the overall results, a mirror comparison of APF trade data (Table 1) shows a generally normal situation with an average valuation excess of CIF prices over FOB by an average of 6%, which is comparable to the ratio of 1.0588 of the Central Bank of Russia for calculating the balance of payments (BOP, 2018).

Thus, it can be concluded that, in general, the use of import statistics of the UN COMTRADE/the Federal Customs Service of the Russian Federation for the analysis of mirror data on the Czech APF trade in the Russian market is possible in view of the acceptable data difference methodology.

3.2. Main APF goods and mirror statistics asymmetry

To study the commodity composition of Czech APF exports to the Russian market, we used the results of the previous study (Yurik and Pushkin, 2018), where a list of 32 main Czech APF products with a depth of sampling of 98.4% was selected, while 11 main products accounted for over 90% of the trade volume. As noted in the indicated study, the center of trade interests is undoubtedly concentrated in the first three groups of Czech goods, which have significant volumes of trade and have promising growth characteristics for expanding their presence in the Russian market. At the same time, the first three products formed more than 60% of the value of APF goods and had excellent growth characteristics, when, at the same time as the cost of supply, their quantity and price increase (Yurik, Pushkin and Yurik, 2019). As for the asymmetry of statistical data on products from the top three (Table 2), the following results are recorded here.

Table 2. Mirror data comparison for the APF top three

		CIF/FOB			Share		
		2015	*2016*	*2017*	*2015*	*2016*	*2017*
	TOTAL	0.84	0.90	0.91			
01-24		1.05	1.04	1.09	100%	100%	100%
	11 Main goods	1.08	1.07	1.10	85%	88%	92%
	- Top 3				53%	57%	62%
2309	Animal feed	0.90	0.94	0.98	17%	23%	25%
2203	Beer	1.10	1.06	1.17	14%	15%	19%
0407	Birds' eggs	1.04	1.06	1.01	21%	20%	18%

Source: Own calculations on the basis of data of UN COMTRADE, 2019

Thus, in group 2309 (Animal feed), the value of the coefficient CIF/FOB is less than one, i.e. the value of Czech goods exported to Russia (Czech statistics) was greater than that which the Customs fixed when crossing the Russian border. By 2017 this asymmetry has steadily decreased and, in general, it can be attributed to transport losses. Additional information about the situation can be obtained only by customs directly from manufacturers. For the rest of the top three products, the average values of deviations in the value of goods in CIF prices from FOB for groups 2203 (Beer) and 0407 (Birds' eggs) remained on average within acceptable values, i.e. the cost of goods in CIF prices was higher for transportation costs and insurance within the average norms (perhaps, for beer in 2017, it is slightly more than acceptable).

Thus, a mirror comparison of data on the value of trade flows of 11 main goods and three top-leaders at the level of statistics did not reveal any noticeable problems and confirmed the possibility of using mirror statistics of Russian imports from the Czech Republic when analyzing Czech APF exports to the Russian market.

3.3. Additional possibilities of mirror statistics in analysis of APF products (on the example of beer)

As we know, statistics records not only the customs value of goods for a particular product, but also their quantity. The standard unit of measurement of physical volumes of goods at customs is kilograms. At the same time, for the convenience of calculating customs payments for certain goods, physical volumes are also recorded in additional units of measurement (liters, units, etc.). Thus, the statistics allows carrying out a mirror comparison of data not only by value, but also by the number of traded goods. These quantitative data can be found in the additional tables of the statistical database of the Federal Customs Service of the Russian Federation.

Russian market of natural imports supplies of beer. The data on price conditions and market share of natural supply of beer and eggs are presented in Table 3.

Table 3. Data on price and market share of Russian import from non-CIS countries in 2017

	L	thous, $	$/L	Share
2203 Beer made from malt				
non-CIS	153835151	167630	1.09	100%
DE	62968072	64551	1.03	41%
CZ	27037780	23814	0.88	18%
BE	14941712	20763	1.39	10%
LT	8048022	5513	0.69	5%
GB	7456429	10128	1.36	5%
IE	6748694	13311	1.97	4%
MX	6653370	7541	1.13	4%
CN	3880122	3952	1.02	3%
KR	2807170	2124	0.76	2%
FI	1920810	2357	1.23	1%
NL	1810921	2986	1.65	1%
PL	1719673	1132	0.66	1%
JP	1528475	1636	1.07	1%
US	1513274	2154	1.42	1%
FR	1461029	1232	0.84	1%
Other	3339598	4436	1.33	2%

Source: Own calculations on the basis of data of the Federal Customs Service of Russia, 2019.

As follows from Table 3, the position of Czech beer in the Russian market can be called stable, since among non-CIS countries in 2017 Czech beer occupied 18% of the market, and this is the second place after Germany (41%) with a noticeable margin from third place Belgium (10% of the market of non-CIS countries). The average beer price per liter for Germany, the Czech Republic and Belgium was 1.03; 0.88 and 1.39 dollars/l.

According to our estimates, the demand for original Czech beer in the Russian market will continue with a tendency of growth in both the number of deliveries and prices, since the closest competitors from non-CIS countries have a noticeable gap in prices from the Czech Republic. In addition, it is possible to recommend the expansion of the supply of premium Czech beer. Judging by the prices for German and Belgian beer, the Russian market is ready to pay more for high-quality original beer brewed and bottled in the Czech Republic.

Problem data asymmetry. We will consider the possibility of detecting the problematic asymmetry of statistical data on the example of Czech beer.

As known, the Czech Republic is proud of its national drink and Czech beer is world famous. In addition, since January 2008 "Czech beer" is a protected designation of the European Union (PGI – Protected geographical indication). This sign is regarded as intellectual property and is protected by EU legislation in order to preserve the good name and quality of beer produced in the Czech Republic. In addition, the entry of the designation "Czech beer" in the EU registry provides an opportunity to protect the traditions of Czech brewing and production technology, as well as to prevent the emergence of fakes that breweries can give out for Czech beer and thereby abuse its unique qualities. According to the EU protected designation, "Czech beer cannot be considered a product made in the Czech Republic in an unconventional way or produced in the traditional way, but abroad" (Fontanka, 2008).

In further analysis, we will focus not on the value volumes of beer, but on its quantity. When comparing mirror flows, the norm is considered to be almost complete coincidence of the physical volumes of the flows. Otherwise, an additional analysis of the causes of data asymmetry is required.

Comparison of Czech exports to the Russian Federation and Russian imports from the Czech Republic on beer in quantitative terms gave the following results.

Table 4. Mirror comparison of Czech beer data (in liters)

	2015	*2017*
Russian import from the Czech Republic	15,644,571	27,061,624
Czech export to Russia	15,226,590	24,216,116
Import / Export	103%	112%
Import - Export	417,981	2,845,508

Source: Own calculations on the basis of data UN COMTRADE, 2019

As follows from Table 4, the import of Czech beer to Russia from the Czech Republic in liters was higher than the Czech export of these volumes to the Russian market: in 2015 and 2017 by 3% and 12% respectively. This unnatural asymmetry of the data indicates that, along with the original Czech beer from the Czech Republic, supposedly “Czech beer“ from other countries also enters the Russian market, while the amount of this beer is growing from year to year. As a result, in 2017, according to mirror statistics, every tenth bottle of Czech beer was delivered to the Russian market from outside the Czech Republic.

Moreover, as calculations show, in 2017 the price of a liter of original Czech export beer was $ 0.82. Beer, which passed customs under the guise of Czech, had a price of 1.22 dollars per liter, which is almost 1.5 times higher than the original Czech export beer.

The study of the reasons for the indicated asymmetry of mirror statistics by value volumes, of course, requires a separate analysis and answers to many questions for customs services and statistics. For example, why do more Czech beer enter the Russian market than are exported from the Czech Republic? Is it re-export (then the export of Czech beer is underestimated by Czech statistics) or system errors in the declaration for the purpose of exporting dubious products? How is the designation "Czech beer" protected by the EU controlled when exporting across the EU border to Russia?

These issues of data asymmetry should be in the focus of attention of the customs authorities of the two countries, in particular, to prevent the unfair use of the EU-protected name “Czech beer” and the possible spread of fakes. We plan to continue this line of research and send inquiries to the customs of the EU and Russia.

In conclusion, we can only note that our recommendations regarding the growing demand for original Czech beer in Russia, for which the consumer is willing to pay a higher price, are confirmed to an excellent degree. Indeed, the Russian consumer is already paying a high price for the dubious "Czech beer", whose supply is growing.

4. Conclusion

1. The Russian market is the largest market for sales of goods from all European countries, including for the Czech Republic. Therefore, a practical analysis of the state, conditions of sales and prices of goods exported to the Russian market is demanded and relevant. Traditionally

the analysis of a country's exports is based on national statistics. However the analysis of the same stream on the basis of the host country's mirror statistics in the form of its imports is no less important. In general mirror statistics is closer to the real conditions of the sales market, as it captures the receipt of goods for sale in the domestic market of the importing country.

2. Theoretically in mirror statistics export of goods of one country to the other one should be equal to the import of goods of the latter country from the former one and vice versa. In practice, however, the mentioned trade volumes usually differ. The asymmetry of the data is due to the difference in prices of the recorded flows. As is known, according to customs statistics methodology, the value of exporting goods of a country A is represented in FOB prices, while imports of goods at CIF prices, which additionally include the costs of insurance and transportation of goods. According to various estimates, the ratio of the value of CIF/FOB is from 4 to 10 percent. In addition, the asymmetry of the mirror data can also be associated with various errors in determining the value, masking shadow operations and capital flight.

3. Currently the general view of expert statisticians on the accuracy of data collected by customs offices is that import data are more reliable than export data because customs services are more serious about recording imported goods for purposes of tariff revenue collection, taxes, and other regulatory controls. This conclusion was confirmed by us on the example of the import of Czech APF goods to the Russian market. Here, a mirror comparison of APF trade data showed a generally normal situation with an average valuation excess of CIF prices over FOB by an average of 6%, which is comparable to the ratio of 1.0588 of the Central Bank of Russia for calculating the balance of payments for non-CIS countries. In addition, this conclusion was also confirmed at the level of comparison of data on trade of goods leading (animal feed; beer; eggs of birds), which accounted more than 60% of the value of supplies.

4. In conclusion, the study was conducted mirror comparison of data on the natural supply of Czech beer to the Russian market. The liter was chosen as the unit of measure for quantity, since customs duty and excise are levied by Russian customs per liter of beer. As a result, a problematic data asymmetry was revealed, which shows that beer exports from the Czech Republic were lower than those recorded by Russian customs as imports from the Czech Republic. This "Czech" beer occupies one tenth of the Russian market of original Czech beer. In this case, a mirror comparison of data on the trade in beer made it possible to identify problems in the export of Czech beer. These problems of non-coincidence of natural supplies of the same product need to be dealt with both by the Czech side (in order to protect the national producers of original Czech beer from its imitations) and by the Russian side (including to protect Russian consumers of beer from possible deception and fakes). In addition, in this case, in our opinion, an additional analysis of the situation with the use of the EU-protected Czech beer designation is also required.

In addition, in our opinion, questions of the use of intellectual property rights for the EU-protected PGI mark for Czech beer for export to Russia require analysis.

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STARTUP FUNDING FROM PUBLIC VENTURE CAPITAL: CASE OF ALBANIA

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Annotation: This paper aims to investigate key factors for startup funding from public venture capital in Albania. Costs associated with starting a business represent always a significant risk. It is unlikely to define the time frame to profitability for new enterprises. However, early-stage financial support plays a vital role in overcoming cost-based obstacles and boosting the chances of having successful enterprises. Economies of scale refer to the ability of an enterprise to reduce its costs with respect to business size while economies of scope are related to product diversification. Both can be a catalyst for business growth. Considering limited resources both concepts may be relevant for large-scale companies and less applicable for small-scale enterprises. In this context, one of the initial challenges faced by startups is proper budgeting and fundraising. In this study, the findings showed that Know-How of startup's personnel and employment creation possibilities are of the most significance for proving financial resources from public funds. The least important factor is geographical scope of the business.

Key words: Startups, SMEs, funding, cost, TOPSIS.

JEL classification: M13

1. Introduction

Usually, resource capacity is one of the biggest advantages of large-scale companies over small-scale enterprises. Enterprise size refers to the scale of business operations indicating the level of production and accordingly the volume of sales. Economies of scale can be achieved when production costs decrease and production output increase. For micro and small-size enterprises, cost advantages occurring from economies of scale are very difficult to be performed due to limited business operations. However, other factors affecting business functionality shall be considered. For example, for new enterprises, the advantages of coming up with a great business idea are accompanied by the risk of being not financially supported. Especially during the early stages of a startup, having financial means have significant importance. There are increasing cases when government bodies or agencies provide public venture capital in the form of funds aiming to foster creativity and promote innovation. Nevertheless, the administration and distribution of public funds have been questioned. The same applies to the current situation in developing countries for which the management of public sources and decision-making process may be subject to political bias and social affiliation. As such this paper aims to assess key criteria for startup funding from the main government agency in Albania which provides public capital to startups. Also, the paper seeks to contribute to a fair and transparent selection model based on which startups can be chosen for public funding.

2. Materials and Methods

TOPSIS multi-criteria decision method is used for the purpose of this study. TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) was originally proposed by

Hwang and Yoon (1981) and developed by several academics and researchers (Yoon, 1987; Hwang, Lai, Liu, 1993; Chen, 2000; Shih, Shyur and Lee 2006; Park et. al., 2011). TOPSIS is a mathematical method applied in the literature for selection of the best option(s) from all feasible alternatives through distance measures. Most of the decision-making problems arise when qualitative and quantitative attributes are assessed using human judgment and inaccurate data (Li and Yang, 2004). TOPSIS to the fuzzy environment method proposed by Chen (2000) is applied in this paper. A multi-criteria decision making (MCDM) problem is given in the matrix expressed as follows:

$$D = \begin{array}{c} \\ \\ A_1 \\ A_2 \\ \vdots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccc} W_1 & W_2 & \cdots & W_n \\ C_1 & C_2 & \cdots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \end{array} \quad (\mathbf{1})$$

Where D refers to decision maker, { A_1, A_2, ⋯, A_m } are alternatives among decision maker choose, { C_1, C_2, ⋯, C_n } are criteria which measure alternatives, and X_{mn} is the evaluation of alternative A_m with respect to criterion C_n. While, { W_1, W_2, ⋯, W_n } represents weight of criterion C_n assessed by decision makers.
Linguistic variables are used to assess qualitative and quantitative attributes. In the table below are shown linguistic variables for importance weight of each criterion:

Table 1. Linguistic Variables for Importance Weight of Each Criterion

Linguistic Terms	Very High (VH)	High (H)	Medium (M)	Low (L)	Very Low (VL)
Fuzzy Number	(0.8, 1, 1)	(0.6, 0.8, 1)	(0.3, 0.5, 0.7)	(0, 0.2, 0.4)	(0, 0, 0.2)

Source: Own processing, 2019
Note: In this study Chen's 7-scale variables are converted into 5-scale variables

Linguistic scale and triangular fuzzy numbers which are used to evaluate alternatives with respect to qualitative attributes are as follows:

Table 2. Linguistic Scale for Alternative Evaluation

Linguistic Terms	Very Good (VG)	Good (G)	Fair (F)	Poor (P)	Very Poor (VP)
Fuzzy Number	(8, 10, 10)	(6, 8, 10)	(3, 5, 7)	(0, 2, 4)	(0, 0, 2)

Source: Own processing, 2019
Note: In this study Chen's 7-scale variables are converted into 5-scale variables

Formulas used for calculating the importance of the criteria and alternative evaluation with respect to each criterion are:

$$\widetilde{X}_{ij} = \frac{1}{K}\left[\tilde{x}_{ij}^{1}(+)\tilde{x}_{ij}^{2}\,(+)\cdots(+)\tilde{x}_{ij}^{k}\right] \quad (\mathbf{2})$$

$$\widetilde{W}_j = \frac{1}{k}\left[\widetilde{w}_j^{1}(+)\widetilde{w}_j^{2}\,(+)\cdots(+)\widetilde{w}_j^{k}\right] \quad (\mathbf{3})$$

Where K represents decision maker. Also, normalized fuzzy decision matrix (**1**) can be expressed as $\tilde{R} = \left[\tilde{r}_{ij}\right]_{mxn}$ (**4**), where B and C represent benefit and cost criteria as follows

$\tilde{r}_{ij} = \left(\frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*}\right)$, $j \in$ Band$\tilde{r}_{ij} = \left(\frac{a_j^-}{a_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{c_{ij}}\right)$, $j \in$ C where $c_j^* = \max c_{ij}$ if $j \in$ B, and $a_j^- = \min a_{ij}$ if $j \in$ C. Taking into consideration the different importance of each criterion, Chan (2000) constructed the weighted fuzzy decision matrix as $\tilde{V} = \left[\tilde{v}_{ij}\right]_{mxn}$ (**5**), i= 1, 2, …, m, j = 1, 2, …,n where $\tilde{v}_{ij} = \tilde{r}_{ij} x \tilde{w}_j$. Also, variables $\tilde{v}_{ij}$, $\forall i,j$ are normalized positive triangular fuzzy numbers ranging between 0 and 1. So, fuzzy positive ideal solution (FPIS, A^*) and fuzzy negative ideal solution (FNIS, A^- can be expressed as $A^* = (\tilde{v}_1^*, \tilde{v}_2^*, \cdots, \tilde{v}_n^*)$ and $A^- = (\tilde{v}_1^-, \tilde{v}_2^-, \cdots, \tilde{v}_n^-)$ where $\tilde{v}_1^*$ =(1, 1, 1) and $\tilde{v}_1^-$= (0, 0, 0), j = 1, 2, ...,n.

Distances from positive ideal solution (D^*) and negative ideal solution (D^-) are calculated based on the formulas:

$$D_i^* = \sum_{j=1}^{n} d\left(\tilde{v}_{ij}, \tilde{v}_j^*\right), i = 1, 2, \dots, m. \quad \textbf{(6)}$$

$$D_i^- = \sum_{j=1}^{n} d\left(\tilde{v}_{ij}, \tilde{v}_j^-\right), i = 1, 2, \dots, m. \quad \textbf{(7)}$$

Where D (.,.) shows the distance between fuzzy numbers. Closeness coefficient (CC) determines the ranking order of alternatives. Values closest to 1 are the closest to positive ideal solution $A^*$and values closest to 0 are the closest to negative ideal solution A^-. Using formula below we can rank alternatives from the best to the worst:

$$CC_i = \frac{\mathrm{D_i^-}}{\mathrm{D_i^*+D_i^-}}, \mathrm{i} = 1, 2, \dots, \mathrm{m}. \quad \textbf{(8)}$$

3. Results and Discussion

Albanian Investment Development Agency (AIDA) is the main governmental funding agency in Albania. The main objectives of the agency are the attraction of foreign investments and improvement of Albanian enterprises in terms of competitiveness. The Innovation Fund (IF) is part of AIDA which assists micro, small and medium-sized enterprises aiming to promote innovation and technological development by making Albanian firms more competitive in the European and global market. IF serves mainly micro and small firms in the form of subsidies based on their needs for innovation and technology, enabling optimal development.

A set of 7 criteria is used in this paper. A small enterprise is accepted for funding evaluation only if it is registered in Albania, no longer than 2 years old, and capable of financing at least 50% of its costs (Decision no. 210). After these criteria are met then an applicant enterprise is considered for funding based on their business plan framed by 7 criteria listed below:

Table 3. Set of Criteria

Abbreviation for Criteria	C_1	C_2	C_3	C_4
Criteria	Size of the Enterprise	Financial Capability	Geographical Scope	Operating Sector
Abbreviation for Criteria	C_5	C_6	C_7	
Criteria	Employment Creation	Know-how of Personnel	Documentation	

Source: Decision No. 210 Date 20.04.2018 of The Council of Ministers (Albania)

Grant Approval Commission (KAG) is the decision-making body of Innovation Fund. KAG is composed of 5 commissioners who are responsible for the evaluation of the applications and granting funds to SME enterprises. Decisions are taken based on the one-member-one-vote (OMOV) method. Therefore, a set of 5 decision makers is applied with all the decision makers equal in importance weight to 0.20.

Table 4. Importance Weights of Decision Makers

Decision Makers	D_1	D_2	D_3	D_4	D_5
Importance Weight	0.20	0.20	0.20	0.20	0.20

Source: Decision No. 210 Date 20.04.2018 of The Council of Ministers (Albania)

Using linguistic and triangular fuzzy variables for importance weight of each criterion listed in Table 1, fuzzy decision matrix is as follows:

Table 5. Criterion Importance Weight

	Decision Makers						
Criteria	D_1	D_2	D_3	D_4	D_5	**Weight**	**Rank**
C_1	M	M	M	M	M	(0.3, 0.5, 0.7)	6
C_2	H	M	H	H	H	(0.58, 0.78, 0.94)	5
C_3	M	L	L	M	L	(0.18, 038, 0.49)	7
C_4	H	H	H	H	H	(0.6, 0.8, 1)	4
C_5	VH	H	VH	VH	H	(0.76, 0.96, 1)	2
C_6	VH	VH	VH	VH	VH	(0.8, 1, 1)	1
C_7	VH	H	H	VH	H	(0.69, 0.89, 1)	3

Source: Decision Makers Evaluation and authors' calculations, 2019

Table 6 shows alternative ratings by decision makers with respect to criteria:

Table 6. Alternatives Rating

		Decision Makers				
Criteria	**Alternatives**	D_1	D_2	D_3	D_4	D_5
C_1	A_1	VP	VP	VP	P	P
	A_2	G	G	F	F	G
	A_3	VG	VG	VG	G	VG
C_2	A_1	F	F	F	P	F
	A_2	G	G	F	G	F
	A_3	G	VG	G	G	VG
C_3	A_1	F	F	F	F	F
	A_2	G	F	G	F	G
	A_3	VG	G	G	G	VG
C_4	A_1	F	F	G	G	G
	A_2	F	F	F	G	G
	A_3	VG	G	VG	F	G
C_5	A_1	VP	P	P	P	VP
	A_2	F	F	F	F	F
	A_3	VG	VG	VG	G	VG
C_6	A_1	P	F	F	F	F
	A_2	G	G	G	G	G

	A_3	VG	VG	VG	G	VG
C_7	A_1	F	F	F	F	F
	A_2	F	G	G	G	F
	A_3	VG	G	VG	VG	VG

Source: Decision Makers Evaluation, 2019

Table 7 shows fuzzy normalized decision matrix:

Table 7. Weighted Matrix

	Criteria			
Alternatives	C_1	C_2	C_3	C_4
A_1	(0, 0.9, 2.4)	(2.8, 4.4, 6)	(3, 5, 7)	(5.2, 7.2, 8.8)
A_2	(5.2, 7.2, 8.8)	(5.2, 7.2, 8.8)	(5.2, 7.2, 8.8)	(5.2, 7.2, 8.8)
A_3	(7.2, 9.2, 10)	(6.2, 8.2, 9.4)	(6.2, 8.2, 9.4)	(6.6, 8.6, 9.4)
	C_5	C_6	C_7	
A_1	(0, 1.2, 3.4)	(2.8, 4.4, 6)	(3, 5, 7)	
A_2	(3, 5, 7)	(6, 8, 10)	(5.2, 7.2, 8.8)	
A_3	(7.2, 9.2, 10)	(7.2, 9.2, 10)	(7.2, 9.2, 10)	

Source: Author's calculations, 2019

Also, closeness coefficient is calculated and FPIS and FNIS are given as below:

Table 8. Distance Measurement

	A^*	A^-
$\boldsymbol{A_1}$	2.338	0.063
$\boldsymbol{A_2}$	0.720	1.709
$\boldsymbol{A_3}$	0.441	1.964

Source: Author's calculations, 2019

4. Conclusion

One of the most challenging aspects of micro to small enterprises is the lack of capital strength, especially, in the early stages of business life. Despite the ingenuity and dedication of young entrepreneurs, fixed and variable costs may be a reason for immediate failure. So, financial support in the form of grants or subsidies is of great importance for enterprise survival. In this context, this paper seeks to avoid biased decisions and encourage the transparent funding selection of new enterprises. On one side the study will help decision-makers in determining order preference by similarity to the ideal solution, and on the other side optimal resource allocation by finding the fuzzy positive and negative ideal solutions will increase prospects for successful startups.

Also, findings suggested that the most important decision criterion for enterprise funding is Know-How of personnel (0.8, 1, 1). The second most important criterion is employment creation with importance weight (0.76, 0.96, 1). In addition, the least criterion to have an impact on enterprise funding selection is geographical scope (0.18, 038, 0.49). Also, closeness coefficient of three alternatives indicated preferential alternatives in the following order $A_3 > A_2 > A_1$.Based on data, it can be concluded that new enterprises with better Know-How and employment creation possibilities have more funding prospects from public venture capital (AIDA in Albania). The lack of capital and early costs seems not to be the biggest obstacle for micro and small-size enterprises, because public venture funds are available once practical knowledge and expertise of entrepreneurs are demonstrated. However, the study has its own limitations. Criteria stipulated by government, decision makers, and weights of each criterion assessed by decision makers may change over time. Therefore, a longitudinal study can be proposed.

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EFFECTIVENESS OF PRODUCTION POTENTIAL OF FARMS AS A FACTOR DETERMINING THE USE OF SHORT-TERM SOURCES OF FINANCING

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Annotation: Financial decisions of farmers which are reflected in the financing structure of agricultural activities indicate the predominance of equity capital. In the structure of liabilities, however, long-term capital prevails. However, an increase can be noted in financing of agricultural holdings with short-term capital, mainly due to the increased involvement of trade credit. The main objective of the study is to assess the impact of factors related to the farm's production potential and the efficiency of its use on the probability of making a decision to involve short-term capital to finance agricultural production. The study scope covered commercial farms in Poland. The basic data source were the financial results of 12,027 individual farms, which in 2015 conducted agricultural accounting for the needs of the Polish Farm Accountancy Data Network. The logistic regression model was used to determine the factors affecting the financing of agricultural activities with short-term foreign capital. The dependent variable was the probability of using short-term foreign sources of financing by the agricultural holding in Poland in 2015. The obtained results show that factors related to the farm's production potential and the effectiveness of its use have an influence on the decision to finance agricultural activity with short-term foreign capital. The parameters of the constructed model indicate that there is a positive relationship between: the economic size of the farm, the area of agricultural land, the value of assets (minus land, permanent crops and production quotas), investments on the farm and the marketability of production, and the use of short-term financing sources. However, the higher the farm's ability to self-finance operations and create savings, the lower the likelihood that a given entity will decide to involve short-term capital in financing of agricultural production.

Key words: logistic regression, short-term liabilities, agricultural holdings

JEL classification: Q1, Q12, Q14

1. Introduction

Our previous research has shown that the productive potential (area of agricultural land, share of leased land in the area of agricultural land, total labor input and technical work equipment) affects decisions regarding the selection of external sources of financing agricultural activities (Strzelecka, Zawadzka and Kurdyś-Kujawska, 2018). We have also established that in the structure of liabilities of entities from the agricultural sector, long-term liabilities prevail (Zawadzka and Strzelecka, 2018; Zawadzka and Strzelecka, 2014; Strzelecka, Kurdyś-Kujawska and Zawadzka, 2019), which confirms the results of research that are presented in the literature (Mądra, 2010; Felczak and Domańska, 2014). Agricultural activity is associated with a long production cycle, the effects of which depend to a large extent on environmental factors. The long production cycle, in turn, requires sources of financing, obtained both on the financial and commodity markets, hence farmers' activity on the credit market (Zawadzka, 2012). Agricultural holdings make limited use of short-term external capital (including trade credit) for financing of agricultural activity (Zawadzka and Strzelecka, 2018). The research results concerning the use of trade credit by farms in Poland show, on the one hand, a growing interest in this form of borrowing, and on the other hand, that these entities are more often lenders of commercial credit, than its recipients (Zawadzka and Kurdyś-Kujawska, 2018). It seems interesting, therefore, to establish the factors that affect the use of short-term external capital, including trade credit, by farms. The effect of skillful use of external sources of financing by agricultural holdings may be an increase in labor productivity and income and an improvement of their competitive position on the market nd Mądra, 2008). Linking this issue with the effectiveness of using the production potential of farms seems interesting from a scientific point of view. The production potential of agricultural enterprises includes land, labor and capital resources. It conditions, therefore, the development opportunities for agriculture (Poczta and Średzińska, 2007), and thus determines the need of financing production with external funds (Daniłowska, 2007). At the same time, land and capital resources can be the basis for securing a loan. A higher production potential may contribute to increasing the use of external capital in the structure of financing sources of an agricultural enterprise, including short-term sources. The basic objective of the research is to assess the impact of factors related to the farm's production potential and the effectiveness of its use on the probability of making a decision on the involvement of short-term capital to finance agricultural production.

2. Materials and Methods

The basic source of data were statistics collected as part of a system for collecting and using farm accountancy data (FADN). The test sample included 12,027 individual farms[12], which in 2015 participated in the Polish FADN system. The logistic regression model was used to determine the factors affecting the financing of agricultural activities with short-term foreign capital. It allows to study the impact of many independent variables x_1, ... x_k on the dependent variable Y. The response variable was the probability of using short-term foreign sources of financing by the agricultural holding in Poland in 2015. It is a dichotomous variable that accepts two possible values: 0 - no given feature (6,206 cases), 1 - having a given feature (5,821 cases). The selection of variables for estimating the model parameters was made on the basis of current research results on the factors affecting the use of outside capital, including short-term external capital, by agricultural holdings. On the basis of substantial grounds and the available data, the following variables were selected to asses the analyzed phenomenon, relating to the production/manufacturing potential of the farm and the efficiency of its utilization[13]: x_1 - economic size (in terms of standard output in EUR: 1 - very small, 2 - small, 3 - medium-small, 4 - medium-large, 5 - large, 6 - very large), x_2 - total area of agricultural land (ha), x_3 - total workload (own and paid labor) (AWU)[14], x_4 - value of assets excluding value of land, permanent crops and production quotas (PLN thousand), x_5 – livestock density (LU/ha), x_6 - equipment of labor in land (ha/AWU), x_7 - technical equipment of land (thousands of PLN/ha), x_8 - technical equipment of labor (PLN thousand/AWU), x_9 - type of farm (dichotomous variable, 1 - mixed, 2 - specialized), x_{10} - marketability of production (%) , x_{11} - gross investment (dichotomous variable, 1 - yes, 0 - no), x_{12} – land productivity(thousand PLN/ha), x_{13} – labor

[12]For the purposes of the study, from the population of individual farms, which in 2015 participated in the Polish FADN system (12,105 farms), units with a arable land less than 1 ha were eliminated. These entities, in terms of production and economic results, differ significantly from average units (Wrzaszcz and Prandecki, 2015).

[13]Variable selection was made on the basis of (Poczta, Średzińska and Standar, 2008; Poczta and Średzińska, 2007; Zawadzkaand Strzelecka, 2014; Strzelecka, Zawadzka and Kurdyś-Kujawska, 2018; Zawadzka, Szafraniec-Siluta and Ardan, 2016; Daniłowska, 2007; Orłowska, 2017).

[14]AWU (*Annual Work Unit*) - work unit, equivalent to 2,120 working hours a year (Floriańczyk, Osuch and Płonka, 2016).

productivity (thousand PLN/AWU), x_{14} - Family Farm Income/FWU[15] (PLN/FWU), x_{15} - Cash-flow (2) (PLN) - the ability of the holding to self-finance activities and create savings. In the analyzed group of entities, the minimum area of agricultural land was 1 ha, and the maximum area was 703.43 ha. In more than half of farms, the area of agricultural land was 24.44 ha, the value of assets minus land, permanent crops and production quotas was 453.55 thousand PLN, and the family farm income was at the level of 28.07 thousand PLN. In half of the analyzed farms the livestock density was small and amounted to 0.74 LU/ha. This might suggest a focus on crop production in the surveyed farms. The total labor expenditures varied widely and ranged from 0.11 AWU to 29.65 AWU. The index of technical equipment of land in more than half of farms amounted to 35.31 thousand PLN/ha, while the index of technical equipment of labor was 504.10 thousand PLN/AWU. The percentage ratio of the amount of commodity production (intended for sale)on a farm to the amount of its full production ranged from 0.6% to 206.05%. In more than half of farms the commodity index was 87%. The production volume from one hectare of arable land in half of farms accounted for 5.12 thousand PLN. The amount of cash flows, which shows the ability of the farm to self-finance its activities and generate savings, amounted to PLN 53.16 in half of farms. In the analyzed group of farms, the value of cash flows varied. The difference between the minimum and maximum cash flows amounted to PLN 8,758.34. Table 1 presents descriptive statistics of variables that were included in the initial model.

Table 1. Descriptive statistics of independent variables adopted for the model

Variable	Average	Median	Minimum	Maximum	Range	SD	CV	Skewness
x_2	36.05	24.44	1.00	703.43	702.43	41.21	114.32	5.15
x_3	1.93	1.81	0.11	29.65	29.54	1.18	60.87	7.49
x_4	658.21	453.55	5.00	12,061.04	12,056.04	687.81	104.50	3.93
x_5	1.39	0.74	0.00	1,135.00	1,135.00	10.55	758.16	103.13
x_6	20.01	14,47	0.04	283.00	282.96	19.08	95.37	3.25
x_7	43.71	35.31	0.00	5,172.34	5,172.34	90.34	206.68	31.93
x_8	675.82	504.10	0.00	7,573.39	7,573.39	598.14	88.51	2.89
x_{10}	84.67	87.64	0.60	206.05	205.45	14.29	16.88	-1.14
x_{12}	9.84	5.12	-1.45	4,304.27	4305.73	60.47	614.75	41.60
x_{13}	112.67	77.42	-49.74	1,851.17	1900.90	115.80	102.78	3.62
x_{14}	48,470.54	28,072.31	-33,5624.25	12,457,894.33	12,793,518.58	144,967.93	299.08	55.05
x_{15}	76.90	53.16	-2,880.50	5,877.83	8758.34	148.85	193.58	7.73
Discrete variable								
x_1	**Average**	**Number of farms in each economic size class**						
		0	**1**	**2**	**3**	**4**	**5**	**6**
	3.21	239	3,311	3,780	3,164	1,503	30	239
Dichotomous variables								
x_9	**Average**		**Number of mixed farms**			**Number of specialized farms**		
	0.67		3,964			8,063		
x_{11}	**Average**		**Occurrences 1**			**Occurrences 2**		
	0.59		7,036			4,991		

Source: Own study based on FADN data, 2019

In order to find the best combination of factors significantly affecting the financing of agricultural activity with short-term external capital, the backwards elimination method was

[15]FWU (*Family Work Unit*) - equivalent to 2,120 working hours a year (Floriańczyk, Osuch and Płonka, 2016).

applied. Assessment of the significance of individual model parameters was made using z^2Wald Test. The assessment of the degree of fit of the logistic regression model to the empirical data was carried out using the Cox-Snell R^2, Nagelkerke's R^2 and Count R^2. To assess the goodness of fit of the obtained model, the AUC - Area Under Curve value was used. The quality of the logistic regression model was also evaluated using ROC (Receiver Operating Characteristic Curves).

3. Results amd Discussion

Based on the adopted research assumptions, using the backwards elimination method, subsequent predictors were eliminated from the initial model and the change in the value of the criteria adopted to assess the quality of the model was made. Finally, six independent variables were included in the final model. Results of the final model, evaluating the impact of manufacturing potential and the efficiency of its use on the use of short-term capital to finance agricultural production on farms in Poland are presented in Table 2.

Table 2. Results of the estimation of model parameters

Variable	**Variable parameter**	**Standard error**	**z^2Wald test**	**Significance level**	**Odds ratio**
x_1 – economic size	0.458	0.033	193.707	<0.001	1.581
x_2– arable land area	0.018	0.001	191.887	<0.001	1.018
x_4 - value of assets excluding value of land, permanent crops and production quotas	0.001	0.0001	195.085	<0.001	1.001
x_{10} - marketability	0.013	0.002	69.753	<0.001	1.013
x_{11} - gross investment	0.254	0.044	33.554	<0.001	1.289
x_{15} - Cash flow (2)	-0.003	0.000	175.239	<0.001	0.997
Intercept	-3.612	0.149	590.966	<0.001	0.027
AIC = 13,409.70 Cox-Snell R^2= 0.2356; Nagelkerke's R^2= 0.3142; count R^2= 0.7101 AUC = 0.790 LR = 3,223.01 (df=6; p<0.01)					

Source: Own study based on FADN data, 2019

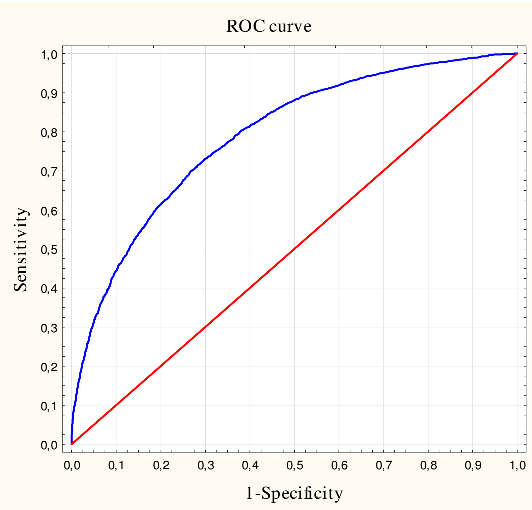
The estimated final model determining the impact of production potential and production and economic results on the probability of using short-term outside sources of financing by agricultural holdings in Poland has the following form:

$$Prob(Y=1) = \Lambda(0.458x_1 + 0.018x_2 + 0.001x_4 + 0.013x_{10} + 0.254x_{11} - 0.003x_{15} - 3.612) \qquad \textbf{(1)}$$

where: $\Lambda(x) = \dfrac{e^x}{1+e^x}$ distribution function of logistic distribution

The model is statically significant at the 1% significance level. Based on the model, 71.01% of cases were correctly classified (*count* R^2 = 0.7101). The quality assessment of the constructed model was based on *Cox-Snell* R^2 (0.2356), *Nagelkerke's* R^2 (0.3142), as well as using the ROC curve, which is presented in Figure 1.

Figure 1. ROC curve for the model



Source: Own study based on FADN data, 2019

The area under the ROC curve (AUC) is 0.79, which indicates a good quality of the constructed model (field larger than 0.5).

The results indicate that in the model, the following factors have a statistically positive effect on the dependent variable: x_1 - economic size, x_2 - area of agricultural land, x_4 - assets excluding land, permanent crops and production quotas, x_{10} – marketability and x_{11} - gross investments. This means that the larger the economic size of agricultural holding, area of agricultural land, assets minus land, permanent crops and production quotas, marketability and gross investments, the higher the likelihood of using short-term outside sources of financing by agricultural holdings in Poland. On the other hand, a negative, statistically significant impact on the dependent variable had variable x_{15} - the ability of the farm to self-finance activities and create savings. Thus, the increase in the size of cash flows showing the farm's ability to self-finance operations and generate savings reduces the likelihood of farmers being ready to use short-term outside sources of financing. Assuming the invariability of the other factors included in the final model (*ceteris paribus*), in relation to the economic size of the farm, the results indicate that the economic size determines the use of short-term outside sources of financing. With the increase of the economic size by one class, the chance of using short-term foreign sources of financing increases by 58%. Agricultural holdings with a larger area of agricultural land have a larger chance to take advantage of short-term external financing. An increase in the area of agricultural land by 1ha means that the chance to finance with short-term external sources increases by 0.18%. The value of assets minus land, permanent crops and production quotas also determines the use of short-term outside sources of financing. The chance of their use will remain almost unchanged if current assets are increased by 1 thousand PLN. A 1% increase in the marketability of production increases the chance of using short-term foreign sources of financing by 0.13%. Implementation of investments in an agricultural holding increases the use of short-term foreign sources of financing by 28%. Along with the increase of the farm's ability to self-finance operations and create savings, the chance to use short-term outside sources of financing decreases by 0.3%.

4. Conclusion

The obtained results show that the factors related to the production potential of the farm and the efficiency of its use have an impact on the decision to finance agricultural activity with short-term external capital. The parameters of the constructed model indicate that there is a positive relationship between: the economic size of the farm, the area of agricultural land, the value of assets (minus land, permanent crops and production quotas), investments on the farm and marketability of production, and the use of short-term external sources of financing. However, the higher the farm's ability to self-finance operations and create savings, the lower the likelihood that a given entity will decide on the involvement of short-term capital in financing agricultural production. It would be interesting to investigate what sources of short-term financing are used by farmers, as well as to indicate, using qualitative studies, the factors determining decisions on the structure of short-term financing. This will be the subject of our further studies.

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ASSESSMENT OF THE OPERATION OF THE HERBS AND SPICES PRODUCTION COMPANY WITH BASTER SP. Z O.O. AS AN EXAMPLE (A CASE STUDY)

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Annotation: The aim of the paper has been to evaluate the operation of a limited liability company, Baster Sp. z o.o., headquartered in Kalisz, Poland, producing herbs and spices in terms of its competitiveness on the domestic and international market and the evaluation of the effect of the quality of products, timely deliveries, documentation completeness and the form of communication with clients on customer satisfaction. To meet the objective of the paper, to get to know the company and to evaluate its operation, an empirical study was performed. The research material was acquired from a survey performed in 2016 among 100 selected domestic and foreign clients. An interview was also made with the company's President. The results have demonstrated that most of the clients were satisfied with the product quality, the form of their contract and cooperation. The critical comments by the respondents facilitated introducing new solutions, including a new type of packaging and a new line of products and they were a trigger for investment decisions to be taken; the purchase of state-of-the-art production lines to accelerate the order execution and to enhance the quality of the products offered.

Key words: quality, competitiveness, customer satisfaction, herbs, spices

JEL classification: D12, L15, M31, O31

1. Introduction

In the applicable literature one can find numerous reports on the production of scale (Baran, 2009; Basu and Fernald, 1997; Davis and Weinstein, 1999). They refer to e.g. the verification of the fact of the occurrence or non-occurrence of the economies of scale or a verification of the effect of the size of the scale of production on the economic and financial results of companies (Baran, 2009). The production scale depends on many internal and external factors. The authors of this paper have decided to focus on selected factors affecting the production of scale, including a possibility of adapting production to the requirements of clients (both in terms of the quality of products and packaging and the assortment proposed to clients), the production portfolio structure, the quality of contacts with business partners, timely deliveries and the price to product quality ratio according to clients. To much extent it is the satisfaction of the present clients and a possibility of attracting new clients for cooperation which determine a possibility of increasing the scale of production. The present study has covered an evaluation of the product assortment of Baster Sp. z o.o. of Kalisz, the operation of the company as well as the effect of the product quality on its development. Another essential aspect has been to investigate whether introducing the systems of certification and innovative technologies enhances the company operation.

2. Materials and Methods

To meet the objective of the paper, to get to know the company and to evaluate its operation, an empirical study has been performed. The research material was collected based on a survey questionnaire addressed to 100 selected clients and from the interview with the President of the company. In 2016 a survey was made to cover the customer satisfaction. Of all the business partners, there were selected 50 clients cooperating with the company longest as well as 50 clients just starting such cooperation. Each of the groups was divided into equal proportions; the clients of the Polish market and of the foreign market. As Baster Sp. z o.o. operates both on the domestic and global markets, the questions included in the survey questionnaire were adapted to the quality requirements applicable in Poland and globally. The questionnaire was developed in three languages (Polish, English and German). On 07.02.2017 also the interview with the President of the company was made.

Baster Sp. z o.o. launched its operation in 2012 under another name, as a self-employment business, and in 2014 it was registered as a commercial law company, Baster Sp. z o.o.. The company is headquartered in a very favourable location, in a close vicinity of the main road, close to the heavy goods large-size transport route. The operation of the company is based on a comprehensive service to the food sector companies, especially considering the delicatessen producers, meat and fish processing plants as well as dairy**.** The company offers to the clients a wide assortment of dried material, herbs and spices prepared according to the individual client requirements. The products supplied are analysed in terms of quality by independent external certified laboratories. To ensure an ongoing product quality enhancement and to minimise the external and internal threats, the company board took a decision on developing and implementing food safety management systems to meet the legal requirements and to satisfy the needs and expectations of clients, especially in terms of health safety and the quality of the products offered.

3. Results and Discussion

Over the recent years the food sector companies in Poland have been undergoing considerable transformations in many areas of their operation, including the production technology, equipment and the range of the products offered. The key reasons of such transformations are the need to modernise and to adapt the product offer to the permanently changing environment.

Baster Sp. z o.o. offers to the clients a wide range of herbs and homogenous spices, e.g. the bay leaf, cardamom, pimento, caraway, estragon, basil, marjoram and many others which provide a specific flavour. The company offers also dried vegetable material acquired from top-quality vegetables grown in pure environment, away from the pollution of urban agglomerations and busy roads. They are created with state-of-the-art technologies facilitating the acquisition of the product within 8 hours after processing, without chemical treatment. Sample dried vegetable materials offered by the company include: ground horseradish, coarse carrot, onion flakes, tomato flakes, fennel, cube mirepoix, dried chives, to mention just a few. Baster Sp. Z o.o. also creates own spices mixtures including a mixture of herbs, homogenous spices and dried vegetables at adequate proportions to highlight the nature of a dish. All the mixtures proposed by the company are carefully prepared by special process engineers with their unique recipes. They are e.g. pasta, potato, French fries, fish, pork, pizza, ribs, salad spices and spices for many other dishes. To acquire possibly the greatest customer confidence, Baster Sp. z o.o. has implemented obligatory supporting quality management systems; Hazard Analysis and Critical Control Points (HACCP) (compare: McMeekin et al., 2006; Sofos, 2008) and the system of Good Manufacturing Practice (GMP) (compare: Holzapfel, Geisen and Schillinger, 1995; Unger et al., 2008). Next to the obligatory systems, also a non-obligatory system has been implemented, Quality Safety Management System, compliant with ISO 22000 (compare: Ruževičius, 2008). Introducing those systems has assured providing high quality products to clients.

