

Impact of Mergers of Czech Companies on their Profitability and Returns¹

Petr VALOUCH* – Maria KRÁLOVÁ** – Jaroslav SEDLÁČEK*

Abstract

The aim of this paper is to assess whether mergers of companies in the Czech Republic affect the profitability and returns of merged companies in the period of three years after the merger. The analysis is based on a sample of over 300 Czech companies implementing mergers in 2001 – 2010. This sample was created using data from the Trade Bulletin and Trade Register of the Czech Republic. The analysis used basic statistical tests verifying the statistical significance of the particular explored indicators of merging and merged companies three years after the merger in relation to the same indicators at the moment of merger. The explored indicators were net earnings after taxes (EAT), return on assets (ROA) and return on equities (ROE). The period of three years after the merger was chosen due to the reduced influence of some accounting methods requiring revaluation or exclusion of some assets from the balance sheet of the merged company.

Keywords: mergers, earnings after taxes, return on assets, return on equities, effects of mergers, statistical tests

JEL Classification: G34

Introduction

Evaluations of efficiency and economic impacts of mergers have been gaining in significance recently and have become a subject of a number of economic studies, e.g. (Lang, 2003; Weech-Maldonado, 2002). Recent studies have also

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researched the factors affecting efficiency of mergers and their economic impacts as well as the relations between merger development trends and particular microeconomic and macroeconomic factors (Dorata, 2012; Komlenovic, Mamun and Mishra, 2011; Marks, 1997; Vu, Shi and Hanby, 2009). Other studies are commenting economic and accounting issues resulting to very difficult comparability between financial statements based on different accounting, valuation and consolidation methods (Bohušová and Svoboda, 2010; Steker and Otrusínová, 2012; Sedláček, 2010) with possible inaccuracy of the results of domestic and cross-border mergers evaluation. However, no deeper analysis of economic effects of mergers has been done for the Czech Republic, especially due to the complicated access to data on the numbers and economic results of mergers. Just recently two basic studies evaluating economic impacts of mergers in the Czech Republic have been published (Valouch and Králová, 2012; Valouch, Konečný and Králová, 2013). But analysis of economic impacts of mergers from owners point of view is still missing.

Merger can be defined as a process in which one or more companies cease to exist and their assets are taken by the legal successor that already exists or arises as a new subject as a result of the merger (Skálová, 2015). Mergers in the Czech Republic are primarily regulated by Act no. 125/2008 Coll., on transformations of trading companies and cooperatives and by Act. No. 89/2012, Civil Code. This regulation differentiates two basic types of mergers: a merger while no new company is formed and a merger while a new company is formed. The under-mentioned data show that the more frequent type of a merger in the Czech Republic is the one in which no new company is formed, i.e. the one in which not all merging companies cease to exist legally but at least one of them continues being active. This type of a merger is administratively simpler, as in the other type of a merger all merging companies cease to exist and a completely new company is formed. Especially cross-border mergers are then regulated by Tenth Directive of the European Parliament and Council No. 2005/56/EC on cross-border mergers.

Mergers are usually based on certain economic motives. The main motives of mergers in the Czech Republic are administration simplification, tax optimization, operational synergy, unification of control structures, stronger market position, simplification of ownership relations and better access to loans (Sedláček, Hýblová and Valouch, 2015).

The expected economic effects of mergers include (Kocmanová and Šimberová, 2011) better profitability and returns of the continuing companies, decrease in costs caused among others by usage of synergic effects, gaining a higher market share, etc. The conducted statistical analysis aimed to ascertain whether these

expected goals, in this case the increase in profitability and returns of merged companies, are met. The analysis was based on accounting and economic data of companies with headquarters in the Czech Republic merging in 2001 – 2010.

1. Aim and Methodology

The aim of this paper is to assess whether mergers of companies in the Czech Republic influence the profitability and returns of merged companies in the period of three years after the merger. Primarily we analyse this aspect of mergers from the point of view of owners of merging and merged companies who are interested especially in earnings after taxes of merging and merged companies. The period of three years was chosen due to the reduced influence of some accounting methods requiring revaluation or exclusion of some assets from the balance sheet of the merged company and other accounting and taxation modifications and also because we can expect that the three-year-long period is sufficient for short-term effects of the merger, such as the setting of new company processes in the merged company, to have ceased. These occur immediately after a merger and can substantially affect the evaluation of economic parameters of the merger during its preparation and immediately after its implementation. The analysis is based on a sample of over 300 Czech businesses merging in 2001 – 2010. The sample was created using data from the Trade Bulletin and Trade Register of the Czech Republic. These publicly available sources showed that there were 2,396 mergers of business entities in the Czech Republic between 2001 and 2010 (the mergers implemented by non-profit or other entities were excluded). Out of the total number, 2,255 mergers were those in which no new company is formed and only 141 mergers were of the type in which a new company is formed. However, the key data for our analysis were financial statements of the merging companies as of the decisive day (or the day proceeding the decisive day) and financial statements of the merged company 3 years after the decisive day. Although these accounting entities are obligated to publish their financial statements in compliance with Article 21a of Act No. 563/1991 Coll., on accounting, by submitