Investigating the differences in entrepreneurial success through the firm-specific factors

Microeconomic evidence from the Czech food industry

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Abstract
Purpose – This paper aims to investigate the effect of firm-specific determinants on the entrepreneurial success (measured through the objective financial performance) of the Czech food processing firms over 2003-2014 and with the main particular focus on capital structure and productivity as the tough challenges of the firms in transition and emerging economies.

Design/methodology/approach – Determinants of profitability are tested econometrically, as for the estimation technique, both-way fixed effects controlling for variety over the time and across enterprises were applied. The collected micro-panel data set consists of 10,509 observations and includes 1,804 firms. Estimated regression models with fixed effects are used to quantify the determinants of the financial performance, operationalized through three key performance indicators – price-cost margin, return on assets and return on equity.

Findings – Estimated econometric models supported hypothesis assuming a positive relationship between the labour productivity and profitability. In line with the assumptions based on the development of the Czech food market, high leverage of firms led to the decrease of profitability, which can be explained by the high financial distress costs and worsened market position of firms in the competitive environment. Ageing of firms and firm size were associated with the increase of profitability indicators.

Practical implications – The findings of the presented research are important for investors considering agribusiness as a part of their investment portfolios and for policymakers to enhance the economic efficiency of the food industry through regulations and public support, and particularly, from the firm management viewpoint, e.g. to pay attention to the debt policy due to the negative impact of high indebtedness on firm profitability, and to the productivity factors, which proved to be important drivers of entrepreneurial success.

Originality/value – Although the firm-specific factors responsible for firm performance have already been studied, the food processing industry has received limited interest from the empirical analysts, and the results are not always unequivocal. This study is expected to contribute to the literature on this subject, both empirically and methodologically, as to the best of the authors’ knowledge, no study has been encountered yet where the factors determining the profitability of the Czech food processing industry have been the focus.

JEL classification – D22, D40, M21, L66

Funding: This work was supported by the Internal Grant Agency of Faculty of Regional Development and International Studies, Mendel University in Brno, under no. 2017/009, and by the Internal Grant Agency of Faculty of Business Administration, University of Economics in Prague, under no. IP300040.
With regards to the collected micro-data set and the estimation technique, the study can be considered as extensive not only from the perspective of the research in the Czech Republic but also from the international perspective.

**Keywords** Financial performance, Productivity, Regression analysis, Capital structure, Czech food industry, Firm-level analysis

**Paper type** Research paper

### Introduction

High competition on the national and international markets, changes in the size structure of firms, reallocation of production and distribution, new technological innovations, the importance of information, emphasis on the product quality and differentiation challenge all firms to look for new ways to succeed on the market. Nowadays, firms compete in a global, turbulent and unpredictable environment (Carney et al., 2017 or Jiang et al., 2016), which gives rise to great challenges for entrepreneurs especially in emerging economies that are increasingly moving to market orientation and seeking rapidly advance economically (Bruton et al., 2008). As Anderson and Ronteau (2017) pointed out, the unique circumstances of these economies lie in changing the environment, which is valid particularly for the rapid transitions of economics in Central and Eastern Europe (Welter et al., 2017). Therefore, entrepreneurs have to understand and monitor their performance and factors influencing the growth and profitability, which can be essential elements for understanding the sources of enterprise competitiveness and the source for the implementation of the entrepreneurial strategy (Abdallah, 2017; Bryła, 2017; Wach et al., 2016; Cassia and Colombelli, 2010; Gao et al., 2010; Richard et al., 2009). As emphasized by Karadag (2017), most small and medium-sized enterprises (SMEs) fail due to insufficiencies of financial management, as they do not make use of important challenges with respect to financial and overall performance. There is no doubt that profitability has direct implications on shareholders, potential investors, employees and other interested parties, as investor and managerial perceptions of firm quality are highly related to measures of financial success, as pointed out by Deng et al. (2017), Katchova and Enlow (2013) or Oner Kaya (2015). Namely, McGuire et al. (1990) found out that although firms with high return on assets and low debt-to-asset ratios were considered to be successful, other measures of firm success, such as growth in sales and operating income, were not significantly related to any of the reported qualitative performance indices of quality.

The determinants of an enterprise’s success (measured by profitability and growth indicators) have attracted the attention of numerous researchers investigating financial management in developing and emerging economies (Karadag, 2017; Berko and Damoah, 2013; Newman et al., 2012; Asimakopoulos et al., 2009; Klapper et al., 2002). However, the task to understand the determinants of performance has created a bifurcated view not only from the viewpoint of the difference of these economies from more developed economies, but also due to the fact that they are also considerably different from each other, as stated by Anderson and Ronteau (2017), who pointed out the differences with respect to the dynamic context, i.e. slowly emerging economies in Africa versus rapid transition economies in Eastern Europe. Our study strives to contribute to the literature on this subject with empirical evidence from the Czech Republic as an emerging economy, which has undergone significant positive and negative changes during past decades. The transformation processes of transition from a centrally planned economy to a market economy after 1989 (i.e. privatization, liberalization of prices and foreign trade and introduction of internal convertibility of the currency) have led to the creation of a new organizational, institutional
and legal framework for functioning of the entrepreneurial environment with an attempt to achieve real convergence with the Western Europe. Integration of the Czech economy into the European Union (EU) has intensified competition, forced entrepreneurs to operate more efficiently and innovatively and facilitated an influx of ideas and know-how, which allowed for economic growth, on the one hand, but greater demands on entrepreneurs in terms of technological capabilities and managerial skills, on the other hand.

Despite the interest of researchers on understanding factors that determine financial performance of enterprises over time, the food processing industry has received limited interest from empirical analysts (Čechura and Hockmann, 2010; Syrovátka, 2015; Blažková and Dvouletý, 2018; Adamisin et al., 2017; Tomšák et al., 2016), which is emphasized, e.g., by Hirsch and Schiefer (2016), who analysed the firm profitability variation in the European food industry and pointed out that analysis of the food industry’s profitability in the countries of the eastern area of the EU would be worthwhile. As the firm-level research is regarded to be one of the preconditions for successful socio-economic development of every economy (Berko and Damoah, 2013; Coca and Alberti, 2010), we have collected data for 1,804 enterprises for the years 2003-2014 and conducted empirical regression analysis based on 10,509 observations to investigate firm-specific factors of entrepreneurial success within the Czech food processing industry as a response to scholars’ call for more empirical evidence on the micro-level entrepreneurship research in emerging and transition countries (Wadhwa et al., 2017; Borozan et al., 2017; Anderson and Starnawska, 2008; Davidson and Wiklund, 2007).