The survey questionnaires show that all the clients the company cooperates with have been satisfied with the services and products provided (Table 1). However, the satisfaction of our clients acquired recently from Poland and abroad is slightly lower (satisfied with cooperation: 80% of the new clients from Poland and 96% of the new clients from abroad, respectively). Some clients have noted that the company did not always send them the product which would be identical with the one presented at demonstrations (16% of the new clients from Poland, 4% of the new clients from abroad, 20% of the old clients from Poland and 12% of the old clients from abroad, respectively). However, even though, in the opinion of the clients, the products differed slightly from the samples presented, they still met their quality expectations and they expressed a willingness to cooperate further with the company.

Only 4% of the new clients from Poland provided a negative answer, without giving detailed comments, to the question whether the company maintained adequate contacts with clients on the phone or by email, whereas the other respondents were satisfied (Table 1). In the opinion of some of the respondents the company did not always sent the complete documentation required. Such responses accounted for 24% of the new clients from Poland, 12% of the new foreign clients, 28% of the old Polish clients and 16% of the old foreign clients. They noted a necessity of a more accurate verification of the delivery in terms of documents completeness. Neither did the product packaging meet the expectations of some of the clients (28% of the new clients from Poland, 12% of the new clients from abroad, 24% of the old clients from Poland and 4% of the old clients from abroad). Often it was suggested that the company should introduce new packaging, of multiple use, which would be more environment-friendly. With the customer satisfaction in mind, it was decided to implement the proposals immediately.

Table 1. Respondents' opinions on selected aspects affecting satisfaction with cooperation with the examined company (in %)

Specification	New clients from				Old clients from			
	Poland		abroad		Poland		abroad	
	Yes	No	Yes	No	Yes	No	Yes	No
Satisfaction with the services and products provided	80	20	96	4	100	0	100	0
Compliance of products with previously sent samples	84	16	96	4	80	20	88	12
Adequate contacts with clients on the phone or by email	96	4	100	0	100	0	100	0
Documents completeness	76	24	88	12	72	28	84	16
Product packaging expectations	72	28	88	12	76	24	96	4
Satisfaction with products in organoleptic and microbiological terms	96	4	96	4	96	4	100	0
Satisfaction with the quality-price ratio	92	8	100	0	96	4	100	0
Satisfaction with the timeliness of orders	88	12	80	20	76	24	72	28
Willingness to recommend the company's products and services	92	8	100	0	100	0	100	0

Source:own research, 2019

A vast majority of the respondents expressed their satisfaction with the products offered by the company both as a result of organoleptic and microbiological examination(Table 1). A high quality in terms of microbiological examination is a very important factor for production of such kind (Kabak and Dobson, 2017; McKee, 1995; Sospedra, Soriano and Mañes, 2010; Tosun and Arslan, 2013). Some negative responses (4% in each client group: new from Poland and abroad and old from Poland) were justified with a single case of reservations to the quality of the product which did not satisfy their expectations. Only a little group of the respondents claimed that the quality of some products was not adequate to their prices. Such opinions were given only by the clients from Poland (8% of the new clients and 4% of the old clients). However, the foreign partners did not have any reservations to the relation of the product prices to their quality. According to some respondents, Baster Sp. z o.o. did not always execute an order on time. More negative responses were noted in the group of foreign clients (28% of the old clients and 20% of the new ones) than the domestic ones (24% of the old clients and 12% of the new ones). Despite those reservations, most clients would recommend the cooperation with the company to other partners. Only 8% of new domestic clients did not declare their intention to provide positive letters of reference.

On the one hand, herbs and spices are commonly used in the cuisines globally (Bielicka-Giełdoń and Ryłko, 2013; Carlsen, Blomhoff and Andersen, 2011). They enhance the flavour, colour and aroma of dishes. They are also used to preserve food and drinks (Embuscado, 2015). However, the market of those products, both Polish and global, provides a well-developed offer of the companies operating in the sector similar to the company's business profile. With that in mind, acquiring clients and introducing products on the competitive market was a very difficult and time-consuming job. To do it, good-quality products from good and recognised suppliers, even a few hundred kilometres away from the company headquarters, were needed. To acquire all the necessary contacts and to promote the company, the President actively promoted the products not only on the domestic market but also at European and global fair events. A considerable part of the company's key accounts started cooperation once they got to know the offer personally at such exhibition events.

Despite many initial difficulties, the company was developing well enough to reach full stability already 5 years after the start of the operation. At the transition period, the external sources of financing the company had been planning to apply for earlier were helpful. However, at the first stage of development a lack of profits for the current accounting year made any such cooperation with any other bank impossible. Luckily after 1.5 years of efforts, despite a negative balance sheet result, the company was awarded a credited working capital**,** which facilitated the purchase of adequate specialist machinery. Such financial support was very helpful and it was a new trigger for a further operation of the company. While performing the study, the company did not plan to apply for any other additional financial support, however, it did not exclude such a possibility later in time.

The most important factor to be remembered, according to the company's President, is passion and pursuing a success (compare: Cardon et al., 2009) as well as defining goals and executing them persistently (compare: Barbieri and Mahoney, 2009; Kuratko, Hornsby and Naffziger, 1997). Many companies enjoy a development potential, however the owners are not persistent and resistant to stress enough, which eliminates them from that sector. Banks and various institutions offer more and more corporate financing programs. It is important that, while developing a business further, one can rely on investment support (compare: Gimmon and Levie, 2010; Lee, 1996).

Next to the factors enhancing the company development, there are also factors which make it difficult. The biggest obstacle the company was facing during the study was the red tape of the public authorities (compare: Ryglova, 2007; Sørensen, 2007) and the taxation and banking systems which kept on changing. Ongoing changes in the requirements for running companies of such kind delay meeting the goals and company development, sometimes they even lead to the company's bankruptcy.

According to the President, the company's strengths are mostly a very high quality of the products, being an important factor of the offer competitiveness on the spices market (Jabłońska-Porzuczek, Smoluk-Sikorska and Kalinowski, 2016; Lo Turco et al., 2019; Nguyen, Duong and Mentreddy, 2019). Thanks to the innovative technologies in the company, the production processes are much faster and facilitate the production of high quality goods (compare: Garbowska, Berthold-Pluta and Stasiak-Różańska, 2015; Jabłońska-Porzuczek, Smoluk-Sikorskaand Kalinowski, 2014). Introducing certification systems guarantees a high quality of the product to clients (Malhotra and Vashishtha, 2007; Regnerova, Navratilova and Stafek, 2013), which, in turn, makes them satisfied and willing to cooperate further. However, creating customised functional mixtures attracts new demanding clients.

For the board the survey made among the clients has become a trigger to introduce a new offer of spices with neither synthetic additives nor preservatives, referred to as "A Healthy Line of Spices". Each product is free from chemical additives. Functional packaging are to encourage customers to purchase the products even more. They have been provided with string closures, which allows for a multiple use once the product has been opened. The top point in that product line will be introducing a box with 10 sachets with healthy spices: basil, *delikat* for meat, oregano, granulated garlic, sweet pepper, chilli pepper, black pepper, poultry seasoning, universal seasoning and allspice. The box will be advertised as "HEALTHY BOX".

4. Conclusion

On the food market there are more and more companies producing and selling herbs and spices. The study covered the operation of such company with Kalisz-headquartered Baster Sp. z o.o. as an example. With the analyses made it was found that offering the products made from top-quality materials by the company and introducing the top possible certification enhances the company image on the market and facilitates acquiring the customer confidence of the existing and new clients.

From the survey study results one can conclude that, despite introducing many innovative changes, it is still the case that the clients do not get their deliveries on time. For that reason it is so important to introduce new production lines which facilitate a faster and better order execution, which should come together with a greater customer satisfaction. Baster Sp. z o.o., considering the critical comments of the respondents, makes efforts to adapt its way of operation, production and cooperation with clients to meet the expectations of its clients. With that in mind, it plans to purchase state-of-the-art production lines and to launch new products. Besides, the company's board decided to introduce a permanent procedure of measuring the customer satisfaction, every half year, to maintain the top level of the client service and the quality of the products offered.

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AGRI-FOOD TRADE PATTERNS OF BRAZIL: THE ROLE OF EUROPEAN UNION AND CHINA

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Annotation: This article examines the nature and pattern of agri-food trade between Brazil and its (currently) two major trading partners regarding the agri-food products: European Union and China. Paper's objective is to analyze agri-food trade patterns of Brazil with EU and with China regarding to the change in share of each country in Brazil foreign trade structure as well as regarding to the competitiveness of specific agri-food products. The analysis is concentrated from 1995 to 2017. The data for analysis came from UNCTAD, sorting products (46 products/ sectors) by SITC classification (3-digit code).The territorial structure of Brazil's agrarian trade was assessed to identify changes in intra- and extra-regional trade (MERCOSUR) and changes with respect to major trading partners (and especially to the EU and China). The Balassa index was used to assess revealed comparative advantage/competitiveness of specific agri-food products of Brazil's agrarian trade with EU and with China. Brazil's position as one of the most important agri-food exporters in the world has been confirmed. Regional integration within MERCOSUR did not lead to an increase in the share of MERCOSUR countries in the territorial structure of agri-food trade of Brazil. The structure of extra-regional (excluding MERCOSUR) agri-food trade of Brazil has changed significantly. China's position as a trading partner for agri-food products has increased significantly. Also, the value of agri-food trade between Brazil and the EU28 has increased (although rather declining in recent years). However, the European Union is gradually losing its position as Brazil's most important agri-food trading partner (with the exception of the EU's share of Brazil's agricultural imports).The product structure of Brazil's agri-food exports is specialized, but there are differences when comparing agri-food trade between Brazil and the EU and Brazil and China. The structure of agri-food imports to Brazil is more diversified than the structure of Brazilian agri-food exports and it is becoming further diversified.

