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Performance of Small and Medium-sized Enterprises in the Chemical Industry in the Czech Republic – An Exploratory Analysis

Vojtěch Hrubý, Vojtěch Koráb

Abstract

Purpose of the article: The purpose of this article is to assess the performance of small and medium-sized firms in the chemical industry in the Czech Republic using a selected group of financial indicators with the aim to analyze trends, interdependencies and this segment's specifics.

Methodology/methods: This study employs secondary data from the Amadeus database containing general financial information and business reports on almost 20 million European companies including those in the Czech Republic. General scientific methods such as analysis, comparison or generalization were used.

Scientific aim: Only limited social science research has been done on SMEs in the chemical industry in the Czech Republic. This study aims at shedding new light on the understanding of SMEs' performance in this particular industrial segment.

Findings: There is only a limited number of enterprises in the chemical industry in the Czech Republic falling into the category of SMEs, mainly because the manufacture of chemicals is a capital-intensive business. This study focuses on the financial dimension of the performance measurement with results of SMEs in this segment measurably better than the rest of the manufacturing industry.

Conclusions: This paper adds to the existing research on the performance of SMEs in the Czech Republic by focusing on the chemical industry. It builds on the existing knowledge in the areas of small and medium-sized enterprises, firm performance and chemical industry in the Czech Republic by digging deep into the secondary data obtained from the Amadeus database. The analysis produced the evidence that the performance of the companies in the research sample, represented by a selected set of performance measures, is solid and better than the rest of the manufacturing industry.

Keywords: entrepreneurship, firm performance, SME, Czech Republic

JEL Classification: D10, M50, R10

Introduction

Small and Medium-sized enterprises (SMEs) are arguably the single most important category of enterprises in the majority of world economies, developed and developing alike. Their contribution to the job creation, overall employment and value added is indeed considerable. Across the 28-member states of the European Union, SMEs make up 99.8% of all enterprises, 57.5% of value added and 66.8% of employment. They are a powerful engine of the EU28 economy, just under 23 million of them in 2015 generated 3.9 trillion euro in value added, employing 90 million people (European Commission, Annual report on European SMEs 2015/2016, 2016). SMEs not only drive job creation, economic growth and ensure social stability, but also stimulate innovation and entrepreneurship throughout the EU, which make them crucial for encouraging competitiveness (European Commission, User guide to the SME definition, 2005).

In the increasingly competitive and globalized business world SMEs face a mounting pressure to maintain their competitiveness in order to survive and to succeed (Löfving, Säfsten, Winroth, 2014). Compared to larger enterprises, SMEs are often in much more challenging situations when trying to access finance or invest in new technology, research and innovation. SMEs are confronted with a unique set of issues in the market, *e.g.*: market failures in areas such as finance (venture capital), innovation, research or various forms of regulation. There are also structural barriers such as lack of management and technical skills or a limited knowledge of opportunities for international expansion (European Commission, User guide to the SME definition, 2005). This holds true even more in the light of the fact that the category of today's Small and Medium-sized enterprises is dominated by family businesses employing less than 10 people (Koráb, Hanzelková, Mihalisko, 2008).

It is no surprise that SMEs are frequently in the center of interest of social science scholars. Previous studies have singled out some of the key characteristics of SMEs:

- Sever resource limitations in terms of management and manpower, as well as finance.
- Personalized management.
- Reliance on a small number of customers.
- Operation on limited markets.
- High innovative potential.
- A reactive, fire-fighting mentality.
- Informal, dynamic strategies.
- Flat and flexible organizations (Löfving, Säfsten, Winroth, 2014).

The vast majority of SMEs fall into the category of so called micro enterprises, employing less than 10 employees. Such companies and SMEs in general often rely on a small number of customers and therefore need to be very successful in keeping the customer satisfaction high and in staying flexible enough to respond rapidly to changes in the market (Hudson, Smart, Bourne, 2001).

The central topic of many studies in social science, this paper included, is the firm performance and various factors influencing it. A survey of the entrepreneurship literature conducted by (Murphy, Trailer, Hill, 1996) showed that a wide diversity of measures was relied upon. More than 60% of studies used only one or two dimensions of performance, without justification for selection. Murphy concludes that the use of the generic term "firm performance" is ambiguous, because there are multiple dimensions of what is referred to as performance and the relationship between a given independent variable and performance is likely to depend upon the particular performance measure used. An independent variable can be therefore positively related to one performance measure and negatively related to another.

