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Sector-Wide and Country-Specific Drivers of Firm Performance in the Visegrad Group Dairy Industry

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Abstract

The paper investigates the effects of sector-wide and country-specific determinants on profitability of the dairy industry in the Czech Republic, Slovakia, Poland and Hungary over the period of years 2006-2014. Using an econometric approach, a hypothesis about the impact of various drivers of firm performance on both sector and country level was tested. The findings confirm that these factors have a significant impact on the dairy firms' performance in the V4 countries. It was found out that foreign competition measured by the import penetration ratio had significant negative impact on dairy firm performance. The positive development of GDP and market concentration affected profitability positively. The results could help in designing common agricultural and industrial policy in the European Union as well as in managing the mutual trade of milk products in V4 countries.

Keywords

Industry performance, return on assets (ROA), dairy industry, Visegrad group countries.

JEL Classification: M21, Q13, Q17

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Introduction

It is commonly observed that profitability in the dairy industry differs across countries and over time (see e.g. Zdráhal et al., 2017). This is in contradiction to the propositions of the competitive environment hypothesis and the statement that the European food markets are characterized by high market saturation and strong competition (Hirsch and Gschwandtner, 2013; Verter and Osakwe, 2015). Zdráhal et al., 2017) found out that there are similarities as well as differences in the average economic performance of dairy processing enterprises among the Visegrad group (V4) countries. The average economic performance of the enterprises of the dairy industry in the Czech Republic is relatively low in the comparison to its western counterparts, however, in the recent years its level and dynamics has been growing in the comparison with the average economic performance of the enterprises of the dairy industry in the Slovakia, Poland and Hungary.

The EU milk sector experienced significant economic, political and structural changes in the last decades (Ernst and Young, 2013; European Commission, 2015a; Zdráhal and Bečvářová, 2018). The Visegrad group countries had to deal also with the specifics of transformation processes in transition economies (Blažková and Dvouletý, 2018a). Currently, the challenges of the European milk sector are especially the ability to adapt on the market dynamics caused by the abolition of the EU milk quotas (European Commission, 2015b) and the embargo on food imports imposed by Russia (European Commission, 2016). High performance and competitiveness of the dairy industry and the ability to finalize the basic raw material into products with higher value added (and to successfully face the competition within the European and global market) are important prerequisites for keeping dimension of the milk production in the EU regions. This is valid not only for long-term development of these sectors but also in the periods of shocks and volatile markets.

The question of what drives the business performance is a central issue in corporate finance. While part of the economist (e.g. Rumelt, 1991)

assume that performance is driven by firm-specific factors, the proponents of classical industrial organization theory (e.g. Porter, 1990) attribute the influence to industry-wide effects. Empirical studies have shown that firm-specific factors dominate the industry ones. However, this general finding is not of equal validity for all economic sectors. McGahan and Porter (1997) found that the importance of particular effects differs substantially across broad economic sectors. While the industry effects dominate in services, retail and transportation, the firm specific factors account for a larger portion in manufacturing. Based on these findings many empirical studies regarding the performance in food processing sector have been conducted focusing on the analysis of internal profitability drivers. However, there is a lower evidence on industry-wide and country-specific effects in spite of the fact that it would be beneficial for policy makers.

In this study we focus on the determination of the industry-wide and country-specific factors influencing the development of profitability in the dairy sectors of V4 countries in the time period of years 2006-2014. We have limited our time series by the year of 2014 as this was the last year with milk quotas and the next period was significantly influenced by the decision to abolish quota system. The results of this research have important implications for V4 dairy firms, they are also of a great interest to policy makers with respect to agricultural and industrial policy as well as to investment analysts assessing the effects of changes in the external environment on the return from dairy firms. This paper aims to provide existing and potential stakeholders of the dairy industry with information on the development of dairy sectors performance in particular V4 countries and on the intensity of particular performance drivers.