Key words: Agri-food trade, liberalization, Trade Patterns, Brazil, European Union, China

JEL classification: Q17, F14, F15

1. Introduction

Brazil has one of the fastest growing agricultural sector in the world. If we take a look at year 2019, the sector grew by over 40% when compared to the 2007-09 base period (OECD-FAO, 2017). This increase makes world's third largest agricultural exporter. Authors aim to answer the research issue: where this increasing agricultural production is heading globally, concentrating on two major trade partners – EU and China.

Brazil is the world´s leading exporter of soybean (oilcakes and soybeans), sugarcane products (sugar and bioethanol), meat (beef and poultry), coffee and cereals and orange juice and is becoming serious threat to the global market dominance of the world's leading agricultural exporters, the US and EU (Hopewell, 2016).

Brazil's emergence as an agricultural powerhouse was the result not just of its natural factor endowments, but extensive intervention of the Brazilian government which worked together with private sector. Also, Brazil has been able to attract a significant amount of foreign direct investment (Bojanic, 2017). Long-term investment in research and development, human capital, agricultural extension services and infrastructure were crucial and had the effect of constructing a new comparative advantage.

As for the two subjects chosen for the study, the European Union is historically one of Brazil's major (and natural) trading partner and differences between both regions create significant trade complementarity (Hubbard, Alvim and Garrod, 2017). Currently, the EU is Brazil's second-biggest trading partner, accounting for 18.3% of its total trade. Brazil is the EU's eleventh-biggest trading partner, accounting for 1.7% of total EU trade. Brazil is the single biggest exporter of agricultural products to the EU worldwide (European Commission, 2019). Brazil’s exports to the EU consist mainly of primary products and food (animal feed preparations, coffee, soya beans, orange juice and beef and poultry meats) and manufactures, while imports from the EU are mainly manufactures and services. The main agri-food products EU exports to Brazil are whiskey, olive oil, potato, other food preparations and fresh fruit (Hubbard, Alvim and Garrod, 2017).

Agriculture has often been considered as one of the most controversial issues within the European Union and Brazil/MERCOSUR trade relations. There are several policy levels, where their interaction takes place: multilateral level, through the WTO Framework; inter-regional level, through the EU-MERCOSUR dialogue; and bilateral level, through dialogue as part of their Strategic Partnership. In trade negotiations, it is the EU’s agricultural protectionism and unwillingness to reduce this protectionism which Brazil denounced as being sensitive to and which blocks the EU-MERCOSUR negotiations on the EU side. The mutual negotiations started already in 1999, were frozen in 2004, restarted in 2010 with the idea of reaching the FTA fast (Hrabálek and Machačová, 2015). But in the past ten years the talks have not led to a final deal between the two organizations. On the European side the leading “protectionist” countries in the area of agriculture are Ireland and France and the major problematic commodities/products are beef on European side and cars on MERCOSUR one (POLITICO.eu, 2018).

Economic relations between China and Brazil have increased significantly in the past decade on several trade and investment agreements (Cheptea, 2012). As a result, trade between China and Brazil has increased significantly over the past two decades. China has become an important market for Brazil's agri-food commodities, especially for soybean, which is a substantial input into China's feed industry. Also, food derived from soybean is traditionally popular among Chinese. China removed restrictions on soybean imports already in 2001 and the soybean sub-sector is among the most liberalized in China and (unlike cereals), it is not subject to self-sufficiency requirements. China also developed its own soybean crushing industry and Brazilian exports of soy oil to China have decreased significantly (Yu, 2017).

Paper’s objective is to analyze agri-food trade patterns of Brazil with EU and with China regarding to the change in share of each country in Brazil foreign trade structure as well as regarding to the competitiveness of specific agri-food products.

2. Materials and Methods

The analysis of the changes in agrarian foreign trade between Brazil and the other states of the World resp. European Union (EU 28) and China is based on the UNCTAD data. The analyzed time series covers the period 1995-2017. For the purpose of analyzing the commodity structure of agrarian foreign trade, the individual sectors (product groups) are defined according to the Standard International Trade Classification (SITC) Revision 3.

The analysis was carried out at the level of 3-digit code, i.e. for 46 different commodity groups[16] of agrarian foreign trade(SITC 0 + 1 + 22 + 4). The sum of these is the total agrarian trade. The nominal values of the trade flows are in current prices in USD. Attention in the agri-food trade analysis is primarily paid to the trends in terms of trade turnover, export, import and trade balance.

The Coefficient of concentration (CR) was used to assess the changes in the product structure of trade. The concentration index indicates how exports and imports of Brazil concentrate on a few products or otherwise are distributed in a more homogeneous manner among a broad range of products. The model of the Coefficient of concentration is mathematically presented here as follows:

$$CR_l = 100\frac{x_{ij}}{\sum_1^n x}, \text{where l } = \text{ 3 or 5 most traded products} \qquad \textbf{(1)}$$

Where x is the share of exports (imports) in the total agrarian trade (of n=46 products) for the product i in the year j between Brazil and World, resp. EU28 or China. The index value ranges from 0 to 100. A value closer to 100 indicates that an agrarian trade is concentrated in few goods, thus its vulnerability to trade shocks, whereas a completely diversified portfolio will have an index closer to 0. The CR can be classified as an indication of specialization/diversification in the exporter's (importer's) profile.

To capture the degree of trade specialization of a country, we assessed the revealed comparative advantages of the sectors included in the total agrarian trade. To achieve this Balassa (1965, 1977) suggested the following index of revealed comparative advantage:

$$BI_{ij} = \frac{\frac{x_{ij}}{x_i}}{\frac{x_{wj}}{x_w}} \qquad \textbf{(2)}$$

In this calculation x represents exports, i is a country, j is a product and w is a set of countries (World). The Balassa index varies between 0 and infinity. The values between 0 and 1 indicating that the country does not have a comparative advantage and the values between 1 and infinity signaling that the country has a comparative advantage in that sector.

3. Results and Discussion

Brazil's total agri-food export value increased 4.6 times between 1995 and 2017 to 77.6 billion USD. If this increase continues, Brazil will become the world's largest exporter of agricultural

[16]001 Live animals; 011 Bovine meat; 012 Other meat, other offal; 016 Meat, ed. offl., dry, slt, smk; 017 Meat, offl. prdd, nes; 022 Milk and cream; 023 Butter, other fat of milk; 024 Cheese and curd; 025 Eggs, birds, yolks, albumin; 034 Fish, fresh, chilled, frozn; 036 Fish, dried, salted, smoked; 037 Fish etc. prepd, prsvd. Nes; 041 Wheat, meslin, unmilled; 042 Rice; 043 Barley, unmilled; 044 Maize unmilled; 045 Other cereals, unmilled; 046 Meal, Flour of wheat, msln; 047 Other cereal meal, flours; 048 Cereal preparations; 054 Vegetables; 056 Vegetables, prpd, prsvd, nes; 057 Fruit, nuts excl. oil nuts; 058 Fruit, preserved, prepared; 059 Fruit, vegetable juices; 061 Sugars, molasses, honey; 062 Sugar, confectionery; 071 Coffee, coffee substitutes; 072 Cocoa; 073 Chocolate, oth. cocoa prep.; 074 Tea and mate; 075 Spices; 081; Animal feed stuff; 091 Margarine and shorten; 098 Edible prod. prepetns, nes; 111 Non-alcohol. Beverage; 112 Alcoholic Beverages; 121 Tobacco, unmanufactured; 122 Tobacco, manufactured; 222 Oil seeds and oleaginous fruits (excl. flour); 223 Oil seeds, oleaginous fruits (incl. flour, n.e.s.); 411 Animal oils and fats; 421 Fixed veg. fat, oils, soft; 422 Fixed veg. fat, oils, other; 431 Animal, veg. Fats, oils, nes.

commodities and food in the medium to long term. The value of total agri-food import to Brazil also rose, but only 1.7 times and reached 9.9 billion USD in 2017.

The increase in agri-food import values and especially Brazil's exports occurred in the new millennium, when the implementation of Uruguay Round Agreement on Agriculture was completed. It led to a compulsory 36% cut in average bound tariffs at the end of 2000 for developed countries and 2004 for developing ones (Bureau, Guimbard and Jean, 2017). Together with decrease in unilaterally applied tariffs levels and preferential applied tariffs levels Brazil got market access and increased its integration in global agribusiness.

Agri-food foreign trade creates a significant positive contribution to Brazil's total trade balance and is an important source of foreign currency for the country. More detailed data on the development of agri-food foreign trade in Brazil are presented in the table (Table 2).