Chemical industry is an important part of a broader category of the processing industry. Its products can be found in almost all

fields of economy, *e.g.*: rubber and plastics, construction, production of paper and pulp and the auto industry. One third of the chemical production goes into a non-industrial segment represented by agriculture, services, *etc.* Chemical industry in Europe (without pharmacy) employed in 2015 1.2 million people and generated sales of 615 billion euro or 17.4% of the global chemical sales of 3 534 billion euro, 91% of which was generated by TOP 30 world chemical giants (The Czech Chemical Industry Union, 2017). It is obvious that the vast majority of chemical products is manufactured on a large scale in heavy industrial conditions by companies that do not fall into the SME category. On the other hand, there are chemical enterprises that do fit into the category of SME. Such companies have been at least in the Czech Republic at the sidelines of the attention of social science scholars. This uncharted territory of small and medium-sized chemical enterprises in the Czech Republic is the subject of this research paper.

1. Small and Medium-sized Enterprises

Small and Medium-sized enterprises are without doubt the engine of European economy and a major focus of European Commission, striving to promote entrepreneurship and to improve the business environment for SMEs through its policies. Nine out of every ten enterprises are a SME and SMEs generate two out of every three jobs. A key EU executive, the president of the European Commission Jean-Claude Juncker outlined his priorities in the following statement: “SMEs are the backbone of our economy, creating more than 85% of new jobs in Europe and we have to free them from burdensome regulation” (European Commission, Annual report on European SMEs 2015/2016, 2016).

For SMEs are confronted with a unique set of issues, they require assistance that other enterprises do not, The European

Commission explicitly defined SMEs in its Recommendation 2003/361/EC (European Commission, Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (2003/361/EC), 2003) as enterprises, which employ less than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million.

That is the quantitative part of the definition, which also includes an independence criterion in it. To be considered independent, not more than 25 per cent of the company should be owned by another company. For that matter the SME definition distinguishes between three different categories of enterprises: i) autonomous, ii) partner (holdings to other enterprises rise to at least 25% but no more than 50%), iii) linked enterprise (holdings with other enterprises exceed the 50% threshold). One of the key objectives for the precise SME definition is to ensure that support measures developed and operated by the European Commission are granted only to those enterprises that genuinely need them (European Commission, User guide to the SME definition, 2005). From the social science point of view, the characteristics that make SMEs special are indeed more interesting (Löfving, Säfsen, Winroth, 2014).

As (Rosenbusch, Brinckmann, Bausch, 2011) found out in their meta-analysis, most empirical research in the area of SMEs has been carried out in the US, where the SME definition is different. In the US, the definition of an SME varies by industry, based on the North American Industry Classification System (NAICS) developed by the US, Canada and Mexico to standardize the analysis of business statistics. SMEs are mostly defined as having 500 employees or less (applies for example for manufacturing), but in wholesale trades the limit for an SME is often 100 or less and for Nickel and Copper ore mining enterprises the limit can be 1,500 persons or less (USITC, 2010). The broadest definition

of SME offers The Organization for Economic Co-operation and Development (OECD): SMEs are non-subsidiary, independent firms, which employ fewer than a given number of employees (OECD, 2005). It is therefore highly advisable to check the SME definition when comparing results of analyses from different world regions.

The contribution of SMEs to the economy of the developed world is considerable. SMEs make up 99.8% of all enterprises, 57.5% of value added and 66.8% of employment. The employment growth in recent years has been driven by new enterprises rather than existing enterprises hiring workers. The average number of employees per SME have stabilized since 2013 at 4.01 employees per enterprise. SME value added grew at 5.7% in 2015 and the real GDP growth in EU28 was 1.9%, while the Euro area was slightly weaker at 1.5% (European Commission, Annual report on European SMEs 2015/2016, 2016). The number of SMEs in 2015 grew by 1% from the previous year, representing approximately 10 thousand companies. The SME value added in 2015 grew by 6% from the previous year reaching 97% of the 2008 level. SME employment reached 98% of its 2008 level with 26 thousand new jobs in absolute terms.

In the Czech Republic SMEs account for 55% of total value added and 68% of total employment. Medium-sized firms produce the highest share of value added (20%), while micro firms make up the largest share of jobs (32%). Manufacturing is the most important sector for Czech SMEs, accounting for 29% of both SME value added and SME employment. The Czech economy as a whole got back to its 2008 level in 2015, but the total SME value added in 2015 was only 3% below its 2008 level and the overall employment was 2% lower than in 2008. A solid growth in number of persons employed by microenterprises was responsible for absorbing job losses that affected small and medium-sized firms. New business entering

the market in large numbers can be seen responsible for the increased competition and the growing pressure on the incumbents, forcing those with the lowest productivity out of business (European Commission, 2016 SBA Fact Sheet – Czech Republic, 2017).