Theoretical background and hypothesis development

Findings on the interaction between industry-wide and firm-specific factors of a firm performance do not yield consistent results. According to McGahan and Porter (1997), the industry structure is a central determinant of firm performance, which is in compliance with the theory of industrial organization. On the other hand, the opposite approach (according to McGahan and Porter (1997) called the resource based view) argues that firm performance is most influenced by unique organizational processes.

Hawawini et al. (2003) focused on the firm performance drivers and found out that only for a few dominant firms in the sector firm-specific factors matter significantly more than industry factors. For most other firms the industry factors are of a greater importance in the comparison with the firm-specific ones. Similar result was concluded by Schumacher and Boland (2005), who focused their research on food processing firms. Their results indicated that firm specific factors are less important for the vast majority that are not the industry high or low performers. The industry factors as drivers of profitability could not be disregarded also in the Czech food processing sector, as reported by Blažková and Dvouletý (2018b). This evidence provides support that industry nature matters more for firms that are not high or low performers, which is characteristic for the majority of firms in the industry.

Performance variation of a firm and its industry drivers as a research area have a long tradition. Schmalense (1985) using the sample of US manufacturing firms found out, that industry effects accounted for about 20 per cent of variation in firms´ profits. Rumelt (1991) extended his research by including longer observing period, which led to relatively lower proportion attributed to industry effects (only 9-16 per cent) compared with firm-specific factors. Similarly, McGahan and Porter (1997) confirmed the intensity of sector influence on the firms´ profitability. It accounted for 19 per cent of the aggregate variance in the profitability. Blažková and Dvouletý (2018b) estimated the industry effects to be more important after excluding outliers (the industry effects increased from 0.4 to 7.5 per cent when using ROA).

While the debate has mainly focused on firm and industry effects, our aim is to integrate country and year effects in order to account for macroeconomic fluctuations. However, compared to the disagreement between inter-firm and sector-specific factors, the empirical evidence on differences in profitability among countries and over time is rare. Chen (2004) shows that despite the EU single market the national boarders strongly restrict trade within the EU. Based on this finding it can be assumed, that the profits will differ among particular countries due to different import and export penetrations. Several other country-specific aspects such as economic level, interest rates will be controlled. Besides variation across countries, the performance can vary also over time. There are several empirical studies on profit variation over time, e.g. McGahan and Porter

(1997) or Makino et al. (2004), which discovered very weak linkage on profitability.

The hypothesis is elaborated based on the existing literature concerning the drivers of firms´ performance. Prevailing research is not consistent regarding the range of palette of particular sector-wide and country-specific factors. Classical industrial organization theory (e.g. Bain, 1956) assumes that from the perspective of wide-sector character, the performance mainly depends on the industry structure (Hirsch et al., 2013). This can be described by market concentration, conduct of suppliers, vertical integration etc. Justification for systematic differences in profitability between countries can be found in different intensity of the intra-national and inter-national trades. To integrate time factors, prevailing studies incorporated the standard macroeconomic measures (Makino et al., 2004). A time effect is here referred to as a component capturing the macroeconomic cycle.

The hypothesis addresses the relationship between performance of firms and sector, country and year aspects and reflects the findings of the above mentioned studies.

H1: Sector-wide and country-specific factors had a significant impact on the dairy firms´ performance in the V4 countries in 2006-2014.

H0: Sector-wide and country-specific factors had an insignificant impact on the dairy firms´ performance in the V4 countries in 2006-2014.

There are various measures that can be used for the analysis of the financial performance of firms. Since the majority of observed firms are not listed, accounting indicator return on assets (ROA) is used as a proxy for performance. To comprehend the dynamic aspect of V4 dairy sector performance, the industry-wide and country-specific aspects have to be operationalized. This analysis uses market concentration, number of firms in the sector, growth of demand and growth of the price of agricultural producers as proxies for the industry-wide aspects. The country specific aspects are influenced by the market openness and foreign competition, therefore the import penetration ratio becomes a proxy for this area, similarly to Olper et al. (2016). To capture the time effects and their connection to the macroeconomic cycle, the changes in the gross domestic product and interest rate become proxies for these aspects.