Table 2. Brazil's Total agri-food trade

		1995	**2000**	**2005**	**2010**	**2015**	**2017**
Brazil ↔ World							
Turnover	Mil. USD	19,015	16,473	33,642	69,209	79,799	87,541
Export	Mil. USD	13,259	12,808	30,432	60,836	70,982	77,612
Import	Mil. USD	5,756	3,665	3,210	8,373	8,817	9,929
Balance	Mil. USD	7,502	9,143	27,222	52,463	62,165	67,682

Source: UNCTAD, own calculations, 2019

The Balassa Index was used to assess the revealed comparative advantage of 46 products /sectors of Brazil's total agri-food trade. In the all years under review, Brazil revealed comparative advantage in oil seeds (soya), sugar, tobacco (unmanufactured), fruit and vegetable juices, meat (groups 012, 017), animal feed stuff. Brazil has gained comparative advantage in maize and meat (011, 016). On the other hand, Brazil has lost its comparative advantage in spices and fixed vegetable fats. Scores of 21 products increased and scores of 25 products decreased, however scores of Balassa index indicate a relatively stable number of products (10 or 11) with a revealed comparative advantage.

There has been an increase in specialization in the structure of the agri-food export of Brazil. The share of 3 most exported products increased from 49.6% in 1995 to 59.3% in 2017. The five most exported products had 73.0% share in the export in 2017. These products were soya, sugar, meat, animal feed and coffee.

The structure of agri-food imports is more diversified compared to agri-food exports and diversification has increased over time. The share of the 3 most imported products fell from 37.7% in 1995 to 29.2% in 2017. Brazil's most imported agri-food products are wheat, fish (chilled and frozen), fruit and nuts, vegetables (preserved) and alcoholic beverages. These are also products with lowest Balassa's index scores. An interesting finding is that the three most imported agri-food products are fresh food and raw agro-based products. Generally, it can be stated that Brazil's foreign trade is formed according to the principle of comparative advantages.

The value of Brazil's agri-food exports to the EU28 increased 2.4 times between 1995 and 2017. The value of exports grew mostly between 2000 and 2010, in the last decade, the value of exports has been decreasing. However, the share of the EU28 as an export destination decreased from 40.4% to 16.8%. The share of Brazil in the value of agri-food imports of EU28 countries is stable at around 2.3%. The value of total agri-food import to Brazil from EU28 rose 2.1 times (however, it is approximately ten times lower than export). The share of EU28 countries in agri-food import to Brazil was slightly increasing and it was 18.3% in 2017. Detailed data on the changes in agri-food trade are presented in the table (Table 3).

The value of Brazil's agri-food export to China increased significantly (32.2 times) between 1995 and 2017. China's share (as export destination of Brazilian agri-food production) rose from 5.4% to 29.6%. Similarly, Brazil's share on China's agri-food import has risen from 7.7% to 20.2%. The value of Chinese agri-food imports to Brazil rose 15.1 times and was 0.5 billion USD in 2017. China's share of agri-food import to Brazil slightly increased and it was 4.6% in 2017.

When evaluating balance of agri-food trade, Brazil's position in trade with EU28 and with China has strengthened. Brazil became a major supplier of agricultural commodities to China, at the same time, the EU 28 is no longer a major destination for Brazilian agri-food exports.

The commodity structure of agri-food exports of Brazil to the EU28 is more concentrated compared to its general form .However, there is slight diversification. The most exported products are animal feed stuff (081), coffee (071), soya (222), fruit and vegetable juices (059) and unmanufactured tobacco (121). This corresponds to products in which Brazil has a comparative advantage. The share of the 3 most exported agri-food products (animal feed stuff, coffee, soya in 2017) in the value of agri-food exports fell from 66.8% in 1995 to 55.7% in 2017. The structure of agri-food imports is more diversified compared to agri-food exports and the degree of diversification does not change over time. The most imported agri-food products between Brazil and the EU28 are fixed vegetable fat (421), alcoholic beverages (112), vegetables (056), fruit (057) and edible products (098). The share of 3 most imported products (fixed vegetable fat, alcoholic beverages and vegetables in 2017) was 41.2% in 2017.The expectation that it is processed food and agro-based products is confirmed.

Table 3. Brazil's Agri-food trade with EU28 and China

Brazil ↔ EU 28							
		1995	**2000**	**2005**	**2010**	**2015**	**2017**
Turnover	Mil. USD	6,222	6,495	11,673	16,856	15,777	14,880
share on total	%	32.7	39.4	34.7	24.4	19.8	17.0
Export	Mil. USD	5,353	6,042	11,150	15,573	14,082	13,063
share on total	%	40.4	47.2	36.6	25.6	19.8	16.8
Import	Mil. USD	869	453	523	1,282	1,695	1,817
share on total	%	15.1	12.4	16.3	15.3	19.2	18.3
Balance	Mil. USD	4,484	5,589	10,626	14,291	12,387	11,246
Brazil ↔ China							
		1995	**2000**	**2005**	**2010**	**2015**	**2017**
Turnover	Mil. USD	742	455	2,340	9,562	18,790	23,394
share on total	%	3.9	2.8	7.0	13.8	23.5	26.7
Export	Mil. USD	712	440	2,282	9,148	18,265	22,941
share on total	%	5.4	3.4	7.5	15.0	25.7	29.6
Import	Mil. USD	30	15	58	414	525	453
share on total	%	0.5	0.4	1.8	4.9	5.9	4.6
Balance	Mil. USD	681	425	2,225	8,735	17,740	22,488

Source: UNCTAD, own calculations, 2019

Brazil's agri-food exports to China are highly specialized. After a slight decrease in the first decade of the period under review (mainly because of the increase in the number of traded products), high specialization was again dominating principle. The main exported products are soya (222), live animals (011), bovine meat (012), unmanufactured tobacco (121) and fixed vegetable fats (421). The highest share has soya (222) with 90% share of the value of agri-food export of Brazil to China.

The structure of agri-food imports to Brazil from China diversifies over time. The most imported agri-food products are vegetables (054), fish, fresh, chilled (034), animal feed stuff (081), fish dried and salted (035) and vegetables prepared (056). The main imported agri-food products are (vegetables) 054 and Fish fresh (034), which account for about 50% of the value of China's imports to Brazil.

These trends in agri-food foreign trade between Brazil and EU28 and between Brazil and China are subsequently reflected in changes in the territorial structure of Brazil's agricultural trade. Significant proportional change occurred in the agri-food trade between Brazil and EU28 and Brazil and China. The share of EU28 on Brazil's agri-food exports (extra group export) decreased by 25.8 pp. from 1995 (43.0%) to 2017 (17.2%). The EU share on Brazil's agri-food import (extra group imports) remained same around 32%. In the case of China, the share on Brazil's agri-food exports (extra group export) increased by 24.2 pp. from1995 (5.7%) to 2017 (30.2). The China's share on Brazil's agri-food import (extra group imports) increased by 6.0 pp. (1.1% in 1995, 8.1% in 2017).

4. Conclusion

Based on the above analyses, we can conclude the following:

- Brazil's position as one of the most important agri-food exporters in the world has been confirmed. Brazil has benefited of its comparative advantage and together with the general process of liberalization of the agrarian markets in the world at the beginning of millennium.
- The structure of extra-regional (excluding MERCOSUR) agri-food trade of Brazil has changed significantly. China's position as a trading partner for agri-food products has increased significantly. Also, the value of agri-food trade between Brazil and the EU28 has increased (albeit rather declining in recent years).However, the European Union is gradually losing its position as Brazil's most important agri-food trading partner (with the exception of the EU's share of Brazil's agricultural imports).
- The product structure of Brazil's agri-food exports is specialized to soybean (oilcakes and soybeans), sugar, beef and poultry, coffee, tobacco, maize and orange juice. There are differences in its level and dynamics when comparing agri-food trade between Brazil and the EU and Brazil and China. In the case of Brazil's export to the EU, this export has been concentrated, but diversification is taking place. In the case of exports to China, exports are extremely specialized and this high specialization remains in time. There are differences when comparing the structure of agri-food exports to the EU28 or to China, which not only reflects the differences in the comparative advantages of the countries (region) under review, but also suggests a persistent influence of the applied forms of protectionism in specific sectors.
- The structure of agri-food imports to Brazil is more diversified than the structure of Brazilian agri-food exports and it is becoming further diversified.

The EU-Brazil negotiation on further liberalization of mutual trade is currently ongoing. Support for agriculture and market access still prevent the possibility of finding consensus in the negotiations (and moving towards further liberalization), both at the global level with WTO as a platform and on the inter-regional level with the EU itself. This paper emphasizes a broader context than is typically mentioned in the debates on trade liberalization between EU and Brazil. The results point to a significant decline in the EU's position as anagri-food trading partner of Brazil. The authors do not want to come up with opinions at this moment, but there is undoubtedly room for further (more detailed and systematic) research in this area.

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CONTENT

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Q1 Agriculture
Q2 Renewable Resources and Conservation
Q3 Nonrenewable Resources and Conservation
Q4 Energy
Q5 Environmental Economics

R. Urban, Rural, Regional, Real Estate, and Transportation Economics
R1 General Regional Economics
R2 Household Analysis
R3 Real Estate Markets, Spatial Production Analysis, and Firm Location
R4 Transportation Economics
R5 Regional Government Analysis

Y. Miscellaneous Categories
Y1 Data: Tables and Charts
Y2 Introductory Material
Y3 Book Reviews (unclassified)
Y4 Dissertations (unclassified)
Y5 Further Reading (unclassified)
Y6 Excerpts
Y7 No Author General Discussions
Y8 Related Disciplines
Y9 Other

Z. Other Special Topics
Z1 Cultural Economics • Economic Sociology • Economic Anthropology
Z2 Sports Economics
Z3 Tourism Economics