Original scientific paper

REGIONAL AND SECTORAL DIFFERENCES BETWEEN FAMILY BUSINESS UNITS IN THE CZECH REPUBLIC

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Cite this article: Pražáková, J., Rybová, J., Vejsadová Dryjová, M., Hlaváčková, H. (2024). Regional and sectoral differences between family business units in the Czech Republic. *Deturope,* 17(1), 86-113.

Abstract

The article's topic is to identify the character of family business units in the Czech Republic from the point of view of their sectoral and regional representation at the level of NUTS region 2. The paper aims to assess the significance of individual factors influencing financial characteristics of defined groups of family businesses based in the Czech Republic, categorised by region and sector. On a selected sample of family businesses, we examined their mutual differences based on data from their financial statements from 2020 to 2022 in the Albertina database. We surveyed almost 500 family businesses in the Czech Republic that provided data to this database in all three years.

We identified family companies according to the region of the company's headquarters in the Czech Republic and according to the size of the company. The monitored signs are as follows: debt ratio, return on equity (ROE), and personnel cost to total costs. The results confirmed some regional and sectoral differences. Family businesses in the register of family business in the Czech Republic are micro-enterprises, small and medium-sized enterprises. Large businesses are not on the register. The highest representation is in the processing industry, mainly metal processing. These monitored indicators showed differences in family businesses between regions and sectors of their operation. The largest number of family businesses is in the South Moravian Region and the capital city of Prague. We registered no less family businesses in the Karlovy Vary Region and the Ústí Region (Northwest Bohemia). The statistical significance of the results was tested. The approach of family firms to debt financing is crucial here, as most firms are relatively risk-averse and mainly use their capital for financing.

Keywords: Accounting, Corporate Finance, Czech Republic, CZ NACE, Family business, NUTS 2 Region

INTRODUCTION

Family businesses comprise approximately 60% of all businesses in the European Union. In the Czech Republic, they are also an essential part of the economy. The Czech Republic does not have accurate statistical records of family businesses, and the definition of a family business in

the Czech Republic follows the European Union definition. The Ministry of Industry and Trade of the Czech Republic uses a database of family businesses (ASME, 2020). Registration is voluntary for family businesses, confirming that registered businesses meet the definition of a family business corporation. Our study uses the above-mentioned databases and connects them with the companies' financial statements from the Albertina database. On a selected sample of family businesses, we examined their mutual differences between regions and CZ NACE sectors based on data from their financial statements from 2020 to 2022.

THEORETICAL BACKGROUND

The family business has long been considered by scholars to be a fundamental element in any world economy. Historically, family businesses are the oldest form of business and have an irreplaceable position in every economy (Kubíček, 2016). In most countries, they represent more than half of all companies and more than half of the total output of their economy. In several countries, they have the status of the largest employer, as in Germany (Urban, 2020). This subject has been explored by scholars from a variety of geographical locations (mostly from the United States, Canada, Sweden, and Western European countries). Here, family businesses have a long-standing tradition and the possibility of many years of development. For example, Rovelli et al. (2022) summarise 32 years of research on family firms. The situation in the Czech Republic is distinct. The evolution of family firms has been an ongoing phenomenon in this region for the past three decades, after the transition to a market economy in late 1989. Family firms have, to date, completed a relatively brief period of experience. The initial owners transferred ownership of their family businesses to their descendants on a gradual basis. Nevertheless, some businesses in the Czech Republic survived and are still operating today, as is the case with the Baťa and Koh-i-noor brands.

Family firms are found in all sectors of the world economy and significantly influence the development of employment, the amount of value added created, investment, and capital formation (Allouche, Amann, Jaussaud & Kurashina, 2008). A study by Price Waterhouse Coopers (PwC, 2014) estimates that family businesses produce 70-90% of the world's gross domestic product (GDP) annually. They simultaneously create 50-80% of jobs in most countries worldwide. One-third of the 250 largest family businesses in the world are located in Europe. A complete 85% of European companies are family businesses, which generate 70% of European GDP and employ up to 60% of the European workforce (Kubíček, 2016).

According to European Family Businesses (2024), family businesses comprise 65-80% of all European companies, representing more than 40-50% of all jobs on average. Their importance lies not only in the fact that they contribute in a fundamental way to the development of the economy, but they are also crucial for their long-term stability, the specific commitment and responsibility they feel as owners, and the values they espouse.

In the Czech Republic as well, family businesses rank among the important pillars of the national economy. The Association of Small and Medium Enterprises and Entrepreneurs of the Czech Republic considers family businesses to be the basis of a stable domestic economy, as it is family businesses that are the largest source of jobs in the private sector (MTI, 2021). They are an important and irreplaceable element of regional development, as Kocmanová (2021) adds.

Although family businesses tend to be small and medium-sized businesses, there are also large family-owned businesses operating globally that have been family-owned for many generations (Urban, 2020). There are more than 23 million small and medium-sized enterprises in the European Union (EU), which account for 99% of all businesses and two out of three jobs in the private sector. Small and medium-sized enterprises are the engine of the economy (EUR-Lex, 2021). In the Czech Republic, family business is especially in the hands of small and medium-sized enterprises. These enterprises play an essential role in developing the potential of individual regions.

Family businesses are connected to the region in which they operate, and significantly so. They create the entrepreneurial backbone of each region and are the basis of the regions' infrastructure (Petrů, & Havlíček, 2016).

According to Petlina and Koráb (2015), the research in the area of small and medium-sized family businesses resulted in the conclusions that family business in the scope of small and medium-sized enterprises is the engine of the Czech economy, has real potential for its development and is able to increase the competitiveness of the country on the world market.

Financial aspect of family businesses

A relatively large number of authors focus on the succession of the family business to the next generation or on the specifics of family business management. At the same time, far fewer publications cover the evaluation of family businesses in terms of business finance. A recurrent subject in the literature is the question of the tendency of family businesses to favour certain funding sources over others.

In the literature, there are possible to find two partial contractionary views on the relative use of debt by family companies with comparison to other types The first one highlights the risk aversion of family firms due to their owner's low wealth diversification and argues that family firms avoid debt because of the accompanying increased bankruptcy risk (Mishra, & McGonaughy, 1999; Anderson, & Reeb, 2003). The second perspective, represented by Croci, Doukas and Gonenc (2011), argues that family companies prefer debt as a nondiluting financial strategy over raising new capital for company development, which does not affect the ownership structure. Owners of family businesses place greater emphasis on the financial security of the family in the long term than other companies. Prudence and a conservative approach mean that the financial health of family businesses tends to be very good, and the vast majority of family business owners plan to pass their business on to the next generation. Research and analysis by the Association of Small and Medium Enterprises and Entrepreneurs of the Czech Republic (ASME CR, n.d.) also confirms this. The author Szymanska (2015) adds to this issue that she noticed a smaller number of declines, but also erroneous financial decisions, in family businesses than in other entities. Martínez, Requejo (2017) studied the relationship between ownership concentration and firm value. The authors concluded that family control positively affects the performance of the family firm if family members are still influential. Hansen and Block (2020) also confirmed the risk-aversion of family businesses due to their lower debt ratio.

