SECTORAL ANALYSIS OF THE DIFFERENCES IN PROFITABILITY OF CZECH AND GERMAN BUSINESS VENTURES – AN EMPIRICAL BENCHMARK STUDY

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Introduction

Conducting business involves a constant flow of money and capital, whose renewal and expansion on the one hand and distribution and investment on the other need to be managed. Business entities are required to be able to sustainably appreciate capital invested, therefore, it is necessary to conduct analyses of the rate of return on capital invested as part of business management.

Factors such as geographical proximity, cultural similarity, membership in the EU and a qualified workforce have given rise to strong economic ties between Czech and German companies. Therefore, the general goal of this study is to identify the driving factors behind differences in the profitability of Czech and German companies on the basis of a comparative analysis.

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1. Literature Review

This comparative analysis can be understood as a form of benchmarking between these two countries (Jarrar & Zairi, 2001; Vorhies & Morgan, 2005; Kent & Routledge, 2017). In this way, competitive (dis-) advantages can be addressed, and thus possible starting points for targeted improvements can be provided. The values of these drivers of profitability result from an empirical database, and the impacts of the observed differences are modelled using the technique of variance analysis, which is a common tool in the field of management accounting (Christodoulou, Clubb, & Mcleay,

2016; Dluhošová, Ptáčková, & Zmeškal, 2015; Ptáčková, 2015).

The study concentrates primarily on two very popular ratios used for economic decisions, i.e. the return on assets (RoA) and the return on equity (RoE) (e.g., Kijewska, 2016; Easton & Monahan, 2016). Effects from financing or taxation are usually excluded from the return on assets (RoA), as it solely emphasises the operations of a venture. It is defined here as follows:

$$\text{RoA} = \frac{\text{EBIT}}{\text{Total assets}} \qquad (1)$$

According to Sukmawati and Garsela (2016), the return on equity (*RoE*) shows the net income of stockholders in relation to the amount of equity provided in terms of book values. This article uses the following definition of *RoE*:

$$\text{RoE} = \frac{\text{Net income}}{\text{Equity}} =$$
$$= \frac{\text{EBIT} - \text{Interest} - \text{Corporate taxes}}{\text{Equity}} \qquad (2)$$

Several influencing factors, which can be observed empirically, are used as a basis to model both measures. To illustrate such effects on *RoA* and *RoE*, the fundamental interactions of the financial leverage effect (e.g., Anagnostopoulou & Tsekrekos, 2017; Ku & Yen, 2016; Feng, 2016) and the so-called Du Pont identity are used (Erbuga, 2016; Hron, Macák, & Andres, 2015; Mihola & Kotešovcová, 2015). The following fundamental relations are thus implied:

$$RoE = \frac{EBIT - Interest - CTax}{E} =$$

$$= \frac{RoA \times TA - i^{Debt} \times l \times TA - \tau^{CTax} \times RoA \times TA + \tau^{TS} \times i^{Debt} \times l \times TA}{(1-l) \times TA} =$$

$$= \frac{RoA \times (1 - \tau^{CTax}) - i^{Debt} \times l \times (1 - \tau^{TS})}{(1-l)} \quad (3)$$

where:

E = Equity (book value),
CTax = Corporate tax expenses,
TA = Total assets,
RoA = Return on assets = EBIT / Total assets,
i^{Debt} = Average interest rate on debt = Interest expenses / Total debt,
l = Debt ratio = Total debt / Total assets (book values),
τ^{CTax} = Corporate tax rate,
τ^{TS} = Tax-shield rate of debt financing.

The *RoA* can be written as follows on the basis of the so-called Du Pont identity:

$$RoA = AT \times PM \quad (4)$$

where:

AT = Asset turnover = Net turnover / Total assets,
PM = Profit margin = EBIT / Net turnover.

As reported by Penman (2013), in order to analyse the structural aspects of profit, a further breakdown of the profit margin *PM* can be achieved by separating the operating gross profit margin, several operating expense ratios and the remaining components of income.

$$PM = \frac{EBIT}{Sales} = \frac{Total\ income}{Sales} -$$
$$- \frac{Ext.\ supply\ costs}{Sales} - \frac{Staff\ costs}{Sales} -$$
$$- \frac{Depreciation}{Sales} + \frac{Other\ income}{Sales} = \quad (5)$$
$$= GPM - ESR - SCR - DAR + OIR$$

where:

GPM = Gross profit margin,
ESR = External supply ratio (i.e., materials, consumables, externally supplied goods and services or other operational charges except staff costs and depreciation),
SCR = Staff cost ratio,
DAR = Depreciation and amortisation ratio,
OIR = Other income ratio, especially non-operating and extraordinary items.

Asset turnover can likewise be analysed in more detail on the basis of several ratios which are very common in financial statement analyses (Jovanovic, Todorovic, & Grbic, 2017; Koloszko-Chomentowska & Sieczko, 2016). They are particularly the fixed asset turnover (*FAT*), days inventory held (*DIH*), days sales outstanding (*DSO*) and the turnover of other assets (*OAT*). The ratios are defined as follows:

$$Fixed\ asset\ turnover\ (FAT) = \frac{Sales}{Fixed\ assets} \quad (6)$$

$$Days\ inventory\ held\ (DIH) =$$
$$= \frac{Inventory}{Sales} \times 365 \quad (7)$$

$$Days\ sales\ outstanding\ (DSO) =$$
$$= \frac{Receivables}{Sales} \times 365 \quad (8)$$

$$Other\ assets\ turnover\ (OAT) =$$
$$= \frac{Sales}{Total\ assets - Fixed\ assets - Inventory - Receivables} \quad (9)$$

It implies that the total asset turnover (*AT*) in formula (4) can be replaced by a combination of these ratios as follows:

$$AT = \frac{Sales}{Total\ assets} = \frac{1}{\frac{1}{FAT} + \frac{DIH}{365} + \frac{DSO}{365} + \frac{1}{OAT}} \quad (10)$$

Therefore, profitability is linked to several driving factors which are represented by very common financial ratios. Their relations are used here to compare the average profitability of Czech and German ventures, distinguishing several sectors of business.