Estimating the determinants of firm profitability of the Czech food processing firms is challenging for more reasons. Generally, the food processing industry plays a crucial role in the nation due to the affordable supply of food products. In this regard, the link between food processing, national economy and diet is straightforward, as emphasized by Tong et al. (2016). The economic and social significance of this sector is confirmed also by the share on value added of the whole Czech manufacturing sector, i.e. 8.3 per cent in 2015; on turnover, i.e. 8.3 per cent in 2015; and on employment, i.e. 9.3 per cent (Czech Statistical Office, 2017). Moreover, the food industry with its costs, efficiency and quality of production is one of the decisive factors in creating the conditions for the use of agricultural production on domestic and foreign markets. With respect to its share on value added within the food commodity chain, its impact on employment and related development of regions, the efficiency and profitability of the food industry significantly influence the competitiveness of the whole agri-food sector and, as pointed out by Zouaghi et al. (2016), can be regarded as a relevant factor of continuous economic growth (Ujwary-Gil, 2007). And finally, the research studies conducted within the agribusiness sector based on large microdata sets are rare, as most studies are focused on the whole manufacturing sector or other economic sectors. Moreover, due to the poor accessibility of financial data for small firms, most studies exclude them, which is not acceptable in the case of the food industry, where small firms are represented in large numbers (small enterprises with 0-19 persons employed account for 49 per cent of observations in our sample).

Our study aims to explain the effect of firm-specific factors on the entrepreneurial success of food processing firms operating in the Czech Republic. A constructed micro-panel obtained from the corporate database Albertina – Gold Edition (Bisnode, 2016) was analysed econometrically. Estimated regression models with both-way fixed effects were used to quantify the determinants of the financial performance, operationalized through three key performance indicators (KPIs) – price–cost margin (PCM), return on assets (ROA) and return on equity (ROE). Working with these three measures of financial performance ensures the consistency and robustness of the presented results. Our research is designed to
test two main hypotheses determined for investigating the impact of indebtedness and productivity on firm performance, as in the context of the Czech food market development, these characteristics seem to be crucial for the entrepreneurial success. The second purpose of the analysis is to map the whole industry and reveal which sectors are more economically profitable and which are in terms of selected indicators reporting worse economic results. We believe that our study has also important methodological implications to the research on enterprise performance determinants through working with more performance indicators, giving us consistent results across these indicators. Moreover, even though we apply the micro-level observation, we also look into the sub-sector performance. Therefore, our study can be considered as extensive not only from the perspective of the research in the Czech Republic but also from the international perspective.

The findings of the presented research are important for investors considering agribusiness as a part of their investment portfolios and for policymakers to enhance the economic efficiency of the food industry through regulations and public support, and particularly, from the management viewpoint, the identification of the factors that most substantially contribute to the entrepreneurial success would enable agribusiness entrepreneurs to focus their attention on influential factors rather than peripheral ones.

The paper is structured conventionally into five sections. In the first section, we provide readers with a contextual development of the Czech entrepreneurial environment and the Czech agribusiness. In the second section, we review the existing theoretical approaches and we develop tested hypotheses. The third section introduces the collected micro-data data, variables and empirical approach. In the fourth section, empirical results are presented and discussed in the light of the existing studies and theories. Finally, in the concluding sections, final remarks, conclusions and recommendations for both practitioners and scholars are stated.

Food industry in the context of the development of the Czech entrepreneurial environment

The socialist economy, which functioned in the Czech Republic before 1989, was governed by central planning with an emphasis on the development of industrial production. However, the growth of industrial production has been achieved uneconomically, with increased consumption of raw materials, energy and a high level of capital investment, but labour productivity or technological progress has been insufficient (Kopačka, 2004). As a result of the centrally planned economy, the Czech entrepreneurship environment was characterized by a minimal existence of private ownership, significant over-employment and low labour productivity, an inability of enterprises to adequately respond to changes in the world economy and underdevelopment in technological development and technology (Židek, 2006). This economic environment negatively influenced the structure of enterprises in the industry, as SMEs were missing and economic activity was concentrated in large state enterprises. The environment for entrepreneurship has radically changed in the 1990s due to the transformation processes, as mentioned above.

The processing capacity of the Czech food industry before 1989 was concentrated in 12 manufacturing units according to the type of raw material processed and the products produced (Homolka, 1995). During the 1990s, these units were divided into about 250 state-owned enterprises, which were included in the two-wave privatization process, i.e. in 1992 and 1994. At the end of 1994, 98 per cent of these state enterprises were privatized, creating over 550 SMEs (Ministry of Agriculture of the Czech Republic, 1998). Besides, new food producers have arisen not only due to the general boom of entrepreneurial activity in the Czech Republic in the early 1990s, as reported by Lukeš (2017) and Dvouletý (2017a), but
also on the initiative of primary production. For instance, the number of enterprises in the Czech food and beverages industry increased from 5,644 in 1996 to 6,212 in 2006 (European Commission, 2018). According to the Czech Statistical Office (Czech Statistical Office, 2018), in 2015, there were 9,251 active enterprises in the Czech food and beverages industry; nevertheless, the process of disintegration in this sector has already finished and, on the contrary, the process of gradual concentration is evident in all sectors of the food industry (Blažková, 2016).

An important milestone, with which the food industry enterprises had to cope during the transformation process, was the elimination of the negative turnover tax, which constituted a state subsidy for consumer food prices. Food prices increased (together with the increase of prices of other consumable goods), which led to the reduced consumption of population followed by a gradual reduction of food production (Mezera and Dvořák, 1995). Moreover, as noted by Homolka (1995), increased imports from abroad and a decline in exports, which was not possible for many commodities without support, also contributed to the reduction of the Czech food production. A further decline in the capacity of the Czech food industry is largely related to the development of the volume of agricultural production in the Czech Republic (for details, see Becvářová et al., 2009 or Urbancová, 2018).

Although the capacities of the Czech food industry were sufficient at the beginning of the transformation, the overall technical and technological level of the industry was not high, which did not allow the raw material to be processed quickly, in good quality and in the necessary diversity. To change this situation, a considerable amount of funds was needed for reconstruction and modernization, which led to a rise in indebtedness (Mezera and Dvořák, 1995) – the problem of high indebtedness of enterprises in the Czech food industry has persisted to the present (the average debt-to-equity ratio during 2003-2015 was 4.36, as seen in Table II).

