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Is the price-cost margin affected by the market concentration? Evidence from the Czech food and beverages industry

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Abstract:

The paper investigates the relationship between the market concentration and the price-cost margin in the Czech food processing industry during 2003-2014. Estimated econometric models with Fixed Effects supported hypothesis assuming the positive impact of the market concentration on the price-cost margin controlling for productivity. The increase in the productivity was associated with the increase of the price-cost margins. Based on the results, policy makers should promote market competition in the food processing industry, for example through the reduction of entry barriers. Another option worth consideration is to support R&D activities potentially leading to market transformation and increase in efficiency.

JEL Classifications: L11, L66

Keywords: Price-cost margin, market concentration, food and beverages industry, Czech Republic, regression analysis

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1. Introduction

A large range of empirical research in industrial organization economics deals with the relationship between industry performance and market concentration. Assessing the impact of market concentration and other structural variables such as advertising intensity, capital requirements, economies of scale in production, firm size, industry growth or measures of risk has been the subject of many contributions in the literature (e.g. Sivasubramaniam & Kara, 2015; Bothwell et al., 1984; Setiawan et al., 2012; Collins & Preston, 1966; Dickson, 2005).

However, research and evidence for the agribusiness sector is yet sparse (some notable exceptions are Schumacher & Boland, 2005; Weiss & Wittkopp, 2005; Höhler & Kühl, 2014; Dorsey & Boland, 2009; Janda et al., 2013; Čechura & Hockmann, 2011) since past research has focused on entire manufacturing sectors or over broad economic sectors.

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Studies dealing with manufacturing sectors usually exclude small firms and therefore they may not be applicable for food industry. Food sectors have different inherent characteristics and risks that may contribute to or dampen industry effects in comparison with manufacturing sectors or broad economic sector. Sonka & Hudson (1989) identified several important factors distinguishing agribusiness firms from others, i.e. the unique cultural, institutional, and political aspects of food, the uncertainty due to the biologic basis of crop and livestock production, the forms of political intervention across subsectors in agribusiness, institutional arrangements that place significant portions of the technology development process in the public sector, and the differing competitive structures within agribusiness sector.

The food processing firms in the Czech Republic are facing ongoing changes in competition, alteration of institutional arrangements and modified marketing conditions. While the decrease of the number of firms and growth of market concentration in the whole manufacturing industry of the Czech Republic has been subject to research already (see for example Zemplerová & Medvedev, 2005; Zemplerová & Stibal, 1995), the development of the Czech food and beverages industry concentration and its impacts on the food industry performance is obviously less investigated (see e.g. Blažková & Dvouletý, 2017).

As mentioned by many authors, e.g. Dobson et al. (2003) or Swinnen & Vandeplass (2010), the concentration and consolidation processes take place in food processing industry. Clarke et al. (2002) state that large food companies spread globally through the foreign direct investments, which increase the concentration outside their home markets. Nowadays, large corporations dominate the food markets, since they can easier succeed in the competition, pricing policies and legislation regarding food quality and safety than small local enterprises (Daniels et al., 2008). Their better market position enables them the use of economics of scale with a positive effect on costs. Moreover, the concentration of capital may facilitate investment in research and innovation, which contributes to the development of the whole industry.

The above mentioned facts justify the validity and timeliness of the analysis focused on the relationship between the performance and the level of market concentration with respect to other possible factors, since the efficiency and performance of the Czech food industry significantly affects the competitiveness of the Czech agriculture and opportunities of the Czech agri-food products to assert themselves on the market. Understanding the relationship between market structure and performance is critical for determining effective economic policy governing antitrust, intellectual property, industry regulation, and international trade. Therefore, the results of this research have important implications for firms in the food industry and are also relevant to policy makers with respect to competition and industrial policy and to investment analysts assessing the effects of changes in the external environment.

In this paper we empirically test the effect of market concentration on the price-cost margin in the food and beverages industry of the Czech Republic during the period of years 2003-2014. Higher market concentration is assumed to imply higher market power, increasing the ability of firms or the industry to influence the market price. Therefore, higher concentration is expected to lead to higher price-cost margins. Moreover, the effect of other variables, such as the number of firms in the sector and measures of productivity, on the price-cost margin is also investigated. We use the sector-level panel data, constructed from micro data with 13,229 observations across 12 years and 9 food sectors in the Czech Republic, which allows us to interpret separately the impact of the determinants on the performance over the time and across the particular sectors keeping other factors constant. For the price-cost margin as the dependent variable we estimate the set of econometric models following the econometric approach with the Fixed Effects Estimator.