So far, no research study has dealt with a comparison of the profitability of Czech and German companies in different industries. In most studies, comparative analyses relate to changes in the technology or location of specific (industrial or agricultural) production (e.g., Demircan et al., 2016; He & Liu, 2014). Some authors (e.g., Piedra-Munoz, Galdeano-Gomez & Perez-Mesa, 2016; Krechovská, 2015) also introduce the context of various sustainability aspects (socio-economic characteristics, environmentally-respectful practices, and innovation) to measuring profitability.
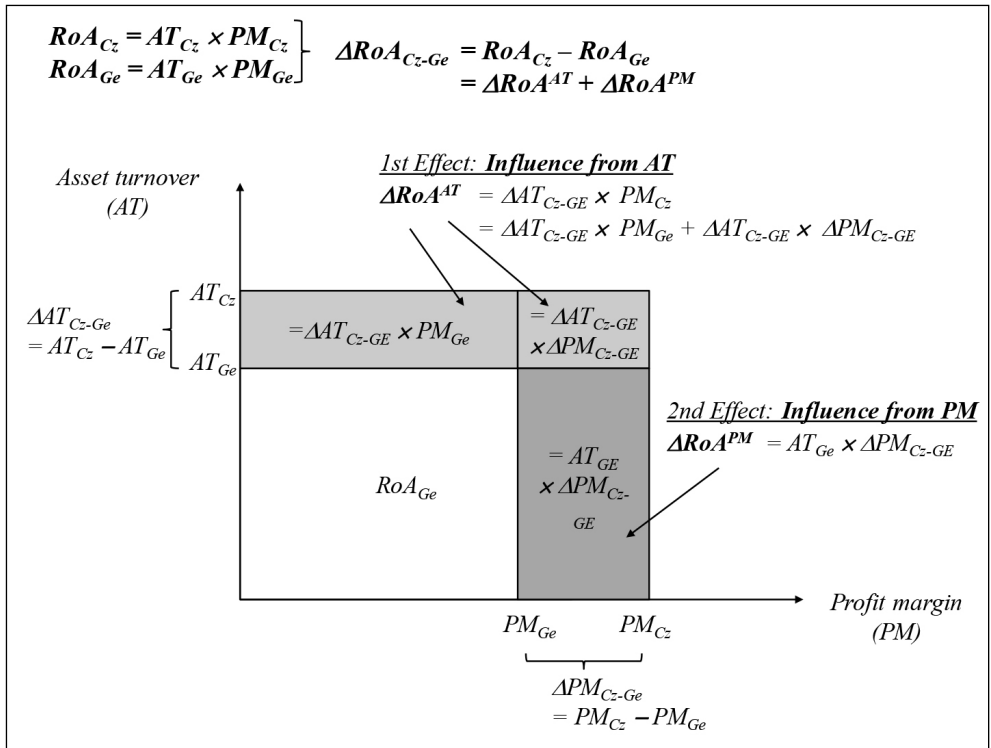
The ROA and ROE indicators, which evaluate the performance of companies, have been used in numerous studies. Some of them deal with the performance of companies in relation to the market value of listed companies

– e.g., in the study conducted by da Rocha Oliveira et al. (2017), which analyzed the following performance indicators: ROA, ROE, Net Margin, EBITDA and EBITDA margin. Other studies focus on evaluating companies in a specific segment of the national economy – for example, the study by Dink, Fung and Jia (2017), which deals with a comparison of the profitability of banks in China and the USA. Within this comparison, they focus more on the influence of individual banking products on profitability. Another study, by Amin and Aslam (2017), conducts research in companies of the pharmaceutical industry; Leite, Guse and Hein (2017) focuses on companies in the Brazilian agribusiness; a study by Vanek et al. (2017) analyzes the ratio indicators of four mining companies extracting hard coal, and a study by Dinca et al. (2017) deals with the construction industry. The last of these studies, conducted in 958 construction companies in eight EU countries in 2004-2013, states that companies from countries in the western part of the EU have a higher ROE compared to companies in countries in the eastern part of the EU, but offer a higher ROA.

A comparison between the ratio indicators of companies in multiple industries was carried out by Batchimeg (2017), who in a sample of 100 Mongolian joint stock companies listed on the Mongolian Stock Exchange ascertained what ratios can affect the financial performance of the given companies with the aim of boosting their competitiveness. Through panel regression covering the period 2012-2015, the author found that ROA has more determinants than ROE and ROS, such as earnings per share; return on costs has positive impacts, while the short-term debts to total assets ratio and the cost to revenue ratio have negative impacts.

Fig. 1: **Analysis of variances in RoA**

$$RoA_{Cz} = AT_{Cz} \times PM_{Cz}$$
$$RoA_{Ge} = AT_{Ge} \times PM_{Ge}$$

$$\Delta RoA_{Cz\text{-}Ge} = RoA_{Cz} - RoA_{Ge}$$
$$= \Delta RoA^{AT} + \Delta RoA^{PM}$$

Asset turnover (AT)

1st Effect: **Influence from AT**
$$\Delta RoA^{AT} = \Delta AT_{Cz\text{-}GE} \times PM_{Cz}$$
$$= \Delta AT_{Cz\text{-}GE} \times PM_{Ge} + \Delta AT_{Cz\text{-}GE} \times \Delta PM_{Cz\text{-}GE}$$

$$\Delta AT_{Cz\text{-}Ge} = AT_{Cz} - AT_{Ge}$$

AT_{Cz}

AT_{Ge}

$= \Delta AT_{Cz\text{-}GE} \times PM_{Ge}$

$$= \Delta AT_{Cz\text{-}GE} \times \Delta PM_{Cz\text{-}GE}$$

2nd Effect: **Influence from PM**
$$\Delta RoA^{PM} = AT_{Ge} \times \Delta PM_{Cz\text{-}GE}$$

RoA_{Ge}

$$= AT_{GE} \times \Delta PM_{Cz\text{-}GE}$$

Profit margin (PM)