At present, the key players on the food markets are large multinational corporations (Blažková, 2016), which can easily succeed on the global competitive markets than small local enterprises due to the better bargaining position, pricing policies and meeting the legislation regarding food safety and quality (Daniels, 2008). Therefore, the growing concentration in the Czech food industry is a result not only of increasing pressure to higher efficiency due to global competition but also due to the changes in the competitive structure within the commodity chain after the entry of large multinational chains into the Czech retail market (Blažková and Dvouletý, 2018). These structural processes reshaped the Czech agribusiness environment with a crucial impact on the enterprises in the food industry, which have experienced the increased market power of retail as their customer with a dominant position and higher bargaining power (Sexton, 2013). Therefore, identifying the key factors of business success and quality financial management can be considered as prerequisites for the higher competitiveness of the Czech entrepreneurs in this industry with indisputable economic and social impacts on regional development.

Literature review and tested hypotheses
Factors of firm performance from the viewpoint of theoretical approaches
There are two competing theories of explanations of performance variations – from the viewpoint of industry-specific factors (known as the “competitive forces approach”) and from the viewpoint of firm-specific factors (known as the “resource-based view”), as stated, e.g., by Galbreath and Galvin (2008).

The beginnings of the interest in industry structure and industry factors as explanatory variables of performance variations are linked to the industrial organization economists who studied the structure–conduct–performance paradigm (Bain, 1968). A crucial contribution to
the theory that industry characteristics are key to explaining firm performance variation has been given by Porter (1980), who described five structural forces determining the industry attractiveness, which enables firms that manage to position themselves in this attractive industry to achieve long-term profitability. In contrast to this approach, the “resource-based view” advocates internal factors as drivers of firm performance and expect the industry characteristics to have little explanatory power for profitability variations, which is believed to be related to the firm resources. According to Wernerfelt (1984), a resource can be anything that could be thought of as a strength or weakness. Hirsch et al. (2014) stated that the use of tangible and intangible resources that are scarce and costly to copy is the cause of higher profitability.

Considerable research has been done to examine the importance of firm-specific and industry-specific factors in relation to the performance variability (Rumelt, 1991; McGahan and Porter, 1997; Schumacher and Boland, 2005; Lin et al., 2014; Blažková and Dvouletý, 2018), which resulted in the general finding that the effects of firm-specific factors on firm performance variability have been discovered to be more important than industry-specific effects. Our paper is based on these findings that were confirmed also by a previously published research study conducted by Blažková and Dvouletý (2018) in the Czech food processing industry. Therefore, we realize the necessity to investigate the firm-specific factors of firm performance in the agribusiness sector more in detail. Many firm-specific factors responsible for firm performance have been studied yet (Barbosa and Louri, 2005; Chandrapala and Knápková, 2013; Chaddad and Mondelli, 2013; Sauka, 2014; Daher and Le Saout, 2015; Kocsis and Major, 2018); however, the results are not always unequivocal, as can be seen in past research results.

Firm-specific factors and firm performance

In the light of the Czech food market development described above, the major issues that the food enterprises had to face were lower productivity and efficiency together with high indebtedness related both to the necessity of modernizing technological equipment and compliance to the legislative standards and quality requirements and to the insufficiencies in the conduct of financial management. Therefore, the main objective of this study is to examine the capital structure and productivity as a key firm-specific factor determining the entrepreneurial success in this industry.

The relationship between capital structure and firm performance has become a subject of extensive research (Hyder and Lussier, 2016; Daher and Le Saout, 2015; Sivathaasan et al., 2013; Frank and Goyal, 2009; Goddard et al., 2005); however, there is no universal theory explaining capital structure decisions, as noted by Taddese Lemma and Negash (2013). Moreover, the conditions of capital structure decision-making differ between advanced and emerging economies, as highlighted by Taddese Lemma and Negash (2013), Eldomiaty (2008) and Glen and Singh (2004). As environmental differences affecting the capital structure decisions are considered relatively inefficient markets, high information asymmetry and different financial arrangements in emerging economies compared with their advanced counterparts (Eldomiaty, 2008). In general, the risk theory suggests that firms with higher risk should on average achieve higher profits (Roeser, 2012; Tsai and Luan, 2016). Agency theory also suggests that the financial pressure of debt reduces free cash flow, leading managers to invest more wisely and not to waste firm resources in perquisites and unprofitable growth. As the debt level increases, the possibility of bankruptcy poses a threat to managers in terms of job loss and lower reputation. These theoretical assumptions have been empirically proven, e.g., by Goddard et al. (2005), Daher and Le Saout (2015) and Sivathaasan et al. (2013). However, in contradiction with risk
theory, a negative relationship has been observed between risk and profit level, known within the strategic management literature as the Bowman “risk-return paradox”, as mentioned by Hirsch et al. (2014). Higher indebtedness causes risk to the firm to grow due to the possible troubles with paying of interests and the increased probability of financial distress (Frank and Goyal, 2009). This is more likely in the market environment of the Czech food industry as a result of the above-mentioned changes during the transformation process. The negative effect of high risk on profitability was estimated by Chhibber and Majumdar (1999) in the Indian economy; Chaddad and Mondelli (2013) in processing, wholesale and retail sector of the US food economy; Asimakopoulos et al. (2009) in the Greek economy; and Hirsch et al. (2014) in the EU food processing industry. Thus, to investigate the relationship between firm indebtedness and its performance, the hypothesis is formulated as follows:

**H1.** There is a negative relationship between debts and loans in the capital structure of the firms and their profitability.

Among internal factors of profitability in the Czech food industry, productivity should be included also, which measures the efficiency of production and is influenced by the initiatives taken at the firm level (Mahmood, 2008). It is understood as a key factor of firm performance due to its positive impacts on cost (Berko and Damoah, 2013; Špička and Machek, 2015). As emphasized by Jorgenson et al. (2014), the productivity can be seen as the economic indicator of innovations that are nowadays of interest to economists and managers (Lefebvre et al., 2015). The successful introduction of new products and processes, organizational structures and systems generates growth of output that exceeds the growth of inputs, which implies the increase in productivity and, thus, income growth. In recent years, enterprises in the food processing industry have faced severe competition due to the increasing concentration within the commodity chain and globalization of the industry (Blažková, 2016), which has forced them to reorganize and to target a higher level of productivity by keeping a steady labour force and increasing overall output. To examine whether the improvements in productivity benefit firm profits, the productivity indicators should be included in the analysis of the firm-specific factors of profitability, as investigated by Athanasoglou et al. (2005), Stierwald (2009) and Berko and Damoah (2013), who confirmed the positive impact of increased labour productivity on profitability. Based on the assumption that improvements in productivity increase firm performance, the relationship between productivity variables and firm profitability is hypothesized as follows:

**H2.** There is a positive relationship between productivity of the firms and their profitability.

Due to the specific development of the Czech food market during the transformation and the subsequent periods, including the accession to the EU, we believe the firm size and age to be important and appropriate success factors for enterprises in the Czech food industry. Therefore, they are included as control variables in our study.