2. SMEs performance measurement

Countless studies and research papers study and discuss firm performance and its measurement from every possible angle and context. According to (Neely, Gregory, Platts, 1995), performance measurement is the process of quantifying the efficiency and effectiveness of action. Measuring firm performance can help managers make informed decisions based on objective data and assist in aligning goals and daily endeavors for new and long-term goals. Measuring itself has a triggering role for management to take actions. Performance measurement has traditionally concentrated on studying SMEs from traditional performance measurement perspectives, such as production and finances (Saunila, 2017).

(Murphy, Trailer, Hill, 1996) conducted a survey of the entrepreneurship literature from 1987 – 1993 and found out that performance measurement in past entrepreneurship and small business research had been overly simplistic. 60% of studies used only one or two dimensions of performance. The survey authors argue that because there are multiple dimensions of what we refer to as performance, the use of the generic term “firm performance” is actually quite ambiguous. From the SMEs perspective, given the resource and time constraints imposed on SMEs, performance measures should be clearly defined, have an explicit purpose, be relevant and easy to maintain and be simple to understand and use (Hudson, Smart, Bourne, 2001).

There are three dimensions of performance in the model developed by (Venkatraman,

Ramanujam, 1986): 1) financial and operational measures, 2) primary and secondary data sources, and 3) objective and subjective measures of performance. Although financial performance is at the core of the organizational effectiveness domain, financial performance measures are considered necessary, but not sufficient to define overall effectiveness. Operational performance measures, such as product quality and market share, that define a broader conceptualization of organizational performance, need to be considered as well (Murphy, Trailer, Hill, 1996).

Many scholars agree with (Wiklund, The sustainability of the entrepreneurial orientation-performance relationship, 1999) that a measurement scale for SME business performance should have indicators for growth as well as for financial performance. Performance measures based upon (Wiklund, Shepherd, 2005) have gained popularity for their reliability and common use in the literature. They include five indicators to capture business performance: sales growth rate, employee growth, gross margin, profitability and cash flow.

A total of 71 different measures of performance was observed in their survey by (Murphy, Trailer, Hill, 1996). A majority of them was related to one of eight performance dimensions: efficiency, growth, profit, size, liquidity, success/failure, market share, leverage.

(Ipinaiye, Dineen, Lenihan, 2017) argue that SME performance is determined by the firm's inherent characteristics and firm strategy, as well as the external (macroeconomic) environment in which it operates. The firm growth is explained by a combination of firm characteristics, firm strategy and macroeconomic conditions. Turnover and employment growth measure the firm's actual performance and the potential productive capacity. Productivity growth assesses the efficiency of resource use in producing a given level of output. In their assessment of the evolution of SME performance (Rusu,

Roman, 2017) conclude that macroeconomic performance indicators, such as: total tax rate, exports of goods and services and private final consumption are statistically significant and have a strong influence on the SMEs performance. That is in line with (Popa, Ciobanu, 2014), who demonstrated that macroeconomic factors (inflation, unemployment, economic crises, changes in GDP *etc.*) have important influence on the performance of the SMEs, besides the microeconomic factors.

It is unlikely that any single performance measure or dimension could appropriately serve the needs of a diverse set of research questions. The multiple dimensions of performance represent the trade-offs facing a firm. Action undertaken to improve performance on one dimension may well depress performance on another dimension and have no effect on others (Murphy, Trailer, Hill, 1996).

3. Chemical industry in the Czech Republic

The origins of chemical production in the Czech Republic date back to 18th century and the industry maintains strong presence in several regions of the country. Thanks to its long tradition, the chemical industry in the Czech Republic enjoys good reputation and is perceived favorably by local inhabitants and authorities. It accounts approximately for 1% of the whole chemical industry in Europe and together with the pharmaceutical industry is the third most important industrial sector in the Czech Republic in terms of share in the GDP, accounting for 13% of the whole Czech industrial production (Chemical and Pharmaceutical Industry in the Czech Republic, 2010).

World chemicals sales in 2015 reached 3,534 billion euro, with China being the biggest contributor with 1,409 billion euro, NAFTA states 583 billion euro and EU states

519 billion euro (The European Chemical Industry, 2017). In the Czech Republic the whole chemical industry in 2016 produced 470.2 billion CZK in sales, 132.6 billion CZK in added value and employed 123.1 thousand people. Unlike in the most EU states, where the chemical industry is represented only by NACE 20 companies, in the Czech Republic it is often aggregated with pharmaceutical industry (NACE 21) and rubber and plastics industry (NACE 22) (The Czech Chemical Industry Union, 2017). In order to achieve a broader comparability of results, this paper limits the research on NACE 20.