The article proceeds as follows. The next part provides the description of the data, variables and methodological approach. The empirical study in the third part focuses on the calculation of performance measure and its interaction to the sector-wide and country specific factors. Concluding part discusses the main results, particular limitations and possible further research.

Materials and methods

Data

AMADEUS, the trans-European database compiled by Bureau van Dijk Electronic Publishing, was used as the main data source. The dataset covers the period from 2006 to 2014 and consists of enterprises operating in the dairy processing industry (NACE class 105) within the Visegrad countries, i.e. the Czech Republic, the Slovak Republic, Hungary and Poland. Further, the data published by the European Commission in the Eurostat database were employed to have relevant information for calculation of variables described below.

	The Czech Republic			The Slovak Republic			Poland			Hungary		
	Population	Sample		Population	Sample		Population	Sample		Population	Sample	
	(N)	(N)	(%)	(N)	(N)	(%)	(N)	(N)	(%)	(N)	(N)	(%)
2006	146	47	32.2	49	21	42.9	736	186	25.3	91	35	38.5
2007	146	52	35.6	50	23	46.0	682	203	29.8	90	53	58.9
2008	178	52	29.2	38	23	60.5	724	225	31.1	100	58	58.0
2009	186	52	28.0	58	23	39.7	656	233	35.5	98	93	94.9
2010	207	51	24.6	229	41	17.9	663	236	35.6	116	93	80.2
2011	199	50	25.1	231	45	19.5	604	239	39.6	112	101	90.2
2012	188	52	27.7	197	49	24.9	603	238	39.5	108	98	90.7
2013	178	46	25.8	189	54	28.6	523	218	41.7	106	100	94.3
2014	181	36	19.9	168	51	30.4	521	154	29.6	115	96	83.5

Note: Population refers to all firms active in the dairy processing industries within the particular analysed countries.
Source: Eurostat, AMADEUS; authors elaboration

Table 1: Shares of observations by country within the sample and in the population.

The sample of the accounting data of enterprises is made out of 3,427 observations across 9 years and 4 countries. To see the representativeness of the sample, the shares of observations by countries in the sample with those in the population are compared in Table 1. This data sample was used for calculating the average value of ROA indicator and the value of concentration ratio for each of the observed country and year.

Variables

The profitability variable acting as the dependent variable is represented by *Return on Assets (ROA)*, which is the most common indicator of profitability and measures the firm's management ability to generate profits from the firm's assets (Megginson et al., 2008). As stated by Hult et al. (2008), ROA belongs to the most used measures of financial performance in previous empirical studies.

Theoretical models and previous empirical studies indicate that both country and industry characteristics play a role in determining profitability, therefore seven independent variables reflecting these characteristics were tested in our analysis. Country specific factors are represented in the model by two variables – *Gross Domestic Product (GDP)* and *Interest rate (IR)*, which reflect the effect of macroeconomic fluctuations in the economy (macroeconomic factors). A firm's performance and distress (failure) can be significantly influenced by the performance of the macro economy. For example, the failure risk of a geared firm is augmented by macroeconomic instability and, therefore, the determinants of failure (low profitability) should also be seen in the macroeconomic context. Industry specific factors reflect especially structural characteristics and are represented in the model by five variables – *Growth of sales revenues (SalesGrowth), Number of firms (NF), Market concentration (CR4), Growth of price of agricultural producers (PAP)* and *Import penetration ratio (IMP)*. The list of all variables, their calculations and data source are given in the Table 2.

Gross Domestic Product (GDP) is an indication of the economy and market development that could foster the development of dairy firms, mainly due to the greater possibilities for extending the production, as characterized by increasing economies of scale. Moreover, a larger GDP frequently means that the country is better equipped in terms of capital, a condition which favours the development of the processing industry (Lapinska, 2014). Also, we expect that the larger the markets are, the larger the scope for product differentiation is. That could positively affect firms´ profitability. Generally, this indicator is an independent variable expressing macro-economic development. Therefore, this variable is related mainly to factors that act in a general sense for most organizations directly, but to a specific product or service covered by the organization it usually acts indirectly. The potential impact of this indicator is primarily an empirical matter, however, the GDP growth should go hand in hand with the growth in the performance of manufacturing industries.

Interest rate (IR) is another macroeconomic determinant of firms' performance. The increase in interest rate rise the cost of debt at which the required rate of return will be lower than the cost of debt, therefore firms reject profitable projects due to the high cost of borrowing, which affected negatively firm's profit. As in the previous case, the influence of this indicator is mainly empirical.

Growth of sales revenues (SalesGrowth) of the dairy industry is an indicator of the size of the demand. It captures developments of the competitive position on both domestic and export markets at the same time. It can be supposed that growth of industry demand would exert a positive influence on profitability, since firms in industries facing growth probably do not feel so competitive pressure than firms in stagnating industries. The classical empirical literature has provided some evidence on this hypothesis, i.e. that growth of industry demand has a positive impact on profits (e.g. Khalilzadeh-Shirazi, 1974; Bradburd and Caves, 1982) and therefore we expect the positive sign of the parameter in the model.

Number of firms (NF) characterizes the size of the dairy industry from the viewpoint of the number of firms operating in the given country. Economic theory says that larger markets with a high number of companies on the market are expected to generate greater competition among companies and smaller ability of the firms to influence prices, therefore negative relationship between ROA and number of firms is expected, i.e. negative sign of the parameter in models.

Market concentration is expressed in models by the concentration ratio of four largest companies on the market *(CR4)*. It can be assumed that higher market concentration leads to higher market power implying higher prices, which should positively influence the profitability of firms on the concentrated markets. Therefore positive coefficient in the model is expected.

Growth of price of agricultural producers (PAPgrowth) reflects the substantial financial risks arising from wide fluctuation in milk prices that milk processing companies face. Farm milk prices have been more volatile in the past decade (Dudová and Bečvářová, 2015). Generally, higher price (of agriculture producers) of input (raw milk) negatively affects the profitability of processing firms. This is especially true for the milk processing industry, which is facing significant market power of retailers on the demand side. Also, by contrast to other manufacturing industries, there are specific supply-side conditions (raw milk availability and contracting of deliveries) of the dairy industry, which could have an impact on profitability. The expected sign is negative since an increase in price of raw material should lower the profitability.

Import penetration ratio (IMP) measures the importance of foreign competition in the domestic country (Lindner, 2001). In general, the international trade increases the competitive pressure (Kalínská, 2010), therefore the import competition can significantly reduce overall market share of large companies in the industry. As a result of the increase in imports, large domestic firms can experience significant losses in market share. On that account the sign of the estimated parameter in the model is expected to be negative.