**Firm size** determines the economies of scale and also the effects of differences in technology and investment opportunities. The empirical findings about the impact of the firm size on profitability are mixed. Most of the previous studies find a positive impact of the firm size on profitability (Chhibber and Majumdar, 1999; Hirsch and Gschwandtner, 2013; Hirsch et al., 2014); however, there is also evidence for the inefficiency of large firms due to the diseconomies of scale (Goddard et al., 2005). Large firms are expected to respond quickly to changes in the market conditions compared with small ones, to diversify the risks, to employ more qualified labour power and, in particular, to benefit from the economies of
scale. Given the fact that price competition is usually the dominant competition strategy among food processors, it seems to be crucial for the firms in the food industry to achieve economies of scale through the sufficient firm size, as pointed out by Hirsch et al. (2014). As noted by Berko and Damoah (2013), large firms are more likely to invest in new technologies and equipment than smaller firms because they have resources to acquire them. And due to higher resource capacity, they are usually more prone to risk and to absorb competitive pressure. Moreover, a better bargaining position of large food firms can be expected in relation to the highly concentrated subsequent stage of the commodity vertical, i.e. retail (Blažková, 2016), which may influence the probability of large firms in the Czech food industry. And finally, another argument for the higher profitability of large food enterprises emerges after joining the EU, i.e. the administrative burdens within the complex EU legislation regarding food safety, additives, packaging and labelling, which put heavier administrative burdens on smaller firms than on larger firms. Based on the above-mentioned context, we assume a positive impact of the firm size on its profitability in the Czech food industry.

There is an evidence about the importance of the firm age as an explanatory variable when assessing the impact of firm-specific factors on profitability. The economic literature on this topic (Arrow, 1962; Dunne et al., 1989; Ericson and Pakes, 1995; Majocchi et al., 2005; Karadag, 2017) usually states that costs will decrease with ageing due to experiences and learning by doing effects leading to higher profits for more mature firms, which would lead to a positive relationship between the firm age and profitability. As stated by Demeter and Szász (2016), the competence building requires time; thus, it is plausible to assume that firm age is associated with knowledge accumulated by firms, which may cause higher returns. On the other hand, depending on the increase in the age of the firm, the company may lose its flexibility and meet problems in harmonization with the rapidly changing environment, as stated by Sørensen and Stuart (2000). Hirsch et al. (2014) showed that a negative relationship between firm age and profitability can occur if the firm ageing is associated with organizational rigidities, obsolete assets and slow growth. In the context of the development of both Czech and the global food market, it can be assumed that young firms in the Czech food industry face greater difficulty and risk of failure. The most obvious reason for this claim is the lack of the reliable network ties, which may imply, e.g., the difficulty in business negotiating or accessing the supplier credit, as noted also by Berko and Damoah (2013). Based on these arguments, we assume the positive impact of firm ageing on profitability in our study.

Data and methods

Data
Database Albertina – Gold Edition compiled by Bisnode (2016) was used as the data source. We defined the industry membership along with the three-digit CZ-NACE level and considered all firms with main activities in any official CZ-NACE food and beverages industry (i.e. ten categories between CZ-NACE 101 and CZ-NACE 110[1]). Our total initial sample consisted of 13,667 observations of yearly individual annual balance sheets and reports of businesses operating in the food and beverages industry in the Czech Republic in particular between 2003 and 2014. Analysis of descriptive statistics revealed some missing data for used variables (1,249 observations), bankrupted firms (89 observations) and 197 enterprises that changed industries (identified by their primary CZ-NACE code) during the observation period. Further extreme values have been controlled and removed from the analysis to make sure that our results are unbiased due to outliers, hence 1,299 enterprises for having a negative value of assets and/or equity, and 324 outlier observations when the
dependent variable (ROA, ROE or PCM) exceeded the 95th percentile or was below the 5th percentile of the sample distribution. These steps yielded a final sample of 10,509 observations across 12 years and 1,804 enterprises used in the following analyses.

Definition of variables and stationarity

The profitability variable acting as the dependent variable is represented by the three alternative measures: ROA, ROE and PCM. Generally, ROA measures the firm’s management ability to generate profits from the firm’s assets; however, this indicator may be biased due to off-balance-sheet activities; ROE reflects the return to shareholders on their equity; and PCM measures total production after subtraction of variable costs against the total production, and on the basis of the relationship between price and costs, it enables to compare firm performance within different firms and products (Megginson et al., 2008).

We selected the determinants mainly in the context of the entrepreneurial environment on the Czech food market and considered profitability as a function of internal firm-specific factors regarded as crucial. Six independent variables were tested in the paper to determine the firm-specific factors that affect the profitability of food processing companies in the Czech Republic. A variable characterizing the capital structure and two proxies for productivity were used to test H1 and H2, and firm size, firm age and a dummy variable representing a new firm were included as control variables. All variables used in the analysis were selected taking into account the availability of data and relying on relevant theory and literature. Table I shows the list of all variables, their calculations and expected sign in models.

To test H1, the variable LONG_RISK is included in models representing indebtedness of food enterprises. Indebtedness can be measured by using different financial ratios; in our study, it is operationalized by the ratio of total debt to total equity, as used by Ross et al.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Expected sign</th>
</tr>
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<tbody>
<tr>
<td>PCM</td>
<td>Value Added – Labour Cost × 100</td>
<td></td>
</tr>
<tr>
<td>ROA</td>
<td>EBIT × 100</td>
<td></td>
</tr>
<tr>
<td>ROE</td>
<td>EAT × 100</td>
<td></td>
</tr>
<tr>
<td>LONG_RISK</td>
<td>Total Liabilities</td>
<td>–</td>
</tr>
<tr>
<td>LABOUR_PROD</td>
<td>Value Added × Number of Employees</td>
<td>+</td>
</tr>
<tr>
<td>PERCOST_S</td>
<td>Labour Cost × Sales</td>
<td>–</td>
</tr>
<tr>
<td>LOG(TA)</td>
<td>Logarithm of Total Assets</td>
<td>+</td>
</tr>
<tr>
<td>AGE</td>
<td>Number of years during which the firm has been operating in the Czech food industry</td>
<td>+</td>
</tr>
<tr>
<td>NEW_FIRM</td>
<td>Dummy variable that takes the value 1 for firms no older than one year and the value 0 for the other firms</td>
<td>–</td>
</tr>
</tbody>
</table>

Table I.