PM_{Ge} PM_{Cz}

$$\Delta PM_{Cz\text{-}Ge} = PM_{Cz} - PM_{Ge}$$
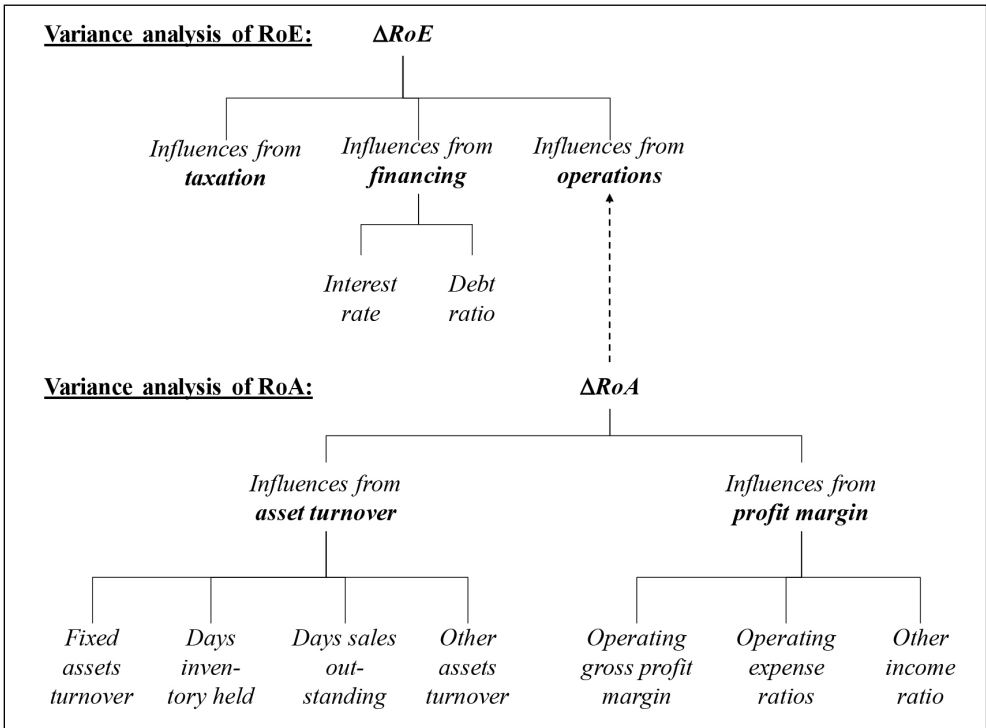
Source: own processing

2. Methodology and Data

With respect to the fundamentals mentioned above, the analytic goal now is to examine empirically observable values of these drivers of profitability for the Czech Republic and Germany. In order to illustrate the impacts of the national differences between these parameters, a cumulative variance analysis is used. As already stated above, this method is a common technique in the field of managerial accounting, where the variances between the planned and actual cost or revenues are usually quantified and allocated to certain influencing factors (e.g. Bhimani et al., 2012; Peles, 1986; Guelfi, 2013). By analogy, the observed differences in these driving factors are analysed to determine their contribution to the variances in profitability (i.e. RoA and RoE) between the two countries. Nevertheless, as some of these influencing parameters interact in a multiplicative way, to separate their effects in a strict sense is difficult.

To fix a particular sequence for the analysed influences is a pragmatic way to solve this problem. Incorporating the differences in the driving factors in a gradual manner according to the order would allocate the compounded effects to these involved influencing factors, which are considered first. The principle for the RoA based on asset turnover (AT) and profit margin (PM) is shown in Fig. 1.

A two-step variance analysis is performed in this article. The first step is aimed at the differences in RoA between the Czech and German ventures and is based on deeper analyses of the asset turnover (AT) and the profit margin (PM). The differences in RoE are analysed in the second step, examining the influences of national taxation, financing and the operations (RoA) of the ventures, respectively. Fig. 2 illustrates this design of the analytical framework in a graphical manner.

Fig. 2: **Design of the analytical framework**

Source: own processing

The following hypothesis can be verified on the basis of this double-level analysis of variances: The driving factors of *RoE* and *RoA* differ significantly between the two countries among several business sectors and would cause substantial differences in profitability when taken separately. The overlapping and compensating nature of the individual effects blanket the total impact. Certain influencing factors can be determined and quantified in their separate contributions to the differences in the typical units of profit rates (*ROA* and *ROE*). This uncovers the sources of competitive advantages and provides useful starting points for continuous improvements.

The BACH database (Bank for the Accounts of Companies Harmonised) of the EU is the source of the driving parameters used in this study. It includes aggregated and harmonised information on the corporate annual accounts from several European countries (European Central Bank, 2015). The BACH database was created under the aegis of the European Committee of Central Balance-Sheet Data Offices (ECCBSO), consisting of experts belonging to or associated with the National Central Banks (NCB) of the European Community or from the National Statistical Institutions (BACH, 2016; European Central Bank, 2015). This database is one of the most reliable sources of accounting data for comparisons between European countries (European Banking Authority, 2012).

The influencing factors analysed were derived from this database as calculated average values, looking at a total period from 2002 to 2014. Distinguishing several business sectors, data from a great number of firms are included as is shown in Tab. 1. It presents the annual average numbers of the included firms from 2002 to 2014. Therein, several sectors are classified according to the NACE [Nomenclaturestatistique des activitéséconomiquesdans la Communauté-européenne (Eurostat, 2008)].

The driving factors of profitability are observed on the basis of this broad sample. Using their long-term average values, the

Tab. 1: Annual average number of firms included in the study

NACE sectors	CZ	DE
A – Agriculture, forestry and fishing	1,051	478
B – Mining and quarrying	143	150
C – Manufacturing	7,515	12,519
D – Electricity, gas, steam and air conditioning supply	456	1,078
E – Water supply, sewerage and waste management	468	787
F – Construction	2,763	5,035
G – Wholesale and retail	4,603	13,030
H – Transportation and storage	1,028	2,668
I – Accommodation and food service activities	1,030	625
J – Information and communication	1,047	2,272
L – Real estate activities	1,426	3,512
M – Professional, scientific and technical activities	1,995	6,881
N – Administrative and support service activities	1,511	1,918
P – Education	466	254
Q – Human health and social work services	552	1,469
R – Arts, entertainment and recreation	443	379
S – Other service activities	279	490

Source: own processing

model-based effects on profitability are calculated. It must be emphasised that the calculated profitability based on the average parameters does not have to be exactly equal to the empirically observed average profitability during that time because of Jensen's inequality (Jensen, 1906). Moreover, the taxation effects are here strictly bound to the current tax rates and the model-based calculated earnings before taxes (EBT), and they do not take the possible loss carry-forwards of previous years into account which, of course, exist in reality. A more detailed explanation of the actual treatment of these aspects will be given in the following sections.

3. Results

The results of the study are presented in this section in a two-step manner. First of all, a comparative analysis of the return of assets discloses differences in the companies' operations and quantifies their impacts on profitability (RoA). In the second step, the findings are combined with further aspects of financing and taxation to analyse the consequences for the return on equity (RoE).