Pindado, Requejo and De La Torre (2015) examined the relationship between family control and capital structure. The authors focused on how family control shapes the capital structure of family firms. The authors' results point to the fact that the sensitivity of debt to cash flow fluctuations and the speed of adjustment of family firms depend on the ownership structure and management style. The authors state that in the case of the presence of a second owner in family firms, the risk of collusion may arise, which limits the acquisition of new external funds. Gallucci, Santulli, De Rosa (2017) on 448 articles examined how family business literature and financial issues interact. The authors found they could not apply classical financial theory to family firms. At the same time, the research results revealed that socio-emotional wealth could contribute to determining a new perspective in which to examine the interplay between family and business.

Michiels (2023) also confirms the fact that we cannot apply classic financial theories to family businesses. The author states that conventional financial theory in the family firms lags and requires a deeper and more detailed understanding of how family dynamics intertwine with financial decision-making. Family businesses differ from the classic corporate finance models

in that they typically have a concentrated ownership structure. Michiels, Molly (2017) also looked at financial decision-making in family firms. These authors state that the reviewed literature (131 evaluated articles on family business financing decisions) demonstrates non-traditional approaches to family business financing decisions. These theories highlight the importance of maintaining control, risk aversion, non-financial goals and values in owners' financial decision-making. These factors then lead to a preference for internal sources of financing over external sources. Expert studies describe considerable differences in the ownership structure of family firms. Acedo-Ramirez et al. (2017) also confirm that many different factors influence the resulting capital structure of family firms. The variables may even differ among the family firms due to differences in size, stage of the life cycle, gender of the chief, generation to which they belong, and other factors.

In one of the chapters of his book, Zellweger (2017) also deals with the capital structure of family firms. It focuses more closely on the concentration of family capital as a separate asset class, it focuses on the advantages and disadvantages of financing with own and foreign capital (debt) and the associated costs of own capital and debt.

The authors Alphy and Ranajee (2024) compiled a comprehensive overview of 192 peer-reviewed journal publications between 2000 and 2023. In the study, the authors included only those publications that addressed the relationship between family businesses and their capital structure as the main research question. Subsequently, they categorized the conclusions from the articles into six main themes, which are (i) family business performance and strategy, (ii) ownership and management structure, (iii) succession and leadership, (iv) variety of knowledge and resources, (v) social and emotional factors and (vi) gender and cultural factors. These six main subthemes explain the shaping or control of family businesses' capital structure choices or their financing decisions. At the same time, the authors state that classic financial theories have limited applicability in the case of family firms. The study by Hansen and Block (2020) mentioned the regional differences caused by different effects of legislative regulations and conditions in the regions themselves. Many factors influence the capital structure of family businesses. The authors mention the following factors: social aspects, cultural aspects, regional aspects, and we must not forget the family aspects.

The literature is often focused on comparing differences between family business and non-family business units in different sectors: the agriculture sector (e.g. Williams & Scott, 2024), the tourism sector (Camison, Forés, & Puiq-Denia, 2016) or manufacturing industries (Erbetta, Menozzi, Corbetta, & Fraquelli, 2013). Differences within groups of family firms are rarely addressed, and this issue is seldom dealt with at the Czech level. Furthermore, research focusing

on Czech family businesses only marginally addresses their financial characteristics, treating them as an additional topic alongside those focusing on transmission to the next generation, or from managerial or sociological perspectives. Based on these findings, we have chosen to focus this paper on geographical and sectoral differences between groups of family businesses in the Czech Republic in terms of their financial characteristics.

The main aim of this article

Based on these studies and our investigation, we made the following assumptions:

- Family businesses are characterised by higher use of their own capital and a lower level of debt financing. This is why the return on equity (ROE) is chosen as a profitability measure instead of return on assets (ROA). The debt ratio indicator accompanies the ROE indicator in our research. The combination of these indicators guarantees the higher validity of the results.
- Another specific indicator for family business units is retained earnings. This indicator correlates highly with values of other measures used, so we refer to it only in deeper analysis (cluster analysis and centroids).
- Small and medium-sized enterprises (SMEs) are typical representatives of family firms, and the composition of our sample corresponds to this. Our data sample does not include big companies at all. Due to the location of the headquarters of the SMEs often also in small towns or villages, we can assume them as important employers in regions. In our research, this aspect of family business is represented by the personal cost indicator.

Based on these assumptions, the main aim of the paper was defined:

The main aim of the paper is to assess the significance of individual factors influencing financial characteristics (ROE, debt ratio, and personnel cost) of defined groups of family businesses based in the Czech Republic, categorised by region and sector.

DATA AND METHODS

In this part of the paper, the main goal is defined and elaborated into the individual sub-objectives, the analyzed sample is described, and all used methods are stated.

1. Sample description

The sample includes companies that were interested in database of the Association of Small and Medium Enterprises of the Czech Republic and the Association approved their registration.

Therefore. we consider it proven as family businesses. There were 1.224 records in the family business database on the date of obtaining the financial data. We obtained data from the financial statements for the year 2022 from 475 companies (Albertina Gold Edition Database). Our sample therefore corresponds to almost 39% of the total number of records. We have two types of companies in our sample. Limited liability companies significantly predominate with 447 representants and their share in the data set is 94.1%. Joint-stock companies participate in the sample 5.9 %.

Number of family companies in the regions of the Czech Republic

We identified family companies in all 8 regions at the NUTS 2 level and all 14 regions at the NUTS 3 level in the Czech Republic (the counts you can see in Tab.1).