Variable	Variables description
ROA	$ROA_{it} = \frac{EBIT_{it}}{Total\ Assets_{it}}$ where *i* denotes each of the four Visegrad countries and *t* denotes the year (dimensionless variable). Data source: Bureau van Dijk Electronic Publishing (2014). AMADEUS database.
GDP	Year-to-year difference of the Gross Domestic Product of the country *i*, in the time period *t*, i.e. $GDP_t - GDP_{t-1}$ where *i* denotes each of the four Visegrad countries and *t* denotes the year (in mil. EUR, in comparable prices 2010). Data source: European Commission. Eurostat.
IR	Year-to-year difference of the interest rate in the country *i*, in the time period t, i.e. $IR_t - IR_{t-1}$ where *i* denotes each of the four Visegrad countries and *t* denotes the year (dimensionless variable). Data source: European Commission. Eurostat – Interest rates database.
SalesGrowth	$SalesGrowth_{it} = \frac{Sales_{it} - Sales_{i,t-1}}{Sales_{i,t-1}}$ where *i* denotes each of the four Visegrad countries and *t* denotes the year (dimensionless variable). Data source: European Commission. Eurostat - Annual enterprise statistics for special aggregates of activities.
NF	Number of firms operating in the country *i* in the time period *t*. Data source: Bureau van Dijk Electronic Publishing. AMADEUS database.
CR4	$CR4_{it} = \sum_{j=1}^{4} S_{ijt}$ where S_{ijt} denotes the market share of *j*-th firm in the country *i* and the time period *t*. The market share of the *j*-th firm is calculated as the production of the company divided by the sum of production of all firms in the market. We calculated the market concentration on the basis of sales data, i.e. sales of own products and services, because this indicator seems to explain more about the market share than the output. (*CR4* is expressed as dimensionless variable). Data source: Bureau van Dijk Electronic Publishing. AMADEUS database.
PAPgrowth	Growth rate of prices of agricultural producers in the country *i* in the time period *t* (expressed as dimensionless variable). Data source: European Commission. Eurostat.
IMP	$IMP_{it} = \frac{M_{it}}{Y_{it} + M_{it} - X_{it}}$ where *i* denotes each of the four Visegrad countries and *t* denotes the year, M_{it} and X_{it} are, respectively, the total imports and exports of dairy products of the country *i* in the year *t*, and Y_{it} is the total production of the dairy processing industry in a particular country *i* expressed by the total sales of own products and services. (*IMP* is expressed as dimensionless variable). Data source: European Commission. Eurostat.

Source: authors elaboration based on Megginson et al. (2008), Viscusi et al. (2005) and Lindner (2001)

Table 2: Variables used in empirical investigation.

Variable	Mean	Median	Max.	Min.	Std. Dev.	Obs.
ROA	-0.01395	-0.0044	0.08473	-0.15303	0.06806	36
GDP	4 607.35	8 161.85	29 574.05	-7 730.40	-1 293.60	36
IR	-0.00192	0.0003	0.015	-0.0197	0.00784	36
SalesGrowth	0.03281	0.04224	0.22119	-0.21031	0.10136	36
NF	263	180	736	38	226	36
CR4	0.45624	0.44815	0.75298	0.15877	0.15046	36
PAPgrowth	0.04292	0.08213	0.30413	-0.35146	0.16006	36
IMP	0.26648	0.28031	0.50673	0.03622	0.13664	36

Source: Gretl, authors elaboration

Table 3: Descriptive statistics.

Table 3 reports the descriptive statistics for all variables used in the regression analysis and gives an overview of the variability of the data sample (the units of analysis are particular V4 countries).

The variables involved in the analyses were formed into the balanced panel structure, where particular units of analysis are four V4 countries observed across period of nine years. Since panel structure requires estimating regression models only based on the stationary variables, we used the unit root test Levin, Lin and Chu (Levin et al., 2002) to check the stationarity of variables. All variables except for *IR* was found out to be stationary, the variable *IR* was, therefore, transformed into the year-to-year differences to be difference-stationary.

Methods

The regression model was estimated in the software Gretl. Based on the Hausman (1978) test, we used the Fixed Effects Estimator. We estimated the econometric model (see equation below) investigating the relationship between industry profitability and its main determinants:

$$ROA_{it} = \alpha_i + \beta_1 CR4_{it} + \beta_2 NF_{it} + \beta_3 IMP_{it} + \beta_4 GDP_{it} + \beta_5 PAPgrowth_{it} + \beta_6 GDP_{it} + \beta_7 IR_{it} + \beta_8 SalesGrowth_{it} + u_{it}$$

where i = 1, 2, 3 and 4 denotes countries and t = 1, 2, …9 denotes years of observation. The results are presented in Table 4.

All models were estimated with the White cross-section standard errors and covariance (d.f. corrected) which deals with the consequences of heteroscedasticity and autocorrelation. The model was controlled for collinearity using correlation matrices, no multicollinearity was detected. Estimated econometric model has a good explanatory power of the variability of the dependent variable in terms of the R-Squared and was found out to be statistically significant (Verbeek, 2012).