Tab. 2: Average values of driver variables of the asset turnover from 2002 to 2014

Business sectors	Average fixed asset turnover			Average days inventory held			Average days sales outstanding			Average other asset turnover		
	$\overline{FAT}_{Cz}$	$\overline{FAT}_{Ge}$	p	$\overline{DIH}_{Cz}$	$\overline{DIH}_{Ge}$	p	$\overline{DSO}_{Cz}$	$\overline{DSO}_{Ge}$	p	$\overline{OAT}_{Cz}$	$\overline{OAT}_{Ge}$	p
A – Agriculture, forestry and fishing	0.585	1.218	**	76.925	73.516		60.007	31.230	**	4.396	3.897	
B – Mining and quarrying	0.835	1.527	**	21.042	34.736	**	55.827	23.800	**	3.035	1.014	**
C – Manufacturing	2.880	2.591	**	42.660	46.838	**	55.006	22.502	**	8.078	4.030	**
D – Electricity, gas, steam and air-conditioning supply	1.021	2.657	**	15.103	7.420	**	60.358	33.495	**	4.427	4.986	
E – Water supply, sewerage and waste management	0.842	0.553	**	15.253	15.369		66.916	45.562	**	4.410	3.950	
F – Construction	4.763	6.280	**	32.733	154.525	**	92.273	38.679	**	5.455	4.280	*
G – Wholesale and retail	7.370	15.096	**	31.619	28.515	**	40.759	23.454	**	14.410	11.499	**
H – Transportation and storage	1.132	1.287	**	11.848	5.280	**	56.203	21.669	**	5.910	3.744	**
I – Accommodation and food service activities	0.770	4.475	**	9.812	6.002	**	48.434	14.887	**	4.065	5.118	**
J – Information and communication	1.294	0.678	**	9.718	11.008		61.860	29.534	**	4.190	2.769	**
L – Real estate activities	0.196	0.199		13.949	132.203	**	128.532	18.178	**	1.564	1.831	
M – Professional, scientific and technical activities	1.175	0.088	**	25.773	51.756	**	110.249	35.191	**	2.827	0.225	**
N – Administrative and support service activities	2.560	1.854	*	5.142	8.557	**	61.182	27.988	**	5.984	5.564	
P – Education	2.647	1.607	**	6.332	6.618		67.780	27.060	**	2.746	3.110	*
Q – Human health and social work services	1.624	1.143	**	6.598	9.749	**	54.275	45.386	**	5.787	3.901	**
R – Arts, entertainment and recreation	1.112	1.592	*	3.730	11.922	**	68.248	14.410	**	1.720	2.843	**
S – Other service activities	4.408	1.879	**	27.894	13.216	**	63.767	29.563	**	6.869	3.805	**
BACH variables used	R41 / A1			A2 × 365 / R41			A3 x 365 / R41			R41 / (A4 + A5 + A6 + A7)		

Source: own processing

Note: p-values of a two-tail unpaired t-test: ** if $p < 0.01$; * if $p < 0.05$

3.1 Benchmarking and Variance Analysis of Return on Assets (ΔRoA)

The first part of the analysis solely focuses on the firms' operations. Aspects of financing and taxation are excluded at this stage. The influencing factors of *RoA*, i.e., asset turnover (*AT*) and profit margin (*PM*), are calculated according to (5) and (10) based on the average values of their underlying driving factors. The empirical average values of the specific ratios

for several business sectors are shown in Tab. 2 and Tab. 3. In most cases, these drivers of *RoA* differ significantly between the Czech and German ventures considering an unpaired two-tail t-test. This confirms the hypothesis stated above.

Using these average values of the driving variables of profit margin (*PM*) and asset turnover (*AT*), the resulting values of both ratios and the *RoA* as a consequence can be calculated according to equations (4) to (10). A potential

Tab. 3: Average values of driver variables of the profit margin from 2002 to 2014

Business sectors	Average gross profit margin			Average external supply ratio			Average staff cost ratio			Average depreciation and amortisation ratio			Average other income ratio		
	$\overline{GPM}_{Cz}$	$\overline{GPM}_{Ge}$	p	$\overline{ESR}_{Cz}$	$\overline{ESR}_{Ge}$	p	$\overline{SCR}_{Cz}$	$\overline{SCR}_{Ge}$	p	$\overline{DAR}_{Cz}$	$\overline{DAR}_{Ge}$	p	$\overline{OIR}_{Cz}$	$\overline{OIR}_{Ge}$	p
A – Agriculture, forestry and fishing	1.027	1.015	*	0.805	0.817		0.203	0.210		0.072	0.082		0.140	0.171	
B – Mining and quarrying	1.015	0.925		0.659	0.585		0.222	0.240		0.098	0.064	**	0.104	0.146	
C – Manufacturing	1.014	1.004	**	0.841	0.821	**	0.117	0.163	**	0.039	0.030	**	0.042	0.060	**
D – Electricity, gas, steam and air- conditioning supply	1.002	1.002		0.838	0.917	**	0.034	0.051		0.060	0.028	**	0.053	0.050	
E – Water supply, sewerage and waste management	1.006	1.009		0.704	0.677	**	0.191	0.192		0.074	0.100	**	0.037	0.066	**
F – Construction	1.007	1.014		0.848	0.761	**	0.130	0.231	**	0.017	0.017		0.032	0.036	
G – Wholesale and retail	1.003	1.000	**	0.946	0.931	**	0.048	0.063	**	0.011	0.007	**	0.027	0.024	*
H – Transportation and storage	1.004	1.003		0.816	0.724	**	0.205	0.272	**	0.053	0.050		0.126	0.093	**
I – Accommodation and food service activities	1.002	1.000	*	0.695	0.669	*	0.256	0.345	**	0.066	0.029	**	0.053	0.069	
J – Information and communication	1.013	1.004	**	0.603	0.660	**	0.187	0.243	**	0.141	0.092	**	0.045	0.126	**
L – Real estate activities	0.997	1.001		0.634	0.624		0.124	0.117		0.199	0.162		0.155	0.130	
M – Professional, scientific and technical activities	1.007	1.038		0.795	1.074	**	0.204	0.386	**	0.023	0.074	*	0.141	1.099	**
N – Administrative and support service activities	1.001	0.999	**	0.723	0.679		0.262	0.169	**	0.060	0.143	**	0.100	0.039	*
P – Education	1.002	0.999		0.707	0.484	**	0.749	0.599	**	0.034	0.048	**	0.548	0.166	**
Q – Human health and social work services	1.006	1.001	**	0.510	0.463	**	0.435	0.639	**	0.045	0.062	**	0.036	0.188	**
R – Arts, entertainment and recreation	1.003	0.915		0.764	0.743		0.188	0.368	*	0.077	0.071		0.101	0.194	
S – Other service activities	1.001	1.003	*	0.714	0.597	**	0.234	0.425	**	0.040	0.042		0.022	0.093	**
BACH variables used	(I1 + I2 + I3) / 100			(I5 + I6 + I81) / 100			I7 / 100			I9 / 100			(I4 − I82 − I83 − − I84 − I85) / 100		