Table 1 Number of subjects in these NUTS 2 and NUTS 3 Regions

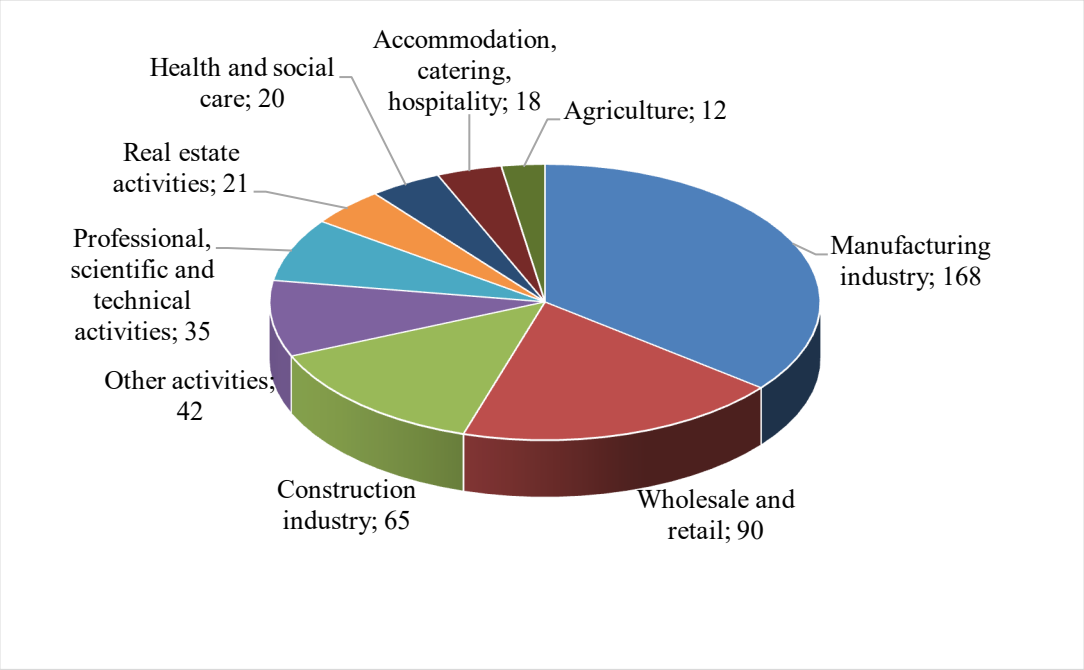
Region NUTS 2	**Region NUTS 3**	**Number of subjects in the NUTS 3 Region**
Capital City of Prague (CZ01)	Capital City of Prague	69
Central Bohemia (CZ02)	Central Bohemian Region	43
Southwest Bohemia (CZ03, 60 family companies)	South Bohemian Region	32
	Plzeň Region	28
Northwest Bohemia (CZ04, 17 family companies,)	Karlovy Vary Region	4
	Ústí Region	13
Northeast Bohemia (CZ05, 78 family companies)	Liberec Region	14
	Hradec Králové Region	25
	Pardubice Region	39
Southeast Bohemia (CZ06, 99 family companies)	Vysočina Region	26
	South Moravian Region	73
Central Moravia (CZ07, 64 family companies)	Olomouc Region	27
	Zlín Region	37
Moravian Silesia (CZ08)	Moravian-Silesian Region	41
Total number of companies		**471**

Source: Albertina Gold Edition Database

Representation of individual sectors of the national economy in the sample

We classified family companies according to the sector of their main activity. We have divided the industry into these groups to meet our needs. The following Fig. 1 shows the structure of the industries represented in our sample.

Figure 1 Structure of the sample – sectors of the economy



Note: Sector name; number of companies
Source: Albertina Database

2. Main objective

The main objective of the paper is to assess the significance of individual factors influencing financial characteristics (ROE, debt ratio, and personnel cost) of defined groups of family businesses based in the Czech Republic, categorised by region and sector.

The main aim will be fulfilled through two partial objectives:

Partial objective 1: To identify whether there are differences (described by ROE, debt ratio, and personal cost) between groups of the family businesses representing different sectors of the national economy.

Partial objective 2: To find out whether there are differences between groups of the family businesses representing the regions of the Czech Republic (described by ROE, debt ratio, and personal costs).

Individual hypotheses prepared for statistical data evaluation:

A1. The data sample evaluation is separated for ROE, debt ratio, and personal costs ratio:

1. The differences among the nine production sectors of family firms in ROE/ debt ratio/ personnel costs:

H0 – There are no statistically significant differences among production sectors (on the CZ NACE level) in ROE/debt ratio/ personnel costs.

HA – There are significant differences between production sectors in ROE/debt ratio/ personnel costs.

A2. Similar hypotheses were constructed for differences among the tested groups of the family business units based on the regions.

B. The evaluation based on all three indicators is performed by using the cluster analysis methods:

1. The verification of differences among the three defined clusters based on all used indicators (ROE/debt ratio/ personnel costs):

H0 – There are no statistically significant differences between constructed clusters.

HA – There are significant differences between constructed clusters.

3. The process of identifying variables

For the evaluation of the differences, the three ratios were chosen. All indicators are based on data obtained from the Albertina database. We initially identified 15 indicators, but we excluded them both due to missing or incorrect data, as well as due to high dependencies (verified by correlation analysis) and functional analysis. Finally, the identified measures are ROE, debt ratio, and personal costs.

Return on equity (ROE)

The measure return on equity (ROE) is defined as a ratio between earnings and equity and is a standardized measure of the ratio analysis. It measures how efficiently a company's management generates profit from its own capital. It is typical for family-owned firms to prefer equity financing to debt financing, and therefore, performance evaluation using this indicator is more appropriate. In our tables, ROE is stated as an index, but sometimes in comments, the percentage form is also used.

Debt ratio

Total liability divided by total assets (sometimes called the debt/asset ratio) shows the proportion of a company's assets that are financed through debt. If the ratio is less than 0.5, most of the company's assets are financed through equity. If the ratio is greater than 0.5, most of the company's assets are financed through debt.

Personal costs

This measure is calculated as a ratio of the personal costs to the total costs of the individual company.

4. The methods and evaluation of the results

Individual steps of the results evaluation are as follows:

a) The differences between sectors are evaluated separately for each of the three measures.
b) The differences between regions are evaluated separately for each of the three measures.
c) Cluster analysis as a method for evaluating the results as a whole.

Detailed procedure of the performed cluster analysis

Cases with missing values were removed from the data sample, 1,183 observations of business units from 2020 to 2022 remained.

The standardization was carried out: Standardization means that each column in the data frame is transformed to have a mean (mean) of 0 and a standard deviation of 1. This is done using the following formula for each element in the data frame:

$$Z = \frac{(z-\mu)}{\sigma} \qquad (1)$$

Where the z is the original value of the used measure. μ is the average value of the indicator, and σ is the standard deviation.

Standardization is a very important step in the data preparation phase. Many machine learning algorithms assume that all input variables have the same scale. For example. distance-based methods (such as k-means clustering or k-nearest neighbours) can be strongly affected by the range of variables.

The optimal number of clusters

The purpose of cluster analysis is to discover a system of organizing and placing business units into groups based on the correlation found among the evaluated measures. The optimal number of clusters to be used for the next clustering method was determined based on AHC methods (Agglomerative Hierarchical Clustering methods). Tab. 2 presents the results of several AHC methods. The methods clearly recommend using 3 groups (clusters) for the k-means clustering.

Table 2 Agglomerative Hierarchical Clustering – number of clusters

	Number of clusters according to the aggregation criterion		
Dissimilarity criterion	**Single linkage**	**Strong linkage**	**Wards method**
Euclidean distance	3	3	3
Chebyshev distance	2	2	2
Manhattan distance	3	3	4

Source: Own processing in STATISTICA 12

The AHC clustering, as well as the k-means clustering method, were processed in STATISTICA 12 software.

K-means method

The k-means method divides the observations into homogeneous clusters. based on their description by a set of quantitative measures. The k-means method is iterative. and the following parameters are entered in the STATISTICA 12 software: number of measures (3 measures mentioned before). The number of observations is 1183, and the number of clusters is 3 (based on the AHC results). The presented solution of the k-means clustering was gained after 3 iterations. The evaluated observations are divided into 3 clusters: 580 to cluster 1, 390 to cluster 2, and 215 to cluster 3.

5. Statistical evaluation of results

Due to the character of the dataset, the nonparametric statistical test of hypothesis is used.

The Kruskal-Wallis test is a non-parametric alternative to one-way (between-groups) ANOVA. It is used to compare three or more samples, and it tests the null hypothesis that the different samples in the comparison were drawn from the same distribution or from distributions with the same median. Thus, the interpretation of the Kruskal-Wallis test is basically similar to that of the parametric one-way ANOVA, except that it is based on ranks rather than means (Siegel & Castellan, 1988).