The manufacturing process for most of the basic chemicals often requires large and complex facilities with significant initial investment costs on technological equipment. New entrants to the chemical market may be deterred by exceptionally high start-up costs and government regulations (Chemicals Industry Profile, 2015). The average size of a chemical enterprise according to the number of employees was 151 in 2016, an increase on 2015 (145) (The Czech Chemical Industry Union, 2017).

The Czech and European chemical industries are closely connected, the latter being the third most important sector in the EU. The European chemical industry is, however, slowly losing its dominant position due to strong pressure from fast growing rivals

mainly from China, India and USA (Chemical and Pharmaceutical Industry in the Czech Republic, 2010). One of the contributors to this declining trend is the fact, that the Czech Republic, like most EU countries, has a growing number of legislation, REACH (registration, evaluation, authorization and restrictions of chemicals) being the often-cited example. Compliance increases costs and thereby decreases the likelihood of new entrants (Chemicals Industry Profile, 2015).

4. Analysis of selected performance measures

The data for this analysis were obtained from Amadeus, a database of comparable financial information of public and private companies across Europe. It is a product of Bureau van Dijk, a global provider of business intelligence and company information, part of Moody's Corporation (NYSE: MCO) since 2017. Amadeus is a comprehensive database on around 21 million companies obtained from over 35 expert and local information providers. It contains information on standard financial items (26 balance sheet items, 26 profit and loss account items, 32 standard ratios, up to ten years history), general descriptive information, ownership, new and many more (Amadeus, 2017).

Table 1. Search strategy.

Step No.	Description	Step result	Search result
1	Status: Active companies	20,957,993	20,957,993
2	Region/Country/region in country: Czech Republic	510,466	504,561
3	NACE Rev. 2 (primary codes only): 20 – Manufacture of chemicals and chemical products	47,863	1,031
4	Number of employees: Last available year, min=10, max=249, exclusion of companies with no recent financial data	2,615,706	215
5	Operating revenue (Turnover) (th EUR): Last available year, min=2000, max=50000, exclusion of companies with no recent financial data	920,757	136
6	Total assets (th EUR): Last available year, min=2000, max=43000, exclusion of companies with no recent financial data	1,402,614	107

Source: Amadeus (29. 11. 2017).

The analysis focuses on SMEs in the chemical industry in the Czech Republic. It focuses on a narrow industrial segment specified by NACE code 20, which falls into medium-high tech category and excludes related segments of pharmaceutical industry (NACE 21) and rubber and plastics industry (NACE 22). In line with some authors (Saulila, 2017), it also ignores micro enterprises to ensure better comparability. Applying the selection criteria listed in the Table 1 a research sample containing data on 107 companies was obtained.

The selected firms averaged 85 employees (the smallest in the sample 15, and the largest 225), have been 20 years in operation (min. 3, max. 47) and generated 300 million CZK (min. 38, max. 1,123) in sales. Not all companies in the sample reported a profit for the last available year, with 14 of them generating a negative net income. Applying the logic used by (Rosenbusch, Brinckmann,

Bausch, 2011) that it can take between 1 and 8 years until companies mature and a good cut-off point between young and mature firms is 12 years, there are only 14 young firms with the 93 remaining companies in the mature category. 63 companies were founded in the 1990' in the early years after the change of the centrally planned socialist economy into the liberal one. This is very typical for the whole Visegrad region (CR, SR, HU, PL). The average profit margin in this segment is 8.41% (min. -12.17%, max. 41.76%), similar to ROA using net income of 8.16% (min. -21.35%, max. 55.81%).

Pearson product-moment correlations were performed on the 10 selected performance variables. In total there were 45 intercorrelations, of which 13 were significant at the $p < 0.05$ level. Thus 29% of the correlations are statistically significant. There were 38 positive and 7 negative relationships as show in the Table 2 below.

Table 2. Means, Standard Deviations, and Correlations of Performance Variables.