Source: own processing

Note: p-values of a two-tail unpaired t-test: ** if p < 0.01; * if p < 0.05

difference in the resulting *RoA* of Czech and German firms *(ΔRoA$_{Cz-Ge}$)* is defined as follows:

$$\Delta RoA_{Cz-Ge} = RoA_{Cz} - RoA_{Ge} \qquad (11)$$

The differences in profitability can be allocated to the driving factors according to section 1. The results are shown in the following table. Positive values of Δ*RoA* refer to the advantages of the Czech ventures, whereas the negative values reflect effects in favour of the German companies.

Looking at these results, one can see that in most sectors the aspects linked to asset turnover have only minor influences on Δ*RoA*.

The main differences come from the profit margin drivers, but they offset each other to a great extent. However, these findings differ substantially between the specific business sectors. This is illustrated exemplarily for the manufacturing sector in Fig. 3, as one of the most important branches in both countries (European Central Bank, 2015).
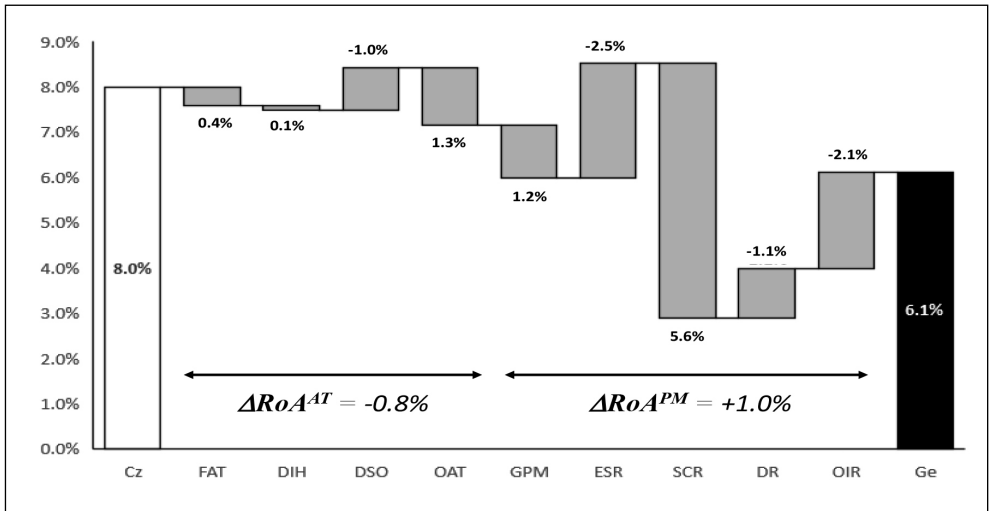
Czech manufacturing ventures show an advantage in operating profitability of 1.9%, which is in accordance with the results of other studies (e.g., European Central Bank, 2015). Aspects of asset turnover show lower influences on profitability, mostly in favour of Czech companies. Only receivables management

Tab. 4: Contribution to variance in return on assets from the driving factors of asset turnover and profit margin

Business sectors	RoA$_{Cz}$	ΔRoA^{AT}				ΔRoA^{PM}					RoA$_{Ge}$
		ΔRoA^{FAT}	ΔRoA^{DIH}	ΔRoA^{DSO}	ΔRoA^{OAT}	ΔRoA^{GPM}	ΔRoA^{ESR}	ΔRoA^{SCR}	ΔRoA^{DAR}	ΔRoA^{OIR}	
A – Agriculture, forestry and fishing	3.8%	-2.3%	0.0%	-0.4%	0.1%	0.9%	0.9%	0.5%	0.7%	-2.3%	5.7%
B – Mining and quarrying	8.0%	-3.6%	0.4%	-0.9%	4.4%	5.0%	-4.1%	1.0%	-1.9%	-2.3%	10.1%
C – Manufacturing	8.0%	0.4%	0.1%	-1.0%	1.3%	1.2%	-2.5%	5.6%	-1.1%	-2.1%	6.1%
D – Electricity, gas, steam and air- conditioning supply	8.7%	-6.5%	-0.4%	-1.6%	-0.6%	0.0%	11.5%	2.5%	-4.6%	0.3%	8.1%
E – Water supply, sewerage and waste management	4.5%	1.2%	0.0%	-0.1%	0.0%	-0.1%	-1.2%	0.0%	1.2%	-1.3%	4.7%
F – Construction	6.1%	-0.5%	2.2%	-0.7%	0.3%	-0.7%	-9.4%	10.9%	0.0%	-0.4%	4.3%
G - Wholesale and retail	6.4%	-1.3%	-0.2%	-1.4%	0.6%	1.1%	-5.2%	5.2%	-1.3%	1.0%	8.0%
H – Transportation and storage	4.5%	-0.4%	-0.1%	-0.5%	0.5%	0.1%	-8.2%	6.0%	-0.3%	2.9%	4.5%
I – Accommodation and food service activities	2.3%	-4.0%	-0.1%	-1.1%	-0.8%	0.6%	-5.3%	18.7%	-7.7%	-3.4%	5.5%
J – Information and communication	10.6%	3.9%	0.0%	-0.3%	0.4%	0.5%	2.9%	2.9%	-2.5%	-4.1%	6.9%
L – Real estate activities	3.2%	0.0%	0.2%	-0.2%	-0.1%	-0.1%	-0.2%	-0.1%	-0.6%	0.4%	3.8%
M – Professional, scientific and technical activities	8.0%	6.9%	0.0%	0.0%	0.3%	-0.2%	1.7%	1.1%	0.3%	-6.0%	3.8%
N – Administrative and support service activities	7.6%	1.3%	0.1%	-0.7%	0.1%	0.2%	-5.4%	-11.3%	10.2%	7.4%	5.7%
P – Education	6.3%	1.3%	0.0%	-0.5%	-0.2%	0.3%	-21.6%	-14.5%	1.3%	36.9%	3.4%
Q – Human health and social work services	5.5%	1.2%	0.0%	-0.1%	0.3%	0.4%	-3.7%	15.9%	1.3%	-11.8%	2.0%
R – Arts, entertainment and recreation	4.4%	-0.9%	0.1%	-0.6%	-1.3%	8.3%	-2.0%	17.1%	-0.6%	-8.8%	-6.9%
S – Other service activities	5.7%	1.9%	-0.2%	-0.5%	0.6%	-0.1%	-12.9%	21.0%	0.2%	-7.8%	3.4%