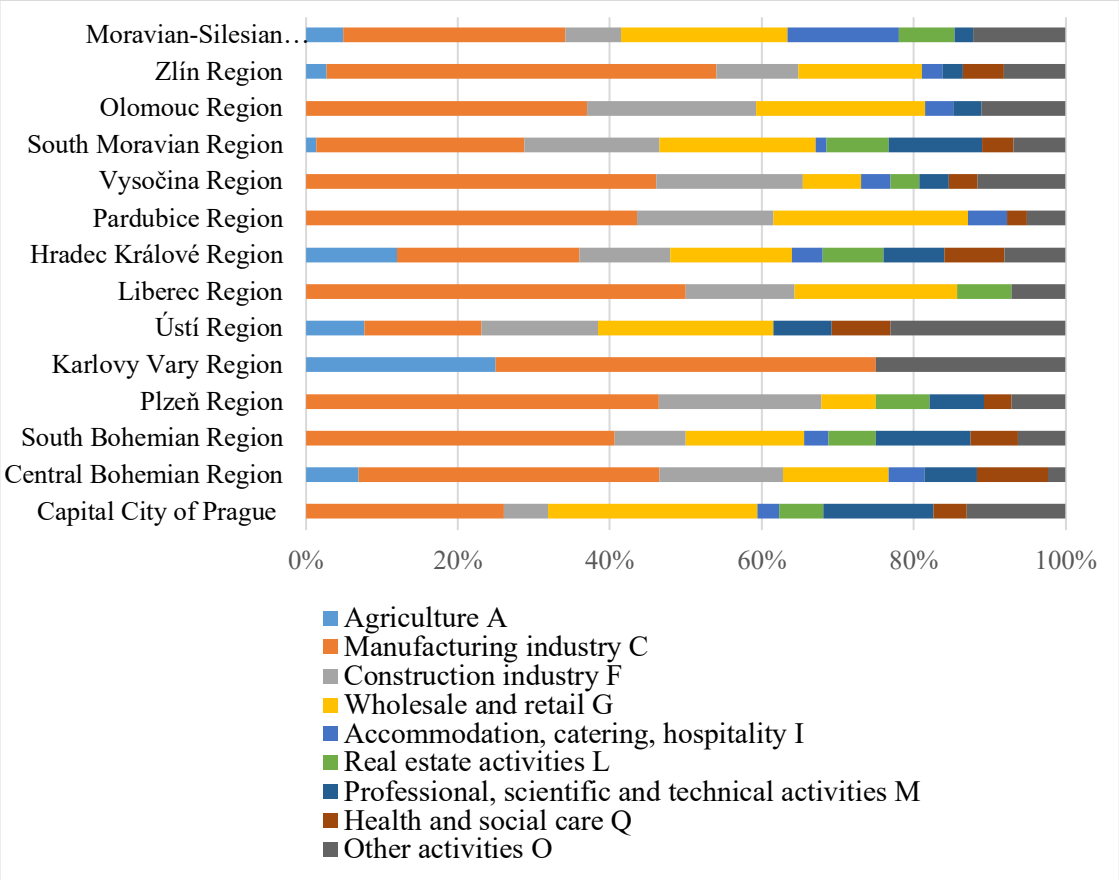
RESULTS AND DISCUSSION

One of the sub-goals is to sort the data of Albertina Database. In the first step, we organized the data in two ways: by region and by sectors. We used data from the period 2020 - 2022 from the Albertina database. The first part of the results describes a sample of family businesses from the Albertina database.

The second part deals with three financial indicators. The third parts deal with statistical significance of financial indicators. The cluster analysis of the sample of family businesses and the evaluation of individual clusters is in the fourth part. There is also a statistical evaluation of the differences between clusters.

We expected to find regional differences in the sectors and regions of the Czech Republic. Here is the result for our sample of 471 family companies in the Czech Republic. Regions correspond to the NUTS 3 level breakdown. We classified the sectors according to the CZ NACE classification. Manufacturing industry representation in the field of family businesses can be specific and unique in the Czech Republic. We selected industries that are significant for our sample or that we assumed would be significant.

Figure 2 Family companies by sector in the regions NUTS 3 of the Czech Republic



Source: Albertina Database

Fig. 2 shows that the regions do not differ significantly in the composition of sectors. We can say that the processing industry prevails in most regions. For example, agriculture is a small sector in our sample. The reason may be the fact that the Ministry of Industry and Trade registers family businesses, but the sector is not limited to this. We use this registry. Agricultural family farms register with the Association of Private Agriculture of the Czech Republic and

apparently do not need to register with the Ministry of Industry and Trade as well. Fig. 2 shows the differences in all sectors of family businesses in the register of the Ministry of Industry and Trade.

1 Separate evaluation of individual indicators in a sample of family companies

The aim of this section is to describe selected indicators for the entire sample of family companies. Cluster analysis uses these ratios in the next section. These are indicators:

- Debt Ratio,
- Return of equity (ROE),
- The personnel cost (calculated as a share to the total costs of the company).

Table 3 Indicators of the sample of family companies

The whole sample	Debt Ratio	ROE	Personnel costs
Arithmetic mean	0.5543	0.1542	0.1939
Standard deviation	0.2968	0.4433	0.1967
Min	0.0002	-4.4085	0
Max	1.8842	4.2594	0.9145
Median	0.5019	0.0116	0.1548

Source: Albertina Database, own processing

In the next step, we examined the differences of the mentioned indicators between the sectors in our sample of family companies. The Manufacturing Industry sector is the most important sector of family companies in our sample. We have separated the most important part of this sector, which includes metalworking, cutlery and machine manufacturing.

The highest debt ratio is reached based on its reports in the agricultural and wholesale and retail sectors, followed by the manufacturing industry. Interesting is that the metalworking sector reaches the 10 % lower value of the debt ratio. On the other hand, the lowest value of the debt ratio reaches the sector M (professional, scientific and technical activities) and the others.

Compared to that, the highest value of the ROE is reached in the accommodation industry, followed by the construction industry. The enormous value of the accommodation industry is affected by the very low total assets reported by the companies in this sector. We assume that they operate with rented assets, for example, buildings and facilities. As you can see in Tab. 4, this indicator has the highest standard deviation. The reason for this difference compared to other indicators is, among other things, the fact that the indicator is calculated from economic

results. In the event of a loss, the value is also negative, and the difference between the maximum and minimum value of the indicator will widen. The last indicator, personnel costs, has the lowest differences among sectors (see the standard deviation, which declares it).

Table 4 Indicators in selected sectors

Arithmetic mean of the sector	**Debt Ratio**	**ROE**	**Personnel costs**
Agriculture (A)	0.6873	0.2300	0.2564
Manufacturing Industry (C)	0.5351	0.1549	0.1833
• **Separately C - metalworking and engineering**	0.4365	0.1261	0.2295
Construction industry (F)	0.2803	0.6950	0.1879
Wholesale and retail (G)	0.5697	0.1824	0.2168
Accommodation. catering. hospitality (I)	0.3051	1.0140	0.1929
Real estate activities (L)	0.3035	0.2792	0.2078
Professional. scientific and technical activities (M)	0.0773	-0.2472	0
Others (O)	0.0154	-0.660	0

Source: Albertina Database, own processing

The results by NUTS 2 regions are depicted in Tab. 5. The region with the worst result in debt ratio is the CZ 08 region, which reaches the lowest one (CZ04 region) by more than 23%. When we compare the NUTS 2 region in ROE indicator, the two regions (CZ 07 and CZ 04 are almost equal, followed by CZ 08 (19, 38%). The ratio of personal costs to total costs is also relatively comparable between regions.