The paper is organized as follows. Section 2 outlines the theoretical framework for analysing the determinants of structure and performance across markets for goods and

services and providing some motivation for the empirical model. Section 3 presents the data and the methodology used for the estimation. In Section 4 we report and discuss the econometric results. The final Section 5 is dedicated to conclusions and recommendations for policy makers.

2. Theoretical background and hypotheses

2.1. Theoretical background

The economists approach the questions about the relationship between market structure and market performance from the two different perspectives: the bounds approach and the structural method. The bounds approach uses the structure of game-theory and is focused on identifying the mechanisms that apply under the general conditions (Sutton, 1991, 1998). As stated by Ellickson (2015), the insights that apply to the broad run of industries are useful, since the economic policy often impacts many industries at the same time. The structural method uses the game-theoretic structure (e.g. Bresnahan & Reiss, 1990; Ericson & Pakes, 1995) and is focused on more narrow and detailed predictions tailored to specific industries.

Systematic works describing the relationship between market structure and performance appeared with the development of the Structure-Conduct-Performance (SCP) paradigm (Bain, 1968), which supposed one-way chain of causation running from industry structure (i.e. firm concentration) to firm conduct (i.e. pricing) to market performance (i.e. profitability). According to SCP paradigm high concentration leads to high prices and thus to high profits, however, significant barriers to entry should exist to maintain concentrated structures. Strong empirical regularity has been detected in the impact of increased concentration on prices and price-cost margins - the hypothesis about the fall in price and price-cost margins as a consequence of decrease in market concentration gained strong empirical and theoretical support.

Nevertheless, the assumption of a one-way chain of causation from structure to performance was criticized by Demsetz (1973) and Peltzman (1977), who postulate the possibility, that conduct and performance may drive the entry decisions that determine the market structure. For example, market with a high level of price competition could mean smaller number of companies entering the market than in the case of collusive environment, which implies the possibility that policies promoting competition may actually lead to more concentrated market structures. This conclusion is considered as a fundamental point of the bounds approach as stated by Ellickson (2015), who provided an excellent review of the more recent studies in the literature focusing on market structure and performance and also discussed the bounds approach and structural approach.

As a reaction to the failure of SCP approach to address the complex role of strategic interaction in determining firm conduct, economists began to apply the game-theoretic approach to market structure. One of the approaches known as bound approach (Sutton, 1991, 1998) aims to identify a number of "strong mechanisms" that characterize equilibrium outcomes across a broad range of industry settings. A comprehensive overview of the related literature, which includes many empirical studies that complement the bounds approach, can be found in Sutton (2007). Sutton (1991) found out different results in two types of industries - he distinguished "exogenous sunk cost markets (Type 1 industries)" in which advertising and R&D play no major role in competition and "endogenous sunk cost markets (Type 2 industries)" in which advertising or R&D play a critical role. Sutton has shown that, in the Type 1 industries, as market size increases, the level of concentration decreases. An opposite conclusion was found in the case of advertising and R&D intensive industries. Unlike the Type 1 industries, strategic importance of R&D investment limits the market structure - with the market size expansion the level of fixed investments increases accordingly. Thus, larger markets

generate greater investment by at least some firms, which eliminates the decrease in concentration and causes that due to required sunk investments some industries are permanently dominated by a small number of firms, as provided by Sutton (1991). The Sutton's theoretical framework was applied in various industries, e.g. Marín & Siotis (2007) focused on chemical industry, Ellickson (2007) used the bounds approach to analyse competition in the US supermarket industry, or Tabacco (2015) applies this framework to analyse the empirical relationship between market size and concentration in EU banking.

The second approach known as the structural methods, takes up a more focused perspective and tries to build detailed models tailored to specific industrial contexts, which can deliver more precise predictions as noted by Ellickson (2015). The study conducted by Bresnahan & Reiss (1990) can be mentioned as an early work applying this approach. They examined the relationship between market size and the number of entrants to the market in isolated rural markets and found out that if competition lowers the profits, the number of firms entering the market should grow less than proportionally with the size of the market. The results of this study supported also the assumption that collusive behaviour is usually harder to sustain with larger number of participants. Nevo (2000) applied the structural approach to simulate the competitive effects of a merger in the specific ready-to-eat cereal industry, which allows evaluating the impact of the merger prior to approval of policy decisions. Since most industries are dynamic, i.e. structures continue to evolve over time, in 1990s the framework for numerically analysing dynamic interactions in imperfectly competitive markets was developed (Ericson & Pakes, 1995), and further extended by subsequent authors, e.g. Benkard (2004), Goettler & Gordon (2011). For review and discussion of applications of this framework see Doraszelski & Pakes, (2007).

Both streams of literature provided important insights into the issue of relationship between market structure and industry performance and raised questions and

2.2. Previous findings and tested hypotheses

Our paper aims at explaining the effect of market structure on price-cost margins based on the panel data from the Czech food and beverages industry. Except the market structure, our analysis also includes the effects of the productivity and the size of the market on the margins. It builds upon a long stream of economic literature using the econometric approach to investigate the relationship between market structure and market performance, whose major finding is that market concentration and market shares of firms are positively related to firm profitability (Schmalensee, 1989). A general finding emerging from this literature is that higher market concentration implies higher prices (e.g. Cotterill, 1999; Newmark, 2004; Setiawan et al., 2012).

When doing price-concentration studies, it is useful to include a measure of market size, as recommended by Newmark (2004), which complements the measure of concentration. Based on the theory of oligopoly (Stigler 1964), prices and margins change not only due to the changes in variance of firm sizes (i.e. changes in market concentration), but also due to the changing number of firms in the market. The generally accepted finding implies that prices and margins rise as number of firms in the industry declines.

However, prices and profits earned by firms are influenced also by internal factors, among which we can include the productivity, i.e. the measure of the efficiency of production. Productivity growth is nowadays seen as the key economic indicator of innovation (Jorgenson et al., 2014). Successful introduction of new products and processes, organisational structures and systems generates growth of output that exceeds the growth of inputs, which implies the increase in productivity and thus income growth.

As mentioned above, the agro-food sector exhibits a number of challenging characteristics - it is highly volatile, both in production and market conditions, due to biological

production processes and unpredictable biological predators combined with variable climatic patterns, the demand for food products is inelastic or non-responsive which results in significant price fluctuations in general, food firms have moved from a production orientation towards one that is more consumer and retailer focused in recent years and it is generally accepted that the food industry faces an increase in competitive pressure because of the food processing sector and primarily retail sector concentration and consolidation. The special character of the food industry in the national economy is also emphasized due to the unique cultural and political aspects of the food. Despite the general recognition of the importance of this sector, no study to our knowledge investigates comprehensively structural changes on the Czech food market and their impact on the industry performance of the Czech food and beverages industry, thus, the results of our study can be seen as groundbreaking.

Based on the above mentioned theoretical framework, three hypotheses were formulated and tested in this study:

H1: There was a positive relationship between market concentration and price-cost margin in the Czech food and beverages industry during the analysed period of years 2003-2014.

H2: An increase in the amount of firms in the Czech food and beverages industry had negative impact on price-cost margins of firms operating in this industry during the analysed period of years 2003-2014.

H3: Productivity was a significant factor affecting the price-cost margins in the Czech food and beverages industry, whose increase had a positive impact on these margins during the analysed period of years 2003-2014.

3. Data and methods

3.1. Data

The empirical analysis has been conducted using data at the firm level drawn from the database Albertina - Gold Edition (Bisnode, 2015), which includes annual balance sheets and reports of business in the Czech Republic. The dataset covers the period from 2003 to 2014 and consists of enterprises operating in the Czech food and beverages industry. Particular sectors are defined based on the 3-digit level of the Classification of Economic Activities (CZ-NACE).

The research excludes one sector from the dataset, detected by descriptive analysis as an outlier, namely manufacture of vegetable and animal oils and fats (CZ-NACE 104) - during the analysed period fundamental structural change took place, which caused sharp fluctuations of the sector performance. Till 2008 there was only one large company in this sector with the high market share (almost half of the output of this sector was produced by this company), whose financial results were worsening during 2003-2008. The bad financial situation of this company resulted in the bankruptcy of the company and its transformation into new enterprises, which caused temporary decrease of market concentration in this sector in 2008 and 2009 (e.g. the CR4 indicator was 46.3% in 2009 in comparison with the value exceeding 90% at the beginning and the end of the observed period - 95.0% in 2003, 92.5% in 2003 respectively).