Source: own processing

| Fig. 3: | Variance of RoA for the manufacturing sector (C) |

Source: own processing

seems to be done in Germany in a more efficient way. This is reflected in a lower average of DSO of only 23 days against 55 days for the Czech Republic. In total, the higher asset turnover of Czech manufacturing ventures causes a higher *RoA* of 0.8% for Czech ventures.

In general, aspects referring to the profit margin show greater impacts. The biggest advantage comes from lower labour cost in the Czech Republic. However, this is completely offset by other effects: the higher cost of external supplies, depreciation and aspects of other income. Moreover, the gross profit margin is higher in Germany. In total, the lower profit margin of Czech manufacturing companies reduces their *RoA* by 1.0%.

However, Tab. 4 clearly indicates that other business sectors show completely different patterns than the manufacturing example.

3.2 Benchmarking and Variance Analysis of Return on Equity (ΔRoE)

Looking at profitability from the stockholders' point of view, i.e., focussing on *RoE*, leads to the second level of this analysis. For this purpose, the findings of the former level of the analysis are now combined with the aspects of financing and taxation. Profitability of operations is reflected in the formerly calculated return on assets (*RoA*) based on its empirical driving factors. Additionally, the extension and cost of debt financing are extracted as average values from the BACH database, once again for the period from 2002 to 2014. The specific values of these aspects of debt financing, i.e., average interest rates and debt ratios, are shown in Tab. 5, distinguishing several business sectors for both countries. In most cases, these parameters differ significantly between the Czech and German enterprises when looking at an unpaired two-tail t-test. Again, this confirms the hypothesis formulated. In spite of mostly higher interest rates, the German ventures in general tend to use a higher degree of debt financing.

The aspect of taxation is not based on empirical data in this analysis. The reason for this is to avoid any distortion of the results produced in the past, i.e., by using the carry-forward of losses from former years. Also, changes in tax legislation during the time series observed could produce misleading signals. Net earnings before taxes (EBT) are taxed here artificially at the recent tax rates instead of empirical tax payments for both countries. Thus, all ventures are viewed here as if they

Tab. 5: Average values of financing costs and debt ratios from 2002 to 2014

Business sectors	Average interest rate on debt				Average debt ratio			
	$\bar{i}_{Cz}$	$\bar{i}_{Ge}$	$\Delta\bar{i}_{Cz\text{-}Ge}$	p	$\bar{l}_{Cz}$	$\bar{l}_{Ge}$	$\Delta\bar{l}_{Cz\text{-}Ge}$	p
A – Agriculture, forestry and fishing	1.6%	3.3%	-1.7%	**	0.248	0.520	-0.272	**
B – Mining and quarrying	1.3%	1.2%	0.1%		0.384	0.770	-0.386	**
C – Manufacturing	1.7%	2.2%	-0.5%	**	0.516	0.688	-0.172	**
D – Electricity, gas, steam and air-conditioning supply	1.7%	1.7%	0.0%		0.472	0.703	-0.231	**
E – Water supply, sewerage and waste management	1.0%	2.6%	-1.6%	**	0.349	0.684	-0.335	**
F – Construction	0.9%	1.3%	-0.4%	**	0.649	0.829	-0.180	**
G – Wholesale and retail	1.5%	2.0%	-0.5%	**	0.635	0.717	-0.082	**
H – Transportation and storage	1.3%	3.1%	-1.8%	**	0.366	0.691	-0.325	**
I – Accommodation and food service activities	2.8%	2.2%	0.6%	**	0.762	0.730	0.032	
J – Information and communication	2.3%	3.2%	-0.9%	**	0.450	0.588	-0.138	**
L – Real estate activities	3.1%	3.6%	-0.5%	**	0.637	0.689	-0.052	
M – Professional, scientific and technical activities	1.6%	3.4%	-1.9%	**	0.534	0.586	-0.052	**
N – Administrative and support service activities	2.0%	2.5%	-0.5%	**	0.637	0.858	-0.221	**
P – Education	0.7%	2.2%	-1.5%	**	0.616	0.492	0.124	**
Q – Human health and social work services	1.5%	1.7%	-0.2%		0.473	0.466	0.007	
R – Arts, entertainment and recreation	3.5%	2.7%	0.8%		0.613	0.687	-0.073	*
S – Other service activities	1.0%	1.8%	-0.8%	**	0.639	0.620	0.020	
BACH variables used	*I10 × R41 / (L × 100)*				*L / 100*			

Source: own processing

Note: p-values of a two-tail unpaired t-test: ** if p < 0.01; * if p < 0.05

were companies. For the Czech Republic, it means the forms of a. s. (akciová společnost – joint stock company) and s. r. o. (společnost s ručením omezeným – limited liability company), and for Germany, the legal forms of AG (Aktiengesellschaft – joint stock company), GmbH (Gesellschaft mit beschränkter Haftung – limited liability company) or UG (Unternehmer gesellschaft, haftungsbeschränkt – a company with a lower capital than GmbH). These legal forms predominate in the database used (European Central Bank, 2015). In the Czech Republic, these companies face a corporate tax rate of 19%, which is identical to the tax-shield rate on debt. The German taxation

of these legal forms is more complex and is usually described in the following way (see, for instance, the online database of the European Commission "Taxes in Europe" TEDB, 2015).

Combining the country-specific average values of debt financing in Tab. 5 and the return on assets from section 3.1 with recent conditions of taxation as described above produces differences in return on equity between the two countries. Positive values of ΔRoE again describe the advantages the Czech companies hold compared to Germany caused by the specific underlying driving factors. The variance analysis is made as described above in a sequential procedure.