Table 5 Indicators by NUTS 2 regions

	Debt ratio	ROE	Personel cost
CZ01	0.5180	0.0962	0.1738
CZ02	0.5908	0.1633	0.2042
CZ03	0.5863	0.1422	0.2012
CZ04	0.4362	0.2121	0.2520
CZ05	0.5559	0.1613	0.1820
CZ06	0.5522	0.1250	0.1864
CZ07	0.5113	0.2112	0.2228
CZ08	0.6660	0.1938	0.1702

Source: Albertina Database, own processing

2 Testing of statistically significant differences of monitored indicators

This part focuses on statistically significant differences between CZ NACE sectors and regions of the Czech Republic in monitored financial indicators. The statistical significance of the differences indicates a real relationship between the selected indicators, and we can evaluate our results accordingly.

The groups of the family companies mentioned before are subjected to the statistical testing of mutual differences. Due to the characteristics of the dataset, the Kruskal-Wallis statistical test was used (for more details, see the methodology). Tab. 6 and Tab. 7 describe the p-values of the mutual pairs of the groups of the companies. The pairs with significant differences at the 0.05 significance level are marked in red.

2.1 Separate evaluation of individual indicators between the regions of the Czech Republic

A short summary of the significant differences in the debt ratio is here:

- There is a statistically significant difference in the debt ratio of family companies in the Vysočina and Moravian-Silesian regions compared to the other five regions (Capital City of Prague, Ústí Region, Karlovy Vary Region, South Moravian Region, Olomouc Region).
- Furthermore, the South Bohemian Region, the Ústí Region, and the Liberec Region differ significantly.

Summary of ROE results:

- Here we found balanced results. Pilsen and South Bohemia regions are significantly different from each other. This also applies to the South Bohemian Region compared to the Capital City of Prague.

Summary of personnel cost:

- In this case, we did not find a significant difference between family companies in the regions of the Czech Republic.

The varying results of companies in different regions of the Czech Republic are attributable to a combination of economic, structural, and regional factors. The main reasons for regional differences in debt ratio can be attributed to the different structure of the economy in individual regions. In industrial regions (e.g., the Moravian-Silesian region), enterprises often have a higher debt ratio due to capital-intensive industries compared to regions focused more on services (as Prague is often referred to). Another relevant factor is the size and type of enterprises in the regions – large enterprises generally have higher debt levels and are more likely to use debt financing. Furthermore, different regions are also described as having different access to finance for businesses, with Prague and Brno often cited as having better access to banking services and investors in general. Conversely, regions with a higher share of

SMEs have lower debt levels, as these smaller enterprises often rely on their own resources or on subsidies.

The differences between the regions are more noticeable after using NUTS 2 regions for the ROE and Personal costs from the total costs' indicators. The following Tab. 6 shows the statistically significant differences of the monitored indicators with respect to the regions NUTS 2. The intensification of differences when using larger regional units points to differences in geographic distribution between regions and their cooperation. If the companies from these regions are more connected, then these differences may deepen.

Differences in debt ratio had the opposite course - only CZ01 – Capital City of Prague and CZ05 – Northeast Bohemia Region were otherwise comparable everywhere.

Table 6: Statistical evaluation of pairs of NUTS 2 regions

Indicators / NUTS 2		CZ01	CZ02	CZ03	CZ04	CZ05	CZ06	CZ07	CZ08
Personnel Costs	CZ01		0.00000	0.00275	0.00000	0.00000	0.00000	0.00000	0.00000
	CZ02	0.00000		0.00017	0.56454	0.14340	0.00141	0.04565	1.00000
	CZ03	0.00275	0.00017		0.00000	0.73368	1.00000	1.00000	0.83529
	CZ04	0.00000	0.56454	0.00000		0.00018	0.00000	0.00006	0.00312
	CZ05	0.00000	0.14340	0.73368	0.00018		1.00000	1.00000	1.00000
	CZ06	0.00000	0.00141	1.00000	0.00000	1.00000		1.00000	1.00000
	CZ07	0.00000	0.04565	1.00000	0.00006	1.00000	1.00000		1.00000
	CZ08	0.00000	1.00000	0.83529	0.00312	1.00000	1.00000	1.00000	
ROE	CZ01		0.00007	1.00000	0.00097	0.00000	0.12374	0.22168	0.00015
	CZ02	0.00007		0.12118	1.00000	1.00000	0.25118	0.39043	1.00000
	CZ03	1.00000	0.12118		0.13973	0.02019	1.00000	1.00000	0.16055
	CZ04	0.00097	1.00000	0.13973		1.00000	0.27427	0.34583	1.00000
	CZ05	0.00000	1.00000	0.02019	1.00000		0.03461	0.08657	1.00000
	CZ06	0.12374	0.25118	1.00000	0.27427	0.03461		1.00000	0.33381
	CZ07	0.22168	0.39043	1.00000	0.34583	0.08657	1.00000		0.49174
	CZ08	0.00015	1.00000	0.16055	1.00000	1.00000	0.33381	0.49174	
Debt Ratio	CZ01		1.00000	0.67443	1.00000	0.04961	1.00000	1.00000	1.00000
	CZ02	1.00000		1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
	CZ03	0.67443	1.00000		1.00000	1.00000	0.90911	0.88468	1.00000
	CZ04	1.00000	1.00000	1.00000		0.48423	1.00000	1.00000	1.00000
	CZ05	0.04961	1.00000	1.00000	0.48423		0.05179	0.06751	1.00000
	CZ06	1.00000	1.00000	0.90911	1.00000	0.05179		1.00000	1.00000
	CZ07	1.00000	1.00000	0.88468	1.00000	0.06751	1.00000		1.00000
	CZ08	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	

Source: Albertina Database, own processing in software Statistica 12>

2.2 Statistically significant differences of monitored indicators between sectors

The following Tab. 7 shows statistically significant differences between CZ NACE sectors for each indicator separately. Statistically significant differences occur between manufacturing, construction, and wholesale and retail trade. This is true for all three indicators.