List of variables
As high indebtedness is one of the long-term issues over the past decades in the Czech food industry, it is expected to have a negative effect on firm profitability.

Two proxies for productivity were constructed as independent variables – labour productivity \((LABOUR\_PROD)\) and personal cost per sales \((PERCOST\_S)\) – to test \(H2\). Variance inflation factors tests and correlation matrices reported a high level of collinearity between the labour productivity \((LABOUR\_PROD)\) and personal cost per sales \((PERCOST\_S)\); therefore, these variables, operationalizing the same determinant – productivity, were put into the regression models separately. Labour productivity is expected to have a positive impact on profitability, as higher labour productivity means the 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 sales, the negative relationship with the profitability variables follows from the general economic theory.

In the context of market conditions in the Czech food industry, i.e. competitive structure within the commodity chain and the transformation processes mentioned above, firm size and firm age are expected to be significant factors with a positive impact on profitability. Firm size is represented by the \(\log(TA)\) variable, measured as a logarithm of total assets, as the logarithmic transformation helps to stabilize the variance of the variable (Verbeek, 2012). The age of the firm \((AGE)\) is expected to have a positive impact on the profitability of the Czech food enterprises due to the learning and experiences, which usually leads to the decrease in costs and thus higher returns (Ericson and Pakes, 1995). We use another variable related to the firm age to control the effect of firm ageing on profitability – the dummy variable representing a new firm \((NEW\_FIRM)\). As the start-up firms usually have to survive the first years of their business with lower returns and there is the highest mortality of start-up firms in the first years of their business (Blažková and Chmelíková, 2016), we expect negative coefficients of this variable in models.

As a high level of collinearity between the productivity variables \((LABOUR\_PROD, \text{ resp. } PERCOST\_S)\) and the firm size variable \((\log(TA))\) has been observed, we had to estimate separate models involving only one of these variables. We estimated six basic models (Models 1 to 6) with the productivity variables, i.e. \(LABOUR\_PROD, \text{ resp. } PERCOST\_S\), to determine the effects of the main firm-specific factors, i.e. productivity and indebtedness, on profitability, and as control models, we estimated models with the firm size variable (Models 7 to 9).

Table II reports the descriptive statistics for all variables used in the regression analysis. Despite the extreme values removal, the profitability variables \((PCM, ROA \text{ and } ROE)\) of

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Mean</th>
<th>Median</th>
<th>Maximum</th>
<th>Minimum</th>
<th>SD</th>
<th>Obs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCM</td>
<td>5.16</td>
<td>5.60</td>
<td>176.48</td>
<td>−548.17</td>
<td>33.20</td>
<td>10,509</td>
</tr>
<tr>
<td>ROA</td>
<td>5.85</td>
<td>4.06</td>
<td>517.65</td>
<td>−420.00</td>
<td>19.16</td>
<td>10,509</td>
</tr>
<tr>
<td>ROE</td>
<td>7.84</td>
<td>7.30</td>
<td>546.49</td>
<td>−544.44</td>
<td>60.32</td>
<td>10,509</td>
</tr>
<tr>
<td>LONG_RISK</td>
<td>4.36</td>
<td>1.31</td>
<td>39.53</td>
<td>0.00</td>
<td>15.01</td>
<td>10,509</td>
</tr>
<tr>
<td>LABOUR_PROD</td>
<td>540.16</td>
<td>298.01</td>
<td>26323.33</td>
<td>−6265.03</td>
<td>1194.52</td>
<td>10,509</td>
</tr>
<tr>
<td>PERCOST_S</td>
<td>17.78</td>
<td>13.49</td>
<td>537.50</td>
<td>0.00</td>
<td>5.92</td>
<td>10,509</td>
</tr>
<tr>
<td>(\log(TA))</td>
<td>220170.40</td>
<td>28474.00</td>
<td>33100294.00</td>
<td>20.00</td>
<td>9210838.60</td>
<td>10,509</td>
</tr>
<tr>
<td>AGE</td>
<td>12.11</td>
<td>12.59</td>
<td>42.00</td>
<td>0.17</td>
<td>5.92</td>
<td>10,509</td>
</tr>
<tr>
<td>NEW_FIRM</td>
<td>0.01</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>0.08</td>
<td>10,509</td>
</tr>
</tbody>
</table>

Source: EViews, authors’ elaboration

Table II. Descriptive statistics
food processing firms in the Czech Republic varied considerably across the firms and over the study period. The average values of PCM, ROA and ROE indicate positive profitability; nonetheless, there are substantial differences among particular firms, as seen in Table II—e.g. PCM with a mean of 5.16 per cent reaches values from −548.17 per cent to 176.48 per cent, which follows from the use of microdata instead of sectors’ averages. The high heterogeneity of microdata is confirmed also by descriptive statistics of other variables; it is noteworthy that this is something common in microeconometrics. Our analysis includes also very small enterprises, which are in the Czech food industry operating in large numbers—as obvious from the high standard deviation of the size variable LOG(TA). The mean of the LONG_RISK variable (4.36) shows high debt-to-equity ratio, as well as the median (1.31), confirming high indebtedness of the Czech food processing firms over the analysed period.

All presented variables in our unbalanced panel of the Czech food and beverages firms for the period 2003-2014 had to be tested for stationarity to make sure that our estimates would not end up as a spurious regression (Verbeek, 2012). 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 9, which has integrated the Levin, Lin and Chu unit root test for the panel data (Levin et al., 2002). On at least 10 per cent level of statistical significance, we were able to conclude that our variables are stationary, and therefore, we are able to proceed towards estimation of regression models. However, for the sake of robustness of our findings, we also include in our analysis year dummies.

**Empirical approach and estimation of regression models**

The regression models were estimated in the software EViews 9 on the stationary variables. As Baltagi (2016) or Verbeek (2012) remarks, we need to deal with time heterogeneity and heterogeneity across all firms, which led to a conclusion that the pooled ordinary least-squares estimator is not suitable for our purpose. As for the estimation technique dealing with unobserved heterogeneity, used also by previous researchers in the field (Cool and Henderson, 1998; Chandrapala and Knápková, 2013; Daher and Le Saout, 2015), one can use random-effects or fixed-effects estimators. Based on panel diagnostic test of redundancy of the fixed effects and the Hausman test, we have decided to use as an estimation technique both-way fixed effects controlling for variety over the time and across enterprises, as used by Anderson and Reeb (2003), who estimated firm performance determinants across 403 firms over eight years. Usage of both sets of dummies also increases stability and robustness of presented estimates.