Tab. 6:   **Current taxation of Czech and German companies**

Variable	Name	Content	Value
τ_{Cz}^{CTAX}	Corporate tax rate of Czech companies	Corporation tax	19%
τ_{Cz}^{TS}	Corporate tax-shield rate of Czech companies	Interest payments are completely tax deductible at the corporate level	19%
τ_{Ge}^{CTAX}	Corporate tax rate of German companies	Combines a corporation tax (Körperschaftsteuer) including a solidarity surcharge of 15.825% and a locally varying trade tax (Gewerbesteuer) of typically 14% (Hebesatz = 400%)	29.825%
τ_{Ge}^{TS}	Corporate tax-shield rate of German companies	25% of interest payments are not deductible from trade tax (Gewerbesteuer), 15.825% + 0.75 * 14%	26.325%

Source: own processing according to European Commission (2015), Marková (2017) and Kussmaul and Ruiner (2011)

The order of the aspects analysed is driven by the question of which aspects are more under the control of the companies themselves. This is given especially for the debt ratio and the firms' profitability of operations (*RoA*). Interference from other factors can be reduced if these aspects are analysed last. The differences in the taxation systems referring to tax rates and tax-shields are considered as a whole. Since these aspects are clearly of an external nature, they are considered in the first place. In the second step, the aspects of financing are addressed. The resulting differences in the return on equity (Δ*RoE*) caused by the factors mentioned can then be quantified by comparing the results of

different sets of influencing variables (I to V). Tab. 7 illustrates this procedure.

The calculated results are shown in Tab. 8.

Again, some interesting aspects shall be discussed exemplarily for the manufacturing sector (C). The higher *RoA* of Czech manufacturing ventures, which was analysed in detail in section 3.1, would lead to an advantage in *RoE* of 4.2%, if all aspects of financing and taxation were equal for both countries at their German levels. However, differences in the later aspects cause additional variances in the *RoE*. Although the nominal tax rates in Germany are much higher than in the Czech Republic, it finally produces an additional advantage

Tab. 7:   **Analyses of variances in return on equity (RoE)**

Set of variables:	I	II	III	IV	V
τ^{CTAX}, τ^{TS}	Cz	$\Rightarrow$ Ge	Ge	Ge	Ge
$\bar{i}^{Debt}$	Cz	Cz	$\Rightarrow$ Ge	Ge	Ge
$\bar{l}$	Cz	Cz	Cz	$\Rightarrow$ Ge	Ge
RoA	Cz	Cz	Cz	Cz	$\Rightarrow$ Ge

RoE_I RoE_{II} RoE_{III} RoE_{IV} RoE_V

Δ**RoE**^{Taxation}

Δ**RoE**$^{Interest\ rate}$

Δ**RoE**^{Leverage}

Δ**RoE**^{Operations}

Source: own processing

Tab. 8: Differences in return on equity between Czech and German companies and their causing factors

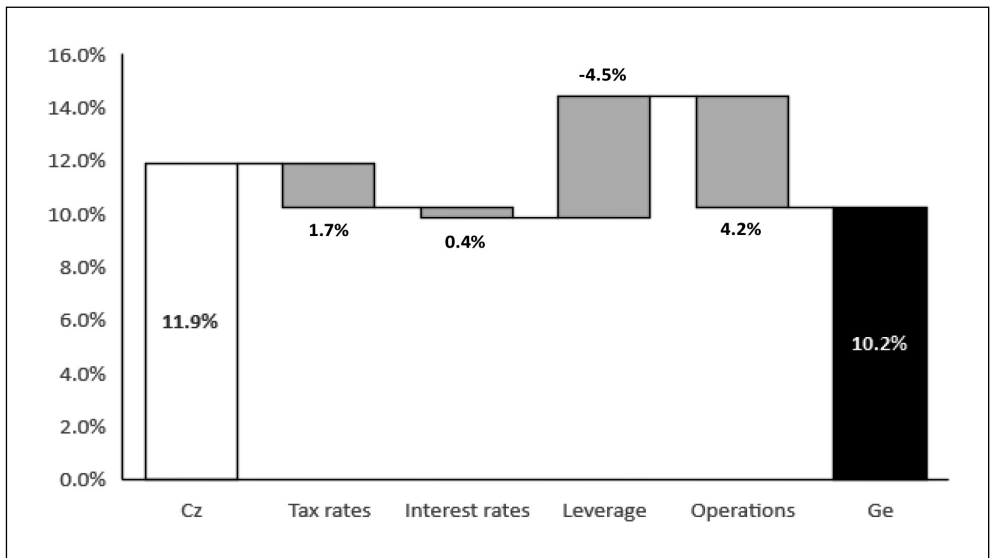| Business sectors	RoE$_{Cz}$	ΔRoE$_{Tax\ rates}$	ΔRoE$_{Interest\ rate}$	ΔRoE$_{Leverage}$	ΔRoE$_{Operations}$	RoE$_{Ge}$
A – Agriculture, forestry and fishing	3.6%	0.5%	0.4%	-0.2%	-2.8%	5.7%
B – Mining and quarrying	9.9%	1.4%	0.0%	-12.9%	-6.4%	27.9%
C – Manufacturing	11.9%	1.7%	0.4%	-4.5%	4.2%	10.2%
D – Electricity, gas, steam and air -conditioning supply	12.2%	1.7%	0.0%	-7.2%	1.4%	16.3%
E – Water supply, sewerage and waste management	5.1%	0.7%	0.6%	-2.0%	-0.5%	6.4%
F – Construction	12.8%	1.8%	0.6%	-10.0%	7.3%	13.2%
G – Wholesale and retail	12.3%	1.7%	0.7%	-2.4%	-3.8%	16.1%
H – Transportation and storage	5.2%	0.7%	0.8%	-1.5%	0.0%	5.3%
I – Accommodation and food service activities	0.5%	0.4%	-1.4%	0.0%	-8.1%	9.7%
J – Information and communication	14.0%	1.9%	0.5%	-3.1%	6.2%	8.4%
L – Real estate activities	2.7%	0.6%	0.6%	0.2%	-1.4%	2.8%
M – Professional, scientific and technical activities	12.5%	1.7%	1.6%	-0.8%	7.2%	2.8%
N – Administrative and support service activities	14.0%	2.0%	0.6%	-15.0%	8.9%	17.4%
P – Education	12.3%	1.7%	1.8%	1.7%	4.0%	3.1%
Q – Human health and social work services	7.3%	1.0%	0.1%	0.1%	4.6%	1.5%
R – Arts, entertainment and recreation	4.8%	0.8%	-0.9%	-0.7%	25.2%	-19.7%
S – Other service activities	11.3%	1.6%	1.1%	0.4%	4.1%	4.2%

Source: own processing

of only 1.7% in the *RoE*. The lower leverage from the debt ratios of Czech corporations, however, reduces their *RoE* by 4.5% compared to German enterprises. Conditions of financing in terms of interest rates are similar and show nearly no influences on *RoE*. Because of the overlapping nature of all these individual effects, the final *RoE* is rather similar for both countries, showing a small advantage for Czech ventures (according to the findings from the European Central Bank, 2015).This fact is therefore in line with a positively defined hypothesis about

the nature of differences in profitability between the Czech and German firms. Fig. 4 illustrates these results for the manufacturing sector, which, however, differ from those of other business sectors.