Table 7 Statistical evaluation of pairs of CZ NACE sectors (p-values)

Indicators /sectors		A	C	F	G	I	L	M	O	C - M
Personnel Costs	A		1.00000	0.54066	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
	C	1.00000		0.00032	1.00000	1.00000	1.00000	1.00000	0.24469	1.00000
	F	0.54066	0.00032		0.00003	1.00000	1.00000	1.00000	1.00000	0.00013
	G	1.00000	1.00000	0.00003		1.00000	1.00000	0.91373	0.02561	1.00000
	I	1.00000	1.00000	1.00000	1.00000		1.00000	1.00000	1.00000	1.00000
	L	1.00000	1.00000	1.00000	1.00000	1.00000		1.00000	1.00000	1.00000
	M	1.00000	1.00000	1.00000	0.91373	1.00000	1.00000		1.00000	0.93267
	O	1.00000	0.24469	1.00000	0.02561	1.00000	1.00000	1.00000		0.04126
	C-M	1.00000	1.00000	0.00013	1.00000	1.00000	1.00000	0.93267	0.04126	
ROE	A		1.00000	0.54066	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
	C	1.00000		0.00032	1.00000	1.00000	1.00000	1.00000	0.24469	1.00000
	F	0.54066	0.00032		0.00003	1.00000	1.00000	1.00000	1.00000	0.00013
	G	1.00000	1.00000	0.00003		1.00000	1.00000	0.91373	0.02561	1.00000
	I	1.00000	1.00000	1.00000	1.00000		1.00000	1.00000	1.00000	1.00000
	L	1.00000	1.00000	1.00000	1.00000	1.00000		1.00000	1.00000	1.00000
	M	1.00000	1.00000	1.00000	0.91373	1.00000	1.00000		1.00000	0.93267
	O	1.00000	0.24469	1.00000	0.02561	1.00000	1.00000	1.00000		0.04126
	C-M	1.00000	1.00000	0.00013	1.00000	1.00000	1.00000	0.93267	0.04126	
Debt Ratio	A		1.00000	0.54066	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
	C	1.00000		0.00032	1.00000	1.00000	1.00000	1.00000	0.24469	1.00000
	F	0.54066	0.00032		0.00003	1.00000	1.00000	1.00000	1.00000	0.00013
	G	1.00000	1.00000	0.00003		1.00000	1.00000	0.91373	0.02561	1.00000
	I	1.00000	1.00000	1.00000	1.00000		1.00000	1.00000	1.00000	1.00000
	L	1.00000	1.00000	1.00000	1.00000	1.00000		1.00000	1.00000	1.00000
	M	1.00000	1.00000	1.00000	0.91373	1.00000	1.00000		1.00000	0.93267
	O	1.00000	0.24469	1.00000	0.02561	1.00000	1.00000	1.00000		0.04126
	C-M	1.00000	1.00000	0.00013	1.00000	1.00000	1.00000	0.93267	0.04126	

Source: Own processing

3 Cluster analysis

K-means clustering method divides the dataset into three clusters (the optimal number of clusters is determined based on the results of hierarchical clustering), see Tab. 8. The largest is cluster 1 with 580 observations, followed by cluster 2 with 389 observations and cluster 3 with 214 allocated observations. The observations (1183 observations in total) are allocated into the 3 clusters in the following ratio: cluster 1 covers 49 %, cluster 2 covers 33 %, and 18 % for cluster 3. The average distance of the cluster from the cluster mean is almost comparable in clusters 1 and 2, with only a slight difference; in contrast, cluster 3 reaches almost a third higher average distance. The range of the centroid distance (a centroid is a company that reaches the values with the lowest deviation from the average of the cluster) and maximum distance of the cluster is the lowest in cluster 2, followed by cluster 3 and cluster 1.

Table 8 Characteristics of the defined clusters

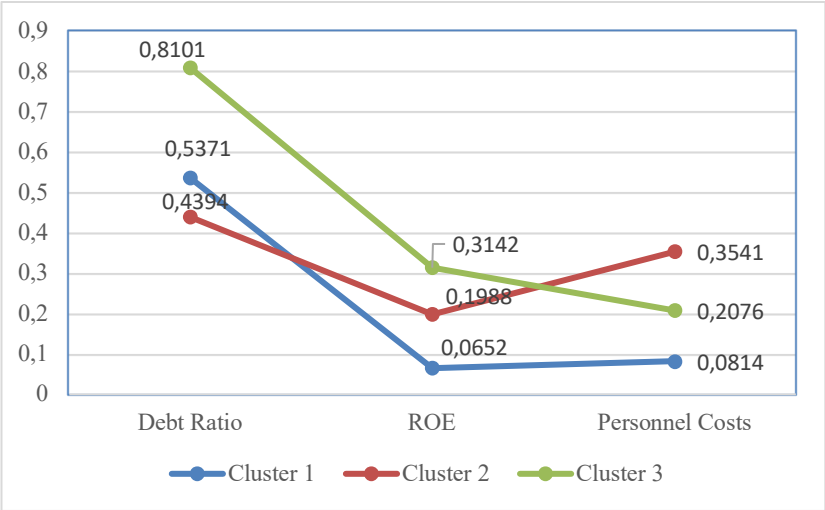
Characteristics	**Cluster 1**	**Cluster 2**	**Cluster 3**
Minimal distance (centroid distance)	0.070	0.040	0.120
Average distance of the cluster	0.544	0.578	0.797
Maximum distance from centroids	5.790	1.650	4.900
Size (number of observations)	580	389	214

Source: Own calculation in STATISTICA 12 SW

3.1 Cluster Evaluation

We describe each cluster of family businesses by using three points of view: financial indicators used for cluster analysis, representation of regions in clusters, and representation of sectors in clusters. Figure 3 shows the cluster differences in debt ratio, personnel costs, and ROE. A detailed evaluation of the individual clusters is given below.

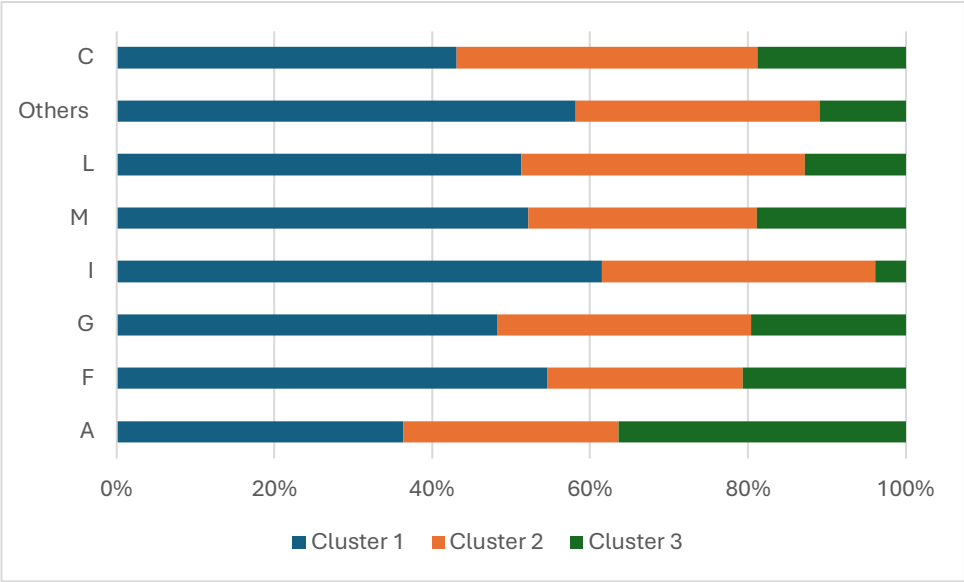
Figure 3 Average values of the clusters



Source: own calculations based on Albertina Gold Edition Database

Fig. 4 shows how the sectors are represented in the individual clusters. The first cluster contains the largest number of companies from the accommodation, catering, and hospitality sector (I). Cluster 2 is predominantly made up of family businesses from the manufacturing industry (C), while the third cluster consists mainly of agricultural businesses (A). More detailed descriptions of the clusters can be found in the following subsections.