All econometric models were estimated with White diagonal standard errors and covariance (df corrected) that are robust against the consequences of heteroscedasticity and autocorrelation often present in large samples as we deal with. As discussed before, several variables indicated issues with multicollinearity, and therefore, some models with highly correlated variables had to be estimated separately. Level of collinearity among explanatory variables was controlled via the variance inflation factor (VIF test) and correlation matrices. No multicollinearity has been detected in finally presented estimates. One statistical limitation comes from the violated assumption of non-normally distributed residuals and therefore we have to be cautious when generalizing our results to other populations. However, econometric assumptions of presented models were fulfilled (Verbeek, 2012).

Statistical verification of the models has been done through the F-test indicating statistical significance of the models and t-tests testing the statistical significance of individual variables. All estimated models were found to be statistically significant at least at 5 per cent level of statistical significance. Statistical significance of individual variables is indicated in the model tables. Non-significant variables were kept in the models because
they increased the explained variance of the dependent variables in the models. The \( R^2 \) test reports that our model fits are relatively good and satisfactory for interpretation.

To empirically determine the significant factors of profitability, we estimated the following econometric models. All models were estimated with the fixed-effects estimator, and the results are presented in Tables III and IV.

**Results and discussion**

All models were estimated for a measure of financial performance using three indicators of profitability, i.e. \( PCM \), \( ROA \) and \( ROE \), as the dependent variables. Table III confirms the significance of factors included in Models 1 to 6 in most cases, and the exceptions with statistically insignificant results have at any rate the same signs in all models. Table IV presents the coefficients for independent variables in control models considering the firm size (\( \log(TA) \)) variable instead of the productivity variables (\( LABOUR\_PROD \), resp. \( PERCOST\_S \)).

Table III reports statistically significant coefficients for the \( LONG\_RISK \) variable for all six main models, i.e. Model 1 to 6, except for the Model 4. In control models in Table IV, the statistical significance of the variable representing indebtedness of the Czech food enterprises was also confirmed. The effect of the debt-to-equity ratio on the firm \( PCM \), \( ROA \) and \( ROE \) is negative, which is in line with our expectations, and means the negative effect of financial leverage on food processing firms’ profitability. The excess debts increased the financial distress costs and decreased the profitability of Czech food processing enterprises in the period of 2003-2014. Additionally, a large part of earnings had to be used to cover interest payments, which implies fewer funds available for reinvestment, affecting the growth opportunities of firms and their performance in the long term, as confirmed also by Asimakopoulos et al. (2009) in the Greek economy. Therefore, we have to conclude that our first hypothesis (\( H1 \)) is statistically supported, as based on our empirical analysis, an increase in debts and loans in the capital structure of enterprises in the Czech food industry affected the profitability of these firms negatively during the analysed period of 2003-2014. This result is in contradiction with the general risk theory (Roeser, 2012) but shows that high leverage of enterprises worsens the position of these enterprises in increasingly competitive markets, as they need to use a higher proportion of gross profits to service debt, as affirmed by Goddard et al. (2005) and Chaddad and Mondelli (2013). The significant negative impact of debt-to-equity ratio was observed also in the EU food industry by Hirsch et al. (2014), who attributed the result to Bowman’s “risk-return paradox”; in the Greek economy by Asimakopoulos et al. (2009) and Papadogonas (2006); and in the Czech business environment by Chandrapala and Knápková (2013), who see the problem in financial distress costs leading to the decline in the value of the firm.

To investigate the effect of productivity on the firm profitability, two proxies characterizing productivity were used in the main models, i.e. labour productivity (\( LABOUR\_PROD \)) in Models 1, 2 and 3 and personal cost per sales (\( PERCOST\_S \)) in Models 4, 5 and 6 (see Table III). All coefficients (except for \( LABOUR\_PROD \) in Model 3) were found to be statistically significant, and as expected, the coefficient was positive in the case of labour productivity and negative in the case of personal cost per sales, supporting our second hypothesis (\( H2 \)), assuming the positive impact of productivity on firm profitability. The statistically insignificant finding in Model 3 can be explained as a result of the different conception of particular profitability measures – the \( ROE \) indicator measures the return on shareholders’ equity and, following from the structure of this ratio, even low-profit firms may achieve high \( ROE \) when their equity is low. In view of the fact that the Czech food
### Table III.
Model table – the determinants of firm profitability

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
<th>Model 7</th>
<th>Model 8</th>
<th>Model 9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PCM (ROA)</td>
<td>PCM (ROA)</td>
<td>PCM (ROA)</td>
<td>PCM (ROA)</td>
<td>PCM (ROA)</td>
<td>PCM (ROA)</td>
</tr>
<tr>
<td><strong>LAVOR_PROD</strong></td>
<td>0.00069*** (0.00023)</td>
<td>9.39E-05* (5.66E-05)</td>
<td>0.000213 (0.000207)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PERCOST_S</strong></td>
<td>1.02053*** (0.088124)</td>
<td>0.12898*** (0.035092)</td>
<td>0.37508*** (0.092547)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NEW_FIRM</strong></td>
<td>-20.1836*** (6.924712)</td>
<td>-7.049565* (4.033118)</td>
<td>-0.681868 (10.11250)</td>
<td>-22.90019*** (7.115500)</td>
<td>-7.416630* (4.045324)</td>
<td>-1.644497 (10.13057)</td>
</tr>
<tr>
<td><strong>LONG_RISK</strong></td>
<td>-0.033443* (0.019939)</td>
<td>-0.07473*** (0.014544)</td>
<td>-0.442602** (0.192188)</td>
<td>-0.019066 (0.018835)</td>
<td>-0.072977*** (0.014237)</td>
<td>-0.437257** (0.191320)</td>
</tr>
<tr>
<td><strong>CONSTANT</strong></td>
<td>-237.6045 (148.8176)</td>
<td>-120.3308 (83.62847)</td>
<td>-603.6026*** (196.2766)</td>
<td>-382.2763*** (191.9036)</td>
<td>-139.8887* (82.42738)</td>
<td>-649.6715*** (191.3807)</td>
</tr>
<tr>
<td><strong>YEAR EFFECTS</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>FIRM EFFECTS</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>R-squared</strong></td>
<td>0.573247</td>
<td>0.525377</td>
<td>0.42123</td>
<td>0.669097</td>
<td>0.529949</td>
<td>0.425081</td>
</tr>
<tr>
<td><strong>Adj. R-squared</strong></td>
<td>0.483968</td>
<td>0.426082</td>
<td>0.300018</td>
<td>0.599870</td>
<td>0.431611</td>
<td>0.304804</td>
</tr>
<tr>
<td><strong>F-statistic</strong></td>
<td>6.420836</td>
<td>5.291117</td>
<td>3.477352</td>
<td>9.663255</td>
<td>5.388080</td>
<td>3.334191</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>10,509</td>
<td>10,509</td>
<td>10,509</td>
<td>10,509</td>
<td>10,509</td>
<td>10,509</td>
</tr>
</tbody>
</table>

**Notes:** Standard errors are in parentheses; *** statistical significance at the 1% level; ** statistical significance at the 5% level; * statistical significance at the 10% level.