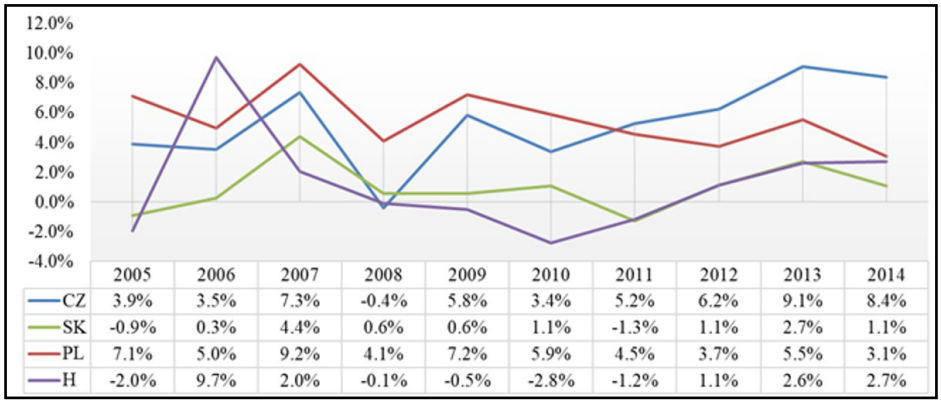
Results and discussion

Economic performance of milk processing companies in CZ, SK, PL and HU

There are similarities as well as different patterns in the changes of average economic performance (ROA) of milk processing companies among the Czech Republic, Poland, Slovakia and Hungary. Figure 1 presents values of average Return on Assets (ROA) of milk processing companies in the Czech Republic, Poland, Slovakia and Hungary during the period 2005-2014.

The milk processing companies in the Czech Republic reached an average ROA of 4% between 2005 and 2010. In 2008, average value of ROA dropped down as a consequence of the crisis in the milk sector due to the global economic crisis and decline in the prices of processors in the fourth quarter of 2008 and in 2009. The average ROA in the sector recovered already in 2009 to a level of around 6% in 2009. As noted by Špička (2013), this was specifically caused by relatively favourable input-output price relations (the low producer prices of milk, which partly compensated the low prices of processors) that induced higher profitability in the 2009. Since 2010, average values of ROA are increasing to the level of between 8% and 10% at the end of the reporting period.

Throughout the reporting period, milk processing companies in the Slovak Republic reached lower values of ROA compared to the enterprises in the Czech dairy industry (with the exception of 2008). Generally, the Slovak milk processing companies achieved very low levels of profitability, ROA fluctuated typically between plus 2% and minus 2%. Also, it took longer time to the milk processing industry of the Slovak Republic to overcome the effects of the crisis in 2008 in terms of profitability. Since 2011, the improvement in average ROA can be identified. Čechura and Malá (2014) investigated technology



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
CZ	3.9%	3.5%	7.3%	-0.4%	5.8%	3.4%	5.2%	6.2%	9.1%	8.4%
SK	-0.9%	0.3%	4.4%	0.6%	0.6%	1.1%	-1.3%	1.1%	2.7%	1.1%
PL	7.1%	5.0%	9.2%	4.1%	7.2%	5.9%	4.5%	3.7%	5.5%	3.1%
H	-2.0%	9.7%	2.0%	-0.1%	-0.5%	-2.8%	-1.2%	1.1%	2.6%	2.7%

Source: own processing based on AMADEUS

Figure 1: Average ROA of milk processing companies in the Czech Republic (CZ), Poland (PL), Slovakia (SK) and Hungary (H) in 2005-2014.

and efficiency differences between food processing companies in the Czech and Slovak Republic and concluded that there are significant differences in the technology between the Czech and Slovak dairy industry. These differences cause negative effects for Slovak dairy companies (productivity parameters, technological change). Also, technical efficiency is higher in the Czech dairy companies in comparison to the Slovak ones.