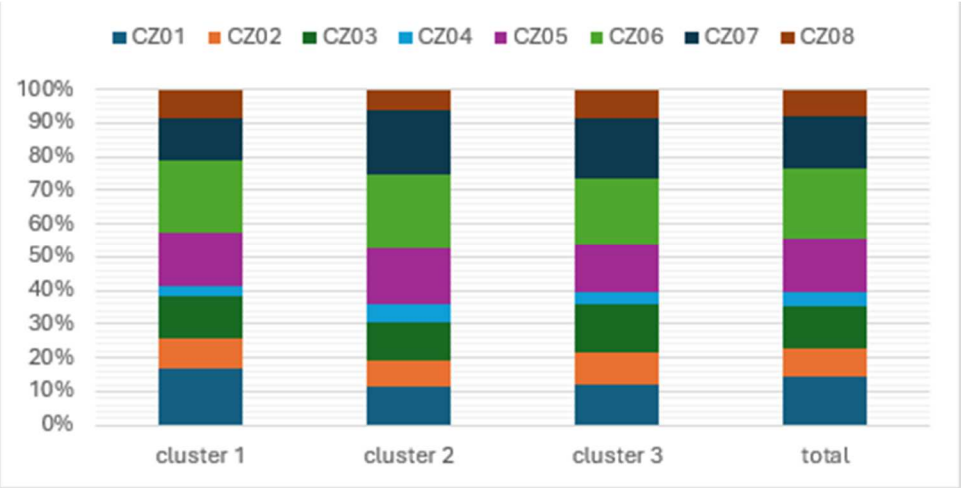
Figure 4: Representation of the sectors in clusters



Source: own calculations based on Albertina Gold Edition Database

Fig. 5 describes the shares of NUTS 2 in clusters. The regions are represented relatively evenly in all clusters. This may mean that the region does not affect the specifics of the groups of family businesses in clusters.

Figure 5 NUTS 2 ratios in clusters



Source: Own processing

Cluster 1 - technologically demanding industry

Regionally, cluster 1 is most represented by companies based in the Capital City of Prague (17%), followed by the South Moravian region (16%) and the Pardubice region (10%). The first two mentioned regions represent the highest achieved ratio of regions in the clusters overall. This value was then achieved only by the South Moravian Region in the 2nd cluster. There are a total of 3 regions exceeding the 10% threshold, and they cover a total of 43% of the records included in cluster 1. Only two regions here have representation at a level close to 1-2% of the cluster.

The average debt ratio slightly exceeded the 0.5 mark, which means liabilities outweigh own capital by 3.7% on average. In terms of debt, this cluster is in the middle of the rest, whereas in terms of equity performance, it reaches the lowest values by far. Compared to cluster 2, it is at a third level and is not even remotely close to the values of cluster 3.

In addition, these are companies whose ratio of personnel costs to total costs is at the level of 8%. Therefore, it is a technologically demanding industry with a lower proportion of human labour. This is also confirmed by the far lowest added value compared to the other clusters (approx. 1/3 compared to the other two clusters).

Regarding the representation of the industry in cluster 1, the largest group is the CZ NACE C companies, i.e., manufacturers (32% of the cluster). Next in order are G (traders) and F (constructions). Together, these three groups of companies cover almost 70% of the total cluster. If we focus more closely on C - i.e., production, then the largest group consists of companies involved in industrial production, companies engaged in metalworking, followed by those focusing on wood products and furniture.

For cluster 1, the ratio of companies regarding the size is 80% in favour of micro-enterprises, small companies represent 17.9%, while medium-sized enterprises represent just over 2% of all selected enterprises.

The companies in this cluster achieve, nominally, the highest cost of goods sold or delivery of services (the average value is at the level of 4.8 million).

Most companies in this cluster focus on business activities with lower value added, but which require a technological background and use a considerable amount of fixed assets.

Cluster 2 – equity and retained earnings

The representation of individual regions in cluster 2 is more unequal than in cluster 3. As in cluster 3, the South Moravian Region has the highest share in cluster 2 (16%). Second is the Zlín Region with 12% of businesses (it covers almost 41% of the Zlín Region companies in total), followed by the Capital of Prague with 11%. The Karlovy Vary Region has the smallest share only 1%, as well as the Ústí Region, Liberec Region (with respect to the total counts of the companies from the Liberec Region this cluster gain almost 64 %) and Plzeň Region with 4%. The first 3 regions with the highest representation represent a total of 39% of the cluster.

The most numerous group contains micro-enterprises with 60% representation; small enterprises reach almost 36%, which makes cluster 2 the cluster with their highest representation. Medium enterprises represent 4%. The largest group in cluster 2 contains producers who make up 43% of the entire cluster (of which 17% are metal and 13% are unspecified activities of producers), followed by wholesalers and retailers with 19% each.

For cluster 2, personnel costs are dominant, representing more than 35% of total costs. The return on equity here is almost 20%. On average, the indebtedness of these enterprises is by far the lowest and reaches a 10% lower value compared to cluster 1. These are enterprises that finance their activities mainly from their own sources. Related to this is the by far highest ratio of retained earnings to total assets (more than 34%) compared to other clusters. Cluster 2 reached average values of the retained earnings in millions of CZK, which is 2 times the value compared to cluster 1 and almost three times the value compared to cluster 3.

Companies from cluster 2 declare the highest ratio of personnel costs to total costs. These facts are related to the range of products, including also products with precise requirements of individual adjustments and manual work. Family businesses in this cluster use external sources of financing the least. The reason for not using external sources of financing may be not only

the fact that the company does not need them, but also a possible fear of debt and exposing the family business to risk.

Cluster 3 – "We use debt financing to the maximum"

Cluster 3 is the most even one regarding the regional representation. The highest share is held by companies from the South Moravian Region (13%) and the capital Prague (13%), followed by the South Bohemian Region and the Zlín Region, both with 11%. Other regions are below 10% representation, and the Karlovy Vary Region, Liberec Region, and Ústí Region have the smallest share (less than 1% of the total number of enterprises). The first four regions with the highest representation (each exceeding 10%) claim a total of 48% of the cluster.

The cluster contains 72% micro enterprises, 26% small enterprises, and less than 2% medium enterprises. Industrial sectors included are wholesale and retail (28%), manufacturing (38%), and construction (17%). Metalworking represents 17% of the manufacturing companies.

Companies from cluster 3 have a completely different approach to financing. Compared to the cautious and protective financing method of the previous cluster, these companies are not afraid of debt financing. The average value of external capital in the cluster is around 81%, and the company with the lowest distance from the average value of the cluster even reaches a value of over 93%.