**Source:** EViews, authors’ elaboration
processing firms use debt to a large extent, as obvious from the values of the debt-to-equity ratio (LONG_RISK) in Table II, the ROE variable is regarded as the least reflective indicator of the overall firm profitability, and thus as the least suitable variable for estimation of the relationship between firm-specific factors and profitability. Our findings are in line with other studies dealing with the effects of productivity on firm performance (Berko and Damoah, 2013; Stierwald, 2009) and also with the theoretical knowledge suggesting productivity to be one of the most influential basic variables governing economic production activities (Pekuri et al., 2011). It could be concluded that productivity improvements bring substantial positive effects on firm performance both in developed and emerging countries, as noted by Bernolak (1997). The increased pressure of global competition forces enterprises to put greater emphasis on productivity improvements, which positively affects firm performance. The issue that may arise in developing or emerging economies is related to the lack of resources, whether skilled workforce or available capital, and to the existence of obsolete technologies – productivity is related to the use and availability of resources and the value creation; therefore, if there is a lack of resources or they are not properly used, the enterprise achieves lower productivity (Bernolak, 1997).

The relationship between the firm age and its profitability was investigated through the AGE variable and the dummy variable NEW_FIRM. Statistical significance of AGE variable was confirmed in almost all models presented in Tables III and IV, except for Model 3. The positive sign of the coefficient for AGE, which is consistent with our assumptions, showed that as the firms in the Czech food processing industry got older in the analysed period, their profitability was observed to grow. The negative sign of the dummy variable NEW_FIRM confirms the worst financial results of start-up firms in the Czech food processing industry, which is in harmony with the research conducted by Blažková and Chmelíková (2016). The significance of the variable NEW_FIRM was confirmed in all models estimating the effect of firm-specific factors on PCM and ROA (Models 1, 2, 4, 5, 7 and 8), and in models with ROE as the dependent variable (Models 3, 6 and 9), the negative sign of the coefficient was found out as well; however, in these models, the NEW_FIRM variable was observed to be statistically insignificant. The explanation of these results is analogous to the above-mentioned explanations related to the different result in Model 3.

### Table IV.
Control model table – the determinants of firm profitability

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent variable</td>
<td>PCM</td>
<td>ROA</td>
<td>ROE</td>
</tr>
<tr>
<td>LOG(TA)</td>
<td>7.131628*** (1.242579)</td>
<td>2.173949*** (0.892486)</td>
<td>3.717721* (2.22967)</td>
</tr>
<tr>
<td>AGE</td>
<td>35.64903*** (8.980467)</td>
<td>13.50381* (7.328326)</td>
<td>56.64614*** (16.73238)</td>
</tr>
<tr>
<td>NEW_FIRM</td>
<td>-19.0614*** (6.807991)</td>
<td>-6.781336* (4.000027)</td>
<td>-0.317807 (10.01555)</td>
</tr>
<tr>
<td>LONG_RISK</td>
<td>-0.048111*** (0.021142)</td>
<td>-0.078705*** (0.015224)</td>
<td>-0.449630*** (0.192848)</td>
</tr>
<tr>
<td>CONSTANT</td>
<td>-499.1080*** (112.3612)</td>
<td>-179.5018*** (89.98138)</td>
<td>-714.0219*** (207.2435)</td>
</tr>
<tr>
<td>YEAR EFFECTS</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>FIRM EFFECTS</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.575906</td>
<td>0.526779</td>
<td>0.421500</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.487183</td>
<td>0.427778</td>
<td>0.300474</td>
</tr>
<tr>
<td>F-statistic</td>
<td>6.491055</td>
<td>5.320654</td>
<td>3.482731</td>
</tr>
<tr>
<td>Observations</td>
<td>10,509</td>
<td>10,509</td>
<td>10,509</td>
</tr>
</tbody>
</table>

**Notes:** Standard errors are in parentheses; *** statistical significance at 1% level; ** statistical significance at 5% level; * statistical significance at 10% level

**Source:** EViews, authors’ elaboration
with ROE as the dependent variable when investigating the productivity effects. PCM is based on value-added and sales, which are usually of very low values in start-up firms, and in the case of value added even negative; therefore, considerably worse financial results (measured by PCM) are observed in the start-ups in comparison with more mature firms. On the contrary, the ROE indicator does not need to be significantly worse in a number of new firms, as it is based on net profit and equity, i.e. even when the accounting net profit is usually low in start-up firms, with the low value of equity, the ratio (ROE) does not need to be considerably worse than for other, older firms, which can be taken as an explanation for the statistical insignificance of the NEW_FIRM variable in the models with ROE as the dependent variable. And finally, ROA assesses the profitability based on all assets; therefore, the results of new firms would be probably worse than those of ROE, i.e. the statistical significance of the NEW_FIRM variable was confirmed in all models with ROA as the dependent variable at least at 10 per cent level of statistical significance. Based on our results, we can confirm a positive relationship between ageing of firms and profitability of Czech food processing enterprises during the period of 2003-2014. When it comes to the firm size impact on profitability, the results in Table IV suggest that the firm size (LOG(TA)) has a significant effect on profitability for all three profitability variables, i.e. PCM, ROA and ROE (Models 7, 8 and 9). The coefficients have a positive sign, which implies that during the analysed period, larger firms in the Czech food processing industry reached higher profitability. In the context of the Czech food market situation, the causes of these findings are straightforward – larger firms may benefit from the size-related advantages, such as the use of economies of scale and scope, raising the capital finance easier, the use of higher diversity of skills within their workforce, better management of risk and, particularly, maintaining a better bargaining position with retailers. Additionally, this result may also imply better adaptation of larger firms to the new macroeconomic environment. These findings confirm the microeconomic theory of economies of scale and correspond also with the previous research conducted in the food industry (Chaddad and Mondelli, 2013; Hirsch et al., 2014) and in emerging markets (Berko and Damoah, 2013; Acquaah and Eshun, 2010; Asimakopoulos et al., 2009; Papadogonas, 2006).