Variables	Mean	St. Deviation	1	2	3	4	5	6	7	8	9
1 Sales th CZK Last avail. yr	299,734.66	244,481.95									
2 Operating P/L [=EBIT] th CZK Last avail. yr	31,725.54	57,329.91	0.59								
3 P/L for period [=Net income] th CZK Last avail. yr	24,751.60	50,697.82	0.60	0.99							
4 Total assets th CZK Last avail. yr	247,814.16	213,265.00	0.75	0.61	0.63						
5 Profit margin % Last avail. yr	8.41	10.92	0.16	0.72	0.70	0.26					
6 ROE using Net income % Last avail. yr	12.97	21.63	0.21	0.47	0.47	0.05	0.65				
7 ROA using Net income % Last avail. yr	8.16	12.13	0.27	0.72	0.70	0.16	0.88	0.73			
8 Current ratio (x) Last avail. yr	4.43	9.44	-0.14	0.03	0.03	-0.01	0.20	0.00	0.06		
9 Liquidity ratio (x) Last avail. yr	3.12	7.74	-0.11	0.05	0.05	0.03	0.21	0.01	0.07	0.99	
10 Collection period days Last avail. yr	57.65	68.29	0.03	0.09	0.06	0.35	0.10	-0.20	-0.02	-0.06	-0.03

Source: Author's own study.

In order to assess the performance of this group against an independent group of companies a second search in the Amadeus database was performed with the same selection criteria with the exception of step 3. All manufacturing NACE codes except NACE 20 for the chemical industry were selected (NACE 10–19, 21–32). The group of 2 583 companies averaged 100 employees (the smallest in the sample 15, and the largest 225), have also been 20 years in operation (min. 2, max. 73) and generated 238 million CZK (min. 0, max. 1 341) in sales. 342 companies generating a negative net income. There are 362 young firms with the 2221 remaining companies in the mature category. The average profit margin in this segment is 6.30% (min. –76%, max. 86%), similar

to ROA using net income of 6.70% (min. –62%, max. 88%).

5. Conclusion

There were only 107 firms selected as SMEs in the chemical industry in the Czech Republic in the research sample. The number is rather small but not surprising as manufacture of chemicals especially the basic ones is a capital-intensive business and most of this industry's value added is produced in large enterprises. It is supported by the finding that total assets in the chemical SMEs are 54 million higher than in the reference group. In order to assess the performance of the research sample a set of 9 performan-

Table 3. Comparison of the performance measures.

Variable	Mean		Min.		Max.		St. Dev.	
	Nace 20	Other	Nace 20	Other	Nace 20	Other	Nace 20	Other
Sales th CZK	299,734.66	238,331.90	37,624.00	0.00	1,123,462.00	1,341,024.00	244,481.95	209,094.30
Operating P/L (=EBIT) th CZK	31,725.54	16,566.70	–19,425.00	–183,748.00	370,187.00	221,143.00	57,329.91	27,198.80
P/L for period (=Net income) th CZK	24,751.60	12,649.10	–32,115.00	–189,673.00	296,612.00	373,916.00	50,697.82	25,715.60
Total assets th CZK	247,814.16	193,780.50	55,038.00	53,574.00	1,151,501.00	1,129,353.00	213,265.00	170,970.80
Profit margin %	8.41	6.30	–12.17	–76.00	41.76	86.00	10.92	10.00
ROE using Net income %	12.97	10.90	–86.54	–986.00	87.45	424.00	21.63	39.30
ROA using Net income %	8.16	6.70	–21.35	–62.00	55.81	88.00	12.13	10.10
Current ratio %	4.43	3.40	0.14	0.00	87.04	70.00	9.44	4.40
Liquidity ratio (x)	3.12	2.30	0.07	0.00	73.84	69.00	7.74	3.70
Collection period days	57.65	51.30	0.00	0.00	485.26	848.00	68.29	44.80
Number of employee	85.31	100.01	15.00	15.00	225.00	225.00	53.83	59.10
Years in operation	19.79	20.00	3.36	2.00	46.59	73.00	8.07	6.80

Source: Author's own study. Source: Author's own study.

ce measures was compared with a selected group of companies representing SMEs in the whole manufacturing industry except the chemical one. The comparison is presented in the Table 3:

The two groups are quite similar. Firms in both are on average existing for 20 years and there are not vast differences in values of comparable performance measures. The reference sample companies are on average 15 employees larger and 6 days more efficient in collecting the receivables. The performance of the chemical SMEs is better in all remaining measures, especially in Profit margin (2.11%), ROE (2.07%) and ROA (1.46%). In absolute terms the average Sales were 61 million higher in the first group and Net income 12 million higher. It can be concluded that some areas of the performance of SMEs in the chemical industry in the Czech Republic represented by the selected performance measures are solid and slightly better than the reference group of the manufacturing

industry.

The main limitation of this study is that it focuses only on a small number of performance measures, which were easily accessible in the Amadeus database and are frequently used in social science research. The study lacks growth measures such as growth of sales or net profit and it also does not include assessment of the operations performance. From this point of view this paper looks only into one dimension of performance of the selected group of chemical companies.

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