This cluster has the highest level of debt financing on average, with an average value of 81%. This is also related to the relatively high ROE (31.4%), which reaches such high values, thanks to the low level of equity capital. In contrast, the ROA, i.e., the profitability of total assets, reaches 5.3% on average, which is, for example, almost double the value compared to cluster 1 (2.8% ROA). Hence, retained earnings are the lowest in this cluster, they are around 11% of the total value of the company's assets on average.

Therefore, higher debt can help improve business profitability, i.e., by utilizing company assets. Thus, the effect of financial leverage is confirmed here. Furthermore, cluster 3 achieves the highest total costs, exceeding CZK 45 million, and the total assets of the companies exceeding CZK 51 million on average.

We can assume that if a company uses debt financing, it will increase its overall profitability. This can facilitate and accelerate its development.

Statistical evaluation of the differences between clusters

The clusters described above were subjected to statistical testing of mutual differences. Due to the characteristics of the dataset, the Kruskal-Wallis statistical test was used. Tab. 9 describes

the p-values of the mutual pairs of the measures used for cluster construction. The pairs with significant differences at the 0.05 significance level are marked in red.

Table 9 Statistical evaluation of the differences between clusters

p-value, significance level 0,05	Cluster 1	Cluster 2	Cluster 3
Cluster 1 ROE		0.00	0.00
Cluster 2 ROE	0.000000		0.147936
Cluster 3 ROE	0.000000	0.147936	
Cluster 1 Personal Costs		21.04544	9.33780
Cluster 2 Personal Costs	21.04544		7.42999
Cluster 3 Personal Costs	9.337796	7.429994	
Cluster 1 Debt ratio		0.000000	0.000000
Cluster 2 Debt ratio	0.000000		0.000000
Cluster 3 Debt ratio	0.00	0.00	

Source: Own computation based on results from SW Statistica 12 and MS Excel

Thus, significant differences were found for almost all combinations. The only exception comprises the ROE indicator from the clusters 2 and 3 comparison. Based on these results, we can therefore reject the H0 and confirm the differences between clusters.

Although the stated value of ROE is by far the highest (compared to the other two clusters), it is caused by a very low equity ratio. In this case, it would be more appropriate to use the ROA, which reaches 3.6%, which is incomparably lower than the 55% ROE.

CONCLUSION

The paper focuses on differences between geographical and sectoral groups of family firms in the Czech Republic in relation to their financial characteristics, a topic that has so far been marginally addressed in research on family firms. The main objective of this paper is to assess the significance of individual factors influencing financial characteristics of defined groups of family businesses based in the Czech Republic, categorised by region and sector.

The structure of the results of the paper is as follows: The first part was a separate evaluation of the monitored indicators in the regions and higher administrative units; then we focused on the differences between sectors, and finally, we evaluated all three main indicators together in a cluster analysis.

The most noticeable differences are between groups of family companies divided by NUTS 2 regions, where mutual differences in personal costs are more often observed. On the other hand, only one combination of regions has a significant difference in debt ratio. When we

compared the production sectors, significant differences were found between manufacturing, construction, and wholesale and retail trade.

The cluster analysis also confirms some regional and sectoral differences, but the overall results of the companies are more balanced than when the indicators were evaluated separately. The approach of family businesses to debt financing is crucial here, when most companies are rather risk-averse and use mainly their own capital for financing.

The results of the research reflect only those businesses that have voluntarily signed up to the ASME family business register; other family businesses are missing. With a few exceptions, the companies in the sample are not subject to audit. Therefore, the quality, correctness, and completeness of the reported information are difficult to verify. Family businesses also include a large group of entrepreneurs who do not even keep accounting records at all. This corresponds to the low number of detailed economic studies. That is the main reason why we used the obtained data, despite their limitations, for the most detailed analysis possible, which the scope of this contribution allowed us.

Future research will aim to expand our dataset (in terms of the number of family business units and research period) and to include a foreign comparison. Family businesses in the Czech Republic would also deserve an analysis in the broader context of the connection between financial and functional analysis.

In the literature, there are possible to find two partial contractionary views on the relative use of debt by family companies compared to other types. The first one highlights the risk aversion of family firms due to their owners' low wealth diversification and argues that family firms avoid debt because of the accompanying increased bankruptcy risk (Mishra, McGonaughy, 1999; Anderson, Reeb, 2003). The second perspective, represented by Croci, Doukas, and Gonenc (2011), argues that family companies prefer debt as a nondiluting financial strategy over raising new capital for company development, which does not affect the ownership structure. Both approaches to debt financing are also evident in our study, where firms from cluster 2 show low debt ratios and, in contrast, cluster 3 very high values of debt financing. Overall, our study supports the first theory, as cluster 1 also shows a preference for lower debt. Therefore, we can summarize that our sample of family businesses has a tendency towards low debt. Hansen, Block (2020) in their study confirmed the risk-aversion of family business due to a lower debt ratio.

In the process of establishing a company, it is imperative to comprehend the competitive environment and the distinctive characteristics of each region. These elements can significantly impact the company's future development, influencing strategic planning, overall riskiness, and

potential future opportunities. The combination of return on equity and debt can point to a paradox, whereby high debt of a firm will simultaneously induce a high ROE. However, this is only due to the low amount of equity, and the riskiness of high indebtedness must be taken into account to assess the financial health of the firm. Despite the high ROE value, the firm may be experiencing significant financial difficulties. Consequently, financial indicators must be evaluated within the parameters of the individual firm and in the broader context of the region and sector.

The most statistically significant differences are observed between groups of family firms divided by NUTS 2 regions, where mutual differences in personnel costs are more frequently observed. Conversely, a single combination of regions exhibited a substantial discrepancy in the debt ratio. A comparison of manufacturing sectors reveals significant disparities between manufacturing, construction, and wholesale and retail trade. The cluster analysis also confirms some regional and sectoral differences, but the overall performance of companies is more balanced than when the indicators are assessed separately. The key issue to consider is how family firms approach debt financing, with most firms preferring to avoid risk and generally using equity capital for financing.

In the context of the relative absence of aggregate statistics concerning the financial performance of family businesses, the results can be utilised by family business proprietors to establish a benchmark for their financial situation. The refinement of the results with respect to regions and sectors, despite the reduced number of firms involved, renders these values more precise and more useful for a specific, narrowly focused firm. The values presented will facilitate benchmarking at the sector and regional level for family business owners, as well as helping with the early identification of risks in three key financial management issues: optimal debt levels, sufficient return on equity, and personnel costs. Consequently, the research findings are beneficial for managers and owners of individual family firms, other stakeholders, and can serve as a foundational framework for subsequent research activities.

The survey results reflect only those firms that have volunteered to join the ASME family firm register; other family firms are not included. With a few exceptions, the companies in the sample are not subject to audit. Consequently, the veracity, precision, and thoroughness of the reported information are challenging to ascertain. It is evident that a significant proportion of entrepreneurs within the family business sector do not maintain accounting records. This is consistent with the paucity of detailed economic studies in this area. Subsequent research will aim to expand the existing data set, both in terms of the number of family businesses covered

and the length of the research period. Additionally, foreign comparisons will be incorporated into the study, thereby facilitating a more comprehensive international analysis.

Acknowledgement

This article was supported by the institutionally funded research at the University of South Bohemia, Faculty of Economics, Department of Accounting and Finances (RVO160).

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