Another measure of competitiveness is the mutual balance of foreign trade with milk products between the Czech Republic, the Slovak Republic and Poland. Milk processing industry in Poland can be seen as more successful in comparison with the dairy industry of the Czech and the Slovak Republic. This is also in line with the research results published by Špička (2015), who found out the lower rate of technological progress in the Czech and Slovak dairy food industries in comparison with Poland in the period of years 2008-2013.

The above-mentioned context corresponds with the average level of ROA of the milk processing industry in Poland. In the years 2005-2010 the milk processing companies in Poland reached higher values of ROA in comparison with the Czech Republic. It is worth mentioning the declining tendency of the average ROA in Poland, and the question arises, what are the causes of this development.

In the period of 2005-2010 the milk processing companies in Hungary reported the lower values of ROA (except of year 2006) compared to Czech Republic and Poland. From the viewpoint of the level and changes in the average ROA values, Hungary is very similar to the Slovak Republic. There can be observed an increasing trend of ROA values in Hungary (similarly to the Czech and Slovak Republic), during the second part of the observed period.

Factors affecting economic performance of milk processing companies

To test our hypothesis, we take the standard measure of business performance ROA (*ROA*), which represents the average value of return on assets of enterprises operating in the dairy industry. Our independent variables are represented by a set of control variables from both sector-wide and country-specific areas. The results of regression analysis are presented in Table 4.

	Dependent Variable ROA	
Independent Variables	Coefficients	Standard Errors
GDP	1.277773e-06***	1.71E-07
IR	-2.09379***	0.59316
SalesGrowth	0.0429	0.10029
CR4	0.28172***	0.09727
NF	0.00002	1.00E-05
PAPgrowth	-0.06379	0.07569
IMP	-0.47626***	0.12248
CONSTANT	-0.02892	0.01826
R-squared	0.79737	
Observations	36	

Note: *** statistical significance at 1% level, ** statistical significance at 5% level, * statistical significance at 10% level.
Source: Gretl, authors elaboration

Table 4: Model table: The determinants of industry profitability.

As follows from the results, the increase in Gross Domestic Product (*GDP*) in particular year was related to the increase in ROA of milk processors in the given year, which is in line with our expectations and the economic theory. Increase in GDP signals positive development of the economy, which is reflected also in the dairy

industry. This indicates that during the period 2006-2014, the increase in GDP in the Czech Republic, Slovakia, Hungary and Poland was associated with higher profitability of milk-processing companies. Increase in GDP usually means that the country is better equipped in terms of capital, a condition which favours the development of the processing industry. The larger the markets are it also allows in larger scope to differentiate products.

The analysis has shown that also the interest rate (*IR*) as a country specific factor significantly matters for performance of enterprises in dairy industry. This factor affects the profitability negatively, which supports the idea that the increase in the interest rate raises the cost of debt and therefore firms reject profitable projects due to the high cost of borrowing. This causes the lost opportunities and affects negatively firm´s profit. The results of the empirical research conducted by Blažková and Dvouletý (2017) among the Czech food processing companies confirmed that there is a negative relationship between profitability and indebtedness.

Growth of demand (*SalesGrowth*) for dairy industry products (on the domestic market or on the foreign market) seems to be positively associated with higher profitability. However, the coefficient was not statistically significant, therefore, we cannot make any conclusions about the impact of the sales growth on profit of milk processing companies.

The results of the research confirm that market concentration (*CR4*) significantly and at the same time positively effects the increase in profitability. As concluded by Čechura et al. (2015), the European milk processing market is characterized by oligopoly market power on average, but significant differences exist among the EU countries. Among countries with high oligopoly market power belongs Hungary. The Czech Republic, Poland and Slovakia belong among countries in which relative mark-up power increased in the most intensive way. These results are also in line with some other studies investigating the relationship between market concentration and profitability, such as e.g. Setiawan et al. (2012), Hersch et al. (1994), Blažková and Dvouletý (2017), or Blažková and Chmelíková (2016).