4. Research Limitations

It goes without saying that all these findings are not free of bias. Even if the coverage in the database is high, the results might not always be completely representative for a specific sector (European Central Bank, 2015). The covered

Fig. 4:   **Variance in RoE for the manufacturing sector (C)**

period of 13 years from 2002 to 2014 might also not present a completely reliable picture, or recent trends could be missed by looking at the average values. However, this is the longest period which is available for both countries in the BACH database so far. Such a restricted sample also limits the reliability of the statistical tests. Since t-test statistics are usually robust, violations of theoretical assumptions might not affect the results too seriously.

Another aspect to be considered with care is that the BACH database provides weighted means of its variables. Therefore, the influence of bigger companies might be strong. Consequently, the results draw a picture of aggregated economies or sectors as a whole, rather than an average of individual firms.

The assumptions made about taxation, which treats all firms as if they were companies, should be considered carefully. However, since the highest volume of business is actually done in both countries using these kinds of legal forms and they predominate in the given database too, it might be an acceptable simplification.

Finally, even if the BACH database provides harmonised accounting information, the influences from the national GAAP still exist (European Central Bank, 2015). Since only fundamental items of balance sheets and income statements are used here, the influences of differing allocations and valuations among these positions should be acceptable. In one specific case an additional correction was made. The BACH income item: 'external supplies and services' (BACH variable I5) is only used in the Czech data. Major parts of this item are recorded in Germany as 'other operating charges' (BACH variable I81). In order to solve this problem, a higher aggregated term for 'external supply' is used here, considering materials, consumables, externally supplied goods and services or other operational charges at the same time (Bach variables I5 + I6 + I81). Other income items, such as staff costs and depreciation and non-operating aspects, are assumed to be comparable. This should also account for allocation aspects in the main items of balance sheets. Differences in valuations of assets and financial debt are not addressed specifically, but should be tolerable.

Tackling all these critical points, the use of the database, once it has grown in size and time, could improve the significance of the results in coming years. Ongoing harmonisation

of the national GAAP will also improve the comparability between countries. This provides an extended target for future research.

Conclusion

National economic policies usually emphasise the aspects of tax rates and labour costs, assuming they are the most important sources of competitive advantages. When comparing the Czech and German economies, these aspects are often seen as significant advantages for Czech enterprises. The study shows that these effects clearly exist, but do not have the greatest impact on the differences in *RoA* or *RoE* in all sectors. German ventures often have a strong advantage in their external sourcing of materials, goods and services, which offsets the lower Czech staff costs to a great extent. Also, the components of other income, outside of the typical production factors, play a remarkable role. Asset turnover, which indicates capacity utilisation, shows, on average, a rather comparable picture, but varies greatly between specific sectors. However, for all these sectors, the DSO (days sales outstanding) ratio is much higher for Czech enterprises. Improvements in receivables management could be an interesting approach to increasing profitability.

Since $\Delta RoA_{Cz\text{-}Ge}$ have positive values for almost all sectors, it indicates systematic operational advantages for Czech firms compared to German ventures. These positive influences from operations logically have a favourable impact on Czech firms' *RoE*. Moreover, the lower tax rates and interest rates provide further advantages to Czech firms. However, these effects are completely offset by the greater amount of debt financing, which is typical for German enterprises in almost all the analysed sectors. This aspect, based on the financial leverage effect, could be used for competitive improvements. Under otherwise equal conditions, Czech ventures could provide higher returns than German ones if they use the same extension of debt financing. On the other hand, the greater financial leverage of German firms increases their exposure to risk. This causes additional pressure in times of economic crises.

The results have given us deeper insights into the economic performance of Czech and German enterprises in individual sectors. Having examined the country-specific driving factors, their contributions to the differences in the typical profitability ratios, i.e., *RoE* and *RoA*, are derived and quantified. This benchmarking addresses important sources of competitive advantages. It uncovers suitable starting points for targeted improvements.

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Abstract

SECTORAL ANALYSIS OF THE DIFFERENCES IN PROFITABILITY OF CZECH AND GERMAN BUSINESS VENTURES – AN EMPIRICAL BENCHMARK STUDY

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Profitability measures are a lens through which business can be viewed and they form a common basis for investment decisions. Especially in areas close to national borders, these decisions could be linked to the question on which side of the border a venture should be located in order to realise country-specific comparative advantages that make the investment more profitable. Differences in profitability between countries are driven by manifold aspects, including specific cost or revenue structures, financing patterns and conditions, as well as taxation. The aim of this study is to identify the driving factors behind differences in profitability of Czech and German firms on the basis of a comparative analysis. In this article, a two-step variance analysis is conducted. The first step focuses on the operational differences in RoA between Czech and German ventures, which is based on deeper analyses of the asset turnover and the profit margin. In the second step, the differences in RoE are analysed, considering influences from national taxation, conditions and patterns of financing and operations of the ventures. A model-based cumulative variance analysis quantifies the impacts of these underlying drivers of profitability with a comparative focus. For this reason, the average measures of these drivers from 2002 to 2014 – the longest time series available for both countries − are extracted from the BACH database, which provides harmonised accounting information. This paper confirms the hypothesis that specific drivers of profitability differ significantly between the two countries in certain business sectors and would cause substantial differences in profitability. Due to the overlapping nature of these individual effects, they compensate each other to a great extent. The results provide useful benchmarks that a company´s management can use to increase its profitability tackling specific comparative (dis-)advantages between the Czech Republic and Germany.