Calculation of the three key firm performance indicators – PCM, ROA and ROE – allowed us to evaluate the overall profitability of particular sectors of the Czech food industry, and to present which sectors are more profitable and which report worse financial results. The comparison and assessment of the Czech food sectors according to the profitability of firms operating in these sectors was made on the basis of the mean and median values of the KPIs that are shown in Table V. For both mean and median of the KPIs, the sectors were lined up from the most profitable to the least profitable sector, and particular sectors were assigned the rankings from 1 to 10 according to the profitability. Thereafter, the average ranking for both mean and median was used for assessing the sector order, as can be found in the last column of Table V.

The best economic results in terms of selected profitability indicators are reported by the sector of manufacture of other food products (CZ-NACE 108), that includes various kinds of food products, e.g. sugar, sweets, cocoa, coffee, tea and especially ready-to-eat meals, which belong mostly to the products with high degree of finalization and high value added. Good financial results are achieved also in the sector of manufacture of bakery and farinaceous products (CZ-NACE 107), which also represents a higher degree of processed production.

The least profitable sector of the Czech food industry was found to be the sector of production, processing, preserving of meat and meat products (CZ-NACE 101), which has been a sector with the largest share on the sales of the entire Czech food industry for a long time (e.g. 22.9 per cent in 2014). This sector is characterized by a large number of very small
processors, a broad range of production, laboriousness and worsening situation of domestic processors owing to the increased imports. Among the least profitable sectors, the sector of processing and preserving of fish and fish products (CZ-NACE 102) and the sector of manufacture of vegetable and animal oils and fats (CZ-NACE 104) can be included. It is proper to mention that the sector CZ-NACE 102 is the least significant food sector in the Czech Republic (the share on the total revenues of the Czech food industry was only 0.7 per cent in 2014), which follows from the geographical location of the Czech Republic. Moreover, only small firms operate in this market, which has a negative impact on their profitability, as confirmed by the above-presented analysis. Unfavourable profitability results of the sector CZ-NACE 104 are probably caused by the fundamental structural change that took place during the analysed period – until 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 the years 2003-2008. The bad financial situation of this company resulted in the bankruptcy of the company and its transformation into new enterprises, which caused sharp fluctuations in the sector profitability and worsening of average sector profitability indicators.

Conclusions
The Czech economy has undergone significant changes over the past decades, such as removing barriers to the free movement of labour and capital, liberalization of all markets, gradual development of the capital market or development and improvement of infrastructure, which led to the new entrepreneurial, institutional and behavioural environment. Openness of the economy raised the expectations of the economic growth, particularly after joining the EU, as “integration can boost productivity by increasing the degree of competition, forcing producers to operate in a more efficient and innovative way,
facilitating also the flow of ideas and managerial know-how to domestic firms”, as stated by Asimakopoulos et al. (2009). However, the development of the market economy also brought about tough challenges that enterprises had to face. In the Czech food industry, i.e. the market under this study, the main challenges were lack of technological capabilities and managerial skills, high corporate indebtedness and disadvantageous market position against retail after the large multinational companies entered the Czech food market.

Therefore, this study aimed to contribute to the empirical investigation of the main firm-specific factors influencing the entrepreneurial success of the Czech food processing firms over the period of 2003-2014. We applied the econometric methodology for the estimation of panel data models on the data set consisting of 10,509 observations and analysing profitability determinants of 1,804 firms. Three profitability indicators, i.e. PCM, ROA and ROE, were used as dependent variables, which enabled us to control the validity of estimations for various profitability measures and to ensure robustness of our findings owing to the consistency of the results across various profitability indicators.

We have found a significant negative relationship between profitability and indebtedness of enterprises – in the observed period of 2003-2014, the increase of the debt-to-equity ratio had a negative impact on profitability, which means that high leverage of firms causes high financial distress costs and worse market position of firms in the competitive environment of the Czech food industry. Also, productivity was confirmed as a significant factor of entrepreneurial success, as enterprises with higher labour productivity achieved higher profitability in the observed period. The development of productivity is important 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 that do not, and therefore they can be more profitable. Important determinants of profitability in the Czech food industry are also firm size and firm age, whose statistical significance, when explaining the firm profitability differences, was confirmed as well. Larger firms reached higher profitability during the analysed period, which points out to evidence of economies of scale in the Czech food processing industry. In the case of firm age, the ageing of firms led to increasing of profitability indicators during the analysed period, where new firms in the industry reached lower profitability.

Analysis of the performance across the CZ-NACE sectors allowed us to rank sectors according to their performance using all three KPIs as a measure. The best economic results in terms of selected profitability indicators were reported by the sector of manufacture of other food products (CZ-NACE 108), that includes various kinds of food products, e.g. sugar, sweets, cocoa, coffee, tea and especially ready-to-eat meals. The least profitable sector of the Czech food industry was found to be the sector of production, processing, preserving of meat and meat products (CZ-NACE 101), which corresponds with the unfavourable position of the Czech meat processors within the commodity chain especially because of the increase of import competition.

We believe that our study has also important methodological implications to the research on enterprise performance determinants through working with more performance indicators, giving us consistent results across these indicators, which ensures the robustness of our findings. Regression models were estimated on a large micro-panel data set with the technique of both-way fixed effects, which guaranteed the control for variety over the time and across enterprises. We also used the micro-data to assess the overall profitability of particular sectors of the Czech food industry.

Based on the results of our study, several managerial implications may lead to higher and sustainable enterprise profitability in this sector. Agribusiness managers should pay
attention to the debt policy owing to the negative impact of high indebtedness on firm profitability and to the productivity factors, which seem to be important drivers of entrepreneurial success. Our findings also inform the policymakers of the economic policy related to the Czech food industry – we suggest that the size of the firm affects the firm profitability, which indicates that assessing the market power and merger approval in the food industry and evaluating the price relations within particular vertical stages, i.e. among farmers, food processors and retail, should be of special attention from antitrust authorities to ensure competition in the agribusiness sectors.

Based on our findings, we recommend for the future research focusing on different types of enterprises, especially with a focus on determinants of performance (both financial and nonfinancial). Upcoming research could also address the role and the effects of entrepreneurship policies (Dvouletý, 2017a; Dvouletý, 2017b; Dvouletý andLukeš, 2016 or Nueth et al., 2011). However, the main problem is the availability of relevant data not only at the firm level but also at the sectoral level, e.g. data on the R&D activities of individual enterprises or particular Czech food industry sectors, employment, advertising expenditures, etc. Data limitations prevented us from considering these variables in this research and remain as a challenge for further research. Combination of administrative and survey data could be a tool recommended for bringing these variables into empirical analysis.

Note

1. 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; 104 Manufacture of vegetable and animal oils and fats; 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.

References


Evidence from the Czech food industry


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