The structure of the industry can be assessed not only by the size distribution of firms on the market, i.e. by the market concentration indicators, but also by the number of firms (*NF*) on the market. Contrary to our expectations, we observed positive sign of the coefficient for this variable in the model. However, we cannot make any conclusion about the impact of the number of firms on the profitability of dairy industry regarding the fact that the coefficient is not statistically significant. As concluded by Čechura et al. (2015), majority of EU milk processors are characterized by only a small or almost no degree of market power. There are several large firms in the dairy industry, but on the other hand, very small firms are represented in large numbers that can be successful and profitable from the regional point of view or due to the discovering and occupying of the market niches. Therefore, the number of firms in the sector is not considered as an important determinant of profitability in the dairy industry.

Given that milk is the main intermediate input used in dairy industry, we observed negative sign of the coefficient for the growth of price of agricultural producers (*PAPgrowth*) in the model, which is in accordance with our expectations. Regarding the fact that the coefficients were not statistically significant, we cannot make any conclusions about the impact on profitability of the milk processing industry.

The impact of imports expressed by import penetration ratio (*IMP*) was confirmed to be significant factor when explaining profitability of milk processors. This determinant influences profitability negatively, i.e. during the period 2006-2014 the increase in IMP in the Czech Republic, Slovakia, Hungary and Poland was associated with lower profitability of milk processing companies. Our strong evidence for negative relationship between import penetration ratio and performance is in accordance with our expectation that the international trade increases the competitive pressure, therefore the import competition reduces overall market share of large companies in the industry, and results in increase in imports and losses in market shares of domestic firms.

Conclusion

One of the main challenges for agricultural policy makers is to support institutional frameworks that enable sustainable and competitiveness development of agribusiness sector. In our study, we therefore investigated the determinants of profitability of the dairy industries in the Czech Republic, Slovakia, Poland and Hungary, in order to assess whether both the country-specific (gross domestic product and interest rate) and industry-specific

(sales growth, market concentration, number of firms, growth of price of agricultural producers and import penetration ratio) determinants exert a significant effect on sectoral profitability (operationalized by ROA). Based on this research question we built a hypothesis, which we tested for the time period 2006-2014.

Our empirical results indicate that there are similarities as well as differences in the average economic performance (ROA) of milk processing companies the Czech Republic, Poland, Slovakia and Hungary. Levels of ROA are generally higher in the Czech Republic and Poland in comparison to the Slovak Republic and Hungary. In the first half of the observed period, the changes in the ROA were quite similar among analysed countries. All the countries were affected by crisis in the milk sector in the year 2008. Recovery after the crisis was faster in the Czech Republic and Poland in comparison to the Slovak Republic and Hungary. In the second half of the observed period, ROA was steadily increasing in the Czech Republic, Slovakia and Hungary. On the other hand, ROA was on a downward trend in Poland. These results correspond with the results and conclusions of studies by Špička (2013, 2015) and Čechura and Malá (2014).

The results suggest that there exist sector-wide and country-specific factors that have a significant impact on performance of the milk processing companies. The results show profitability (ROA) to be significantly related to the interest rate (negatively) and market concentration (positively). This suggests the important role of economies of scale and of investment activity on profitability of milk processing companies. Additionally, it was also found that profitability is significantly related to import penetration ratio (negatively). This suggests the importance of effects of ongoing agri-food trade liberalization.

Our main recommendations for agricultural, industry and trade policy makers is to support macro-economic as well as the dairy industry environment and strengthen competitiveness. The European Single Market is a very demanding market requiring high enterprise performance. Currently, increasingly liberal world dairy markets and the abolition of milk production quotas will further strengthen the competitive pressure on performance of milk processing companies in the Czech Republic, Slovakia, Poland and Hungary. Management of milk processing firms should be more oriented toward product diversification, brand name development and other marketing management activities. At the same time, technological efficiency and synergies in supply chains have to be improved. Public funds should be geared precisely to support innovation in the above areas. Regarding the further research, it would be very appropriate to extend the time period of the analysis as more data become available and to investigate the effects of the abolition of dairy production quotas on the dairy markets.

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