Explaining the changes in the performance of this industry through the analysed indicators would be misleading, since the sharp fluctuations in performance did not occur depending on the evolution of these indicators, but due to the bankruptcy of one largest enterprise in the sector, so following analysis does not include this sector.

The sample of the accounting data of enterprises is made out of 13,229 observations across 12 years and 9 food sectors in the Czech Republic*. The representativeness of the sample is strengthened by including also small enterprises with 0-19 persons employed in the analysis (49% observations in the analysed sample), since they are in the food industry represented in large number.

In order to have information on total values for particular sectors, specifically, total sales, number of enterprises and number of employees, we employ the data published by the Ministry of Agriculture of the Czech Republic (Ministry of Agriculture of the Czech Republic, 2008, 2015) and Eurostat (European Commission, 2015). Since it was necessary to eliminate the effect of inflation, we use also the producer price index for each sector (base year 2005) published by the Czech Statistical Office (Czech Statistical Office, 2016) to deflate value added when calculating labour productivity variable.

3.2. Variables

A fundamental point, when assessing business performance, is the selection of a suitable measure of performance, since different authors approach to performance measurement of firms or industries differently. We use the price-cost margin (*PCM*) to measure the sector performance as applied in numerous studies (e.g. Domowitz et al., 1986; Hersch et al., 1994; Prince & Thurik, 1995; Setiawan et al., 2012). *PCM* represents the dependent variable in constructed models and is calculated as follows:

$$PCM = \frac{\text{Value Added} - \text{Labor Cost}}{\text{Sales}}, \quad (1)$$

Value added is calculated by sales minus costs from external suppliers, i.e. cost of inventories, services, energy, fuels, etc., except labour cost. Thus, numerator value shows total production expressed by sales after deducting variable costs; denominator value represents total production expressed by sales.

Market concentration is expressed in models by two most common measures of concentration - the Concentration Ratio (*CR4*) and the Herfindahl-Hirschman Index (*HHI*). To determine the market structure, it is advisable to use both indicators that complement each other - while *CR_m* describes the market share of *m* largest companies in the industry, *HHI* shows the inequality of distribution of market shares among all firms in the industry.

The concentration indicators represent independent variables in models and are calculated by the following formulas (Viscusi et al., 2005):

$$CR4 = \sum_{i=1}^4 S_i, \quad (2)$$

* Namely CZ-NACE 101 Production, processing, preserving of meat and meat products; 102 Processing and preserving of fish and fish products; 103 Processing and preserving of fruit and vegetables; 105 Manufacture of dairy products; 106 Manufacture of grain mill products, starches and starch products; 107 Manufacture of bakery and farinaceous products; 108 Manufacture of other food products; 109 Manufacture of prepared animal feeds; 110 Manufacture of beverages.

$$HHI = \sum_{i=1}^n (S_i)^2 \quad (3)$$

where S_i denotes the individual market share, i.e. the percentage of the i -th firm calculated as the production of the company divided by the sum of production of all firms in the market, n denotes number of firms in the industry, for which HHI is calculated. In this paper, the market concentration is calculated 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. For the concentration indicators it is valid that the higher they are, the higher market power is concentrated among the largest firms therefore positive coefficients in models are expected.

Number of firms (NF) appears in models as independent variable and characterizes the size of particular sectors from the viewpoint of the number of firms operating in the given sector. Given the general economic theory it can be expected that larger industries with a large number of firms on the market will probably be characterized by greater competition among companies and smaller ability of companies to acquire and maintain a significant market share and the related ability to influence prices, and vice versa, therefore negative relationship between number of firms and price-cost margin is expected, i.e. negative sign of the parameter in models.

Technical-economic efficiency, with which factors of production are used in production, is evaluated by *productivity indicators*, which are in models represented by labor productivity (*LABOR_PRODUCTIVITY*) and personal cost per value added (*PERSCOST_VA*) as independent variables, and are calculated by following formulas:

$$LABOR_PRODUCTIVITY = \frac{Value\ Added}{Number\ of\ Employees} \quad (4)$$

$$PERSCOST_VA = \frac{Labor\ Cost}{Value\ Added} \times 100 \quad (5)$$

Regression estimates and correlation matrixes reported high level of collinearity between labor productivity and personal cost per value added and there these variables were put into regression models separately. Labor productivity is expected to have a positive impact on price-cost margin, i.e. positive value of parameter in models, since higher labor productivity means better ability of firms to use knowledge capital, advanced technology and other production factors. In the case of the second indicator of productivity, namely personal cost per value added, the negative relationship with the price-cost margin follows from the general economic theory, so the sign of the estimated parameter in the model is expected to be a negative.

Table 1 shows the descriptive statistics of the variables used in this research. It is obvious that the data are relatively heterogeneous with relatively high standard deviations for all variables. In the observed period the average of *CR4*, which is 34.89%, can be considered

as loose oligopoly, the average *HHI* classifies the Czech food and beverages industry as unconcentrated market (according to Merger Assessment Guidelines (Department of Justice U.S., 2010)). However, market concentration is different in the particular food sectors. The average *PCM* of 8.42% indicates positive price mark-up of firms, nonetheless, there are considerable differences among particular sectors as seen in Table 1 - *PCM* reaches values from 0.59% to 22.91%.

TABLE 1. DESCRIPTIVE STATISTICS

VARIABLE	MEAN	MEDIAN	MAX.	MIN.	STD. DEV.	OBS.
CR4	34.8928	34.2024	87.0016	12.5773	14.5314	108
HHI	670.9152	437.7111	5497.4150	85.4551	982.0894	108
LABOR_PRODUCTIVITY	585.5383	474.0345	1229.5950	215.4808	285.2492	108
NF	807.4167	338.5000	3036.0000	19.0000	860.7246	108
PCM	8.4233	7.0130	22.9077	0.5916	5.0012	108
PERSCOST_VA	57.1038	58.5622	88.0478	32.3528	12.6960	108

Source: EViews, authors.

The analysed variables were formed into the panel structure pooling together the Czech food and beverages sectors for the period of years 2003-2014. Working with panel data requires to estimate regression models only based on the stationary variables. To test stationarity of the panel data, the unit root test was conducted for each of the variables. We work with the econometric software EViews 8, that has integrated Levin, Lin & Chu test for the panel data (Levin et al., 2002), which proved that all of the variables are stationary.

3.3. Methods

The regression models were estimated in the software EViews 8. In order to decide about the most appropriate technique for estimating the regression models on the panel data, the panel diagnostics' tests were run. Based on the Hausman (1978) test, which showed that there is correlation between individual effects and other regressors, the Fixed Effects Estimator was chosen. After the estimation of the models with the Fixed Effects Estimator, we tested the redundant Fixed Effects using the Likelihood Ratio test and on the 5% level of the statistical significance we rejected the null hypothesis stating that the Fixed Effects are redundant and we accepted the alternative one, stating that the Fixed Effects are the most appropriate estimation technique.

We estimated following econometric models - see Model 1, 2, 3 and 4 defined by the equations (6), (7), (8) and (9) - investigating the relationship between industry performance and industry structural variables such as market concentration, productivity and the size of the industry. All models were estimated with the Fixed Effects Estimator and the results are presented in Table 2.

$$PCM_{it} = \alpha_i + \beta_1 CR4_{it} + \beta_2 NF_{it} + \beta_3 LABOR_PRODUCTIVITY_{it} + u_{it}, \quad (6)$$

$$PCM_{it} = \alpha_i + \beta_1 CR4_{it} + \beta_2 NF_{it} + \beta_3 PERSCOST_VA_{it} + u_{it}, \quad (7)$$

$$PCM_{it} = \alpha_i + \beta_1 HHI_{it} + \beta_2 NF_{it} + \beta_3 LABOR_PRODUCTIVITY_{it} + u_{it}, \quad (8)$$

$$PCM_{it} = \alpha_i + \beta_1 HHI_{it} + \beta_2 NF_{it} + \beta_3 PERSCOST_VA_{it} + u_{it}, \quad (9)$$

where $i = 1, 2, 3, 5, 6, 7, 8$ and 10 denotes sectors and $t = 1, 2, \dots, 12$ denotes years of observation.

TABLE 2. MODEL TABLE - THE DETERMINANTS OF INDUSTRY PERFORMANCE

Independent variable	Model 1	Model 2	Model 3	Model 4
	Dependent variable			
CR4	0.049922*** (0.007204)	0.059829*** (0.004592)		
HHI			0.000625*** (9.93E-05)	0.000738*** (0.000125)
NF	-0.002543*** (0.000640)	-0.001974*** (0.000501)	-0.002347*** (0.000601)	-0.001590*** (0.000414)
LABOR_PRODUCTIVITY	0.001882** (0.000871)		0.002906*** (0.000827)	
PERSCOST_VA		-0.065157*** (0.013884)		-0.067337*** (0.019983)
CONSTANT	7.633007*** (0.532893)	11.65062*** (0.936149)	8.197542*** (0.519394)	13.05688*** (1.178481)
R-squared	0.962135	0.965670	0.960241	0.961195
Adj. R-squared	0.957796	0.961737	0.955685	0.956749
F-statistic	221.7557	245.4911	1.052806	216.1739
Observations	108	108	108	108

Source: EViews, authors elaboration.

Note: Standard Errors are in parenthesis; *** - stat. significance at 1%, ** - stat. significance at 5%,

* - stat. significance at 10%.

All models were estimated with the White cross-section standard errors & covariance (d.f. corrected) which deals with the consequences of heteroscedasticity and autocorrelation, often present in the time series and panel data. All models were checked for the level of collinearity among the explanatory variables using the Variance Inflation Factors (VIF) test and all values were lower than the critical value of ten, and therefore the presented models do not suffer from the multicollinearity problem. The residuals taken from the models were tested for the normality using Jarque Bera normality test and on the 1% level of the statistical significance we were unable to reject the null hypothesis stating the normal distribution of the error term in the models and hence this statistical assumption is also satisfied.

Finally, all estimated econometric models have a good explanatory power of the variability of the dependent variable in the terms of the R-Squared and all models were found to be statistically significant (Verbeek, 2012).

4. Results and discussion

The results in Table 2 suggest that market concentration has a significant effect on the price-cost margin, both for the *CR4* measure (model 1 a 2) and *HHI* measure (model 3 a 4). All coefficients have positive sign which implies that during the analysed period higher market concentration yielded higher price-cost margin for the food processing firms in the Czech Republic, supporting **H1**. Therefore, the results show that firms in the Czech food and beverages industry benefit from more concentrated market structure, which corresponds with other studies that have looked at market concentration and firm performance - e.g. Collins & Preston (1966), Delorme Jr. et al. (2002) and Dickson (2005) found out the positive relationship between efficiency or profitability and market concentration in the U.S. manufacturing sectors, Setiawan et al. (2012) investigated the Indonesian food industry with the same findings and Hersch et al. (1994) proved restraining effect of competition (measured by number of competitors) on the price-cost margins of enterprises also in transitional economies of Hungary, Poland and the former Czech and Slovak Republic (CSFR).

Due to the uneven distribution of market forces within the commodity verticals and market power of retail chains in the Czech Republic (e.g. Bečvářová, 2008; Blažková, 2010), market concentration at the level of food processing seems to be a prerequisite to enhanced competitiveness in relation to the subsequent vertical stage. Higher market concentration in the food industry can mean not only a better bargaining position with customers, but also the exploitation of economies of scale, better access to capital and the associated higher levels of investment, the possibility to finance research and development and increased advertising and promotion, which can significantly affect the growth of food sector performance.

The relationship between the size of the sector and its performance was investigated through the number of firms (*NF*) variable. The statistical significance of the coefficient for *NF* variable was confirmed in all models. The negative sign of the coefficient, which is consistent with our assumptions, showed that the increase of number of firms in a sector in the observed period was associated with a decline in price-cost margin and vice versa, while reducing the number of firms in a sector, the growth of price-cost margin was monitored in the food and beverages sectors of the Czech Republic. The estimated coefficients for *NF* variable are comparable in all models and can be interpreted in the following way. The increase in the amount of firms by ten was associated with the decrease of price-cost margins on average by 0.02% during the period of years 2003-2014. Our second hypothesis (**H2**) is therefore also empirically supported. The corresponding results were found out by Hersch et al. (1994) who proved restraining effect of competition (measured by number of competitors) on the price-cost margins of enterprises in transitional economies of Hungary, Poland and also the former Czech and Slovak Republic (CSFR).

To examine the effect of productivity changes on the price-cost margin, two determinants characterizing productivity were employed in models - labor productivity (*LABOR_PRODUCTIVITY*) in Model 1 and 3 and personal cost per value added (*PERSCOST_VA*) in Model 2 and 4. All four coefficients were found to be statistically significant, and as expected, the coefficient was positive in the case of labor productivity and negative in the case of personal cost per value added supporting our third hypothesis (**H3**) assuming the positive impact of productivity on performance. The results regarding the *LABOR_PRODUCTIVITY* variable suggest that in the period of 2003-2014 the increase of labor productivity led to the increase of sector performance, namely price-cost margin increased by 0.002% (Model 1), resp. 0.003% (Model 3), following one unit (mil. CZK per employee) rise in labor productivity. The impact of productivity on industry performance was confirmed also by employing the *PERSCOST_VA* variable in Model 2 and 4, which proved that the increase of labor costs measured as percentage from value added had negative impact on the sector performance.

5. Conclusions

The aim of this paper was to analyse the determinants of the food and beverages industry performance in the Czech Republic following the recent increase in the amount of studies focused on the determinants of entrepreneurial activity (Dvouletý & Mareš, 2016a, 2016b). The empirical analysis was conducted based on the lack of studies related to investigation of the dependency between the market concentration and the price-cost margin in the Czech environment. Obtained results provide further insight for the policy makers, interested in market competition in the food industry, whether the firms gain more producer surplus through the lowering of competition and anti-competitive behaviour.

Data for the empirical analysis obtained from various databases covered the 12-year period and were formed into the panel dataset. Our research aim was to explain the relationship between price-cost margin, acting as the dependent variable, and indicators of structure and productivity, acting as the independent variables. To answer research question econometric models with Fixed Effects were estimated and interpreted.

The results point to the positive effect of the market concentration on the price-cost margin in the Czech food and beverages industry over the period of years 2003-2014, which is in accordance with the results of previously published studies (e.g. Kaditi, 2013; Setiawan et al., 2012; Dickson, 2005). Also the number of firms in the sector appears to be the factor that determines performance of the Czech food and beverages firms, interpreting that growth of number of firms in sectors let to decrease of price-cost margins during the analysed period. This result is in consistency with standard competitive analysis, since on more competitive market the possibility to increase price above the equilibrium level is worse than on the oligopoly market. Finally, sectors with higher productivity had higher margins in the observed period. The development of productivity is important in terms of production evaluation and in terms of the technical-economic efficiency, i.e. effectiveness with which factors of production are used in production, therefore firms that reach higher productivity have superior products or lower production costs than those do not, and can be more profitable.

Based on the obtained results several policy recommendations can be proposed. Higher market concentration in the Czech food industry leads to higher margins of food processing firms, which can be the result of efficiency or market power, however, in both cases it is reflective of better market position of processors in relation to concentrated retail in the Czech Republic. Due to the weaker bargaining position with retail chains, Czech food processors may be forced to accept the disadvantage delivery terms and conditions including various fees for introduction of goods into the store, participation in the advertising or they may to suffer long maturity invoices, as reported by Blažková (2010). On the other hand, in relation to farmers the abuse of processors' higher market power due to the increased concentration may arise in the form of downward pressure on prices of agricultural producers, which negatively influences Czech agriculture. Since the food processing industry is an important link within the commodity chain, which significantly influences the performance of agriculture and competitiveness of Czech farmers, the formulation of agrarian policy should be targeted also at the processing and consumer stages of the commodity chain. Policies should be designed for development of a market structure to promote competition. Possible way to reduce uncompetitive behaviour is to eliminate barriers of entry, which effectively lowers concentration. Governments may encourage market entry, for example by making capital more available to start-ups, by reduction and simplification of administrative requirements needed to set up enterprise or by support of R&D activities (Dvouletý & Lukeš, 2016). Since the entry of new firms helps to maintain competition and hence efficiency as emphasized by Ilmakunnas & Topi (1999) who state that new firms represent new technologies and their role is important in innovation, which can promote industry competitiveness and a structural change from traditional industries to high-tech industries. Moreover, Blažková

& Chmelíková (2016) who investigated the influence of market concentration on firms' lifespan of new-born firms in the Czech economy, proved that increased market concentration in the industry leads to higher mortality of start-up firms and suppresses the job creation. Finally, with respect to the role of food processors within the commodity chain, marketing of Czech food processors should be promoted to increase the competitiveness of the whole Czech agribusiness sector.

Our results should provide a firmer basis not only for the development of public policy, but also for further analytical research comprehensively focused on all levels of the commodity verticals in the Czech Republic, since to investigate the performance in the whole vertical, including possible effects of industry specific attributes on the firms' performance, would be interesting and challenging aim for further research. We also stress the importance of data collection and its availability, allowing research community to provide stakeholders with analysis and policy recommendations as it was recently pointed out by Polok et al. (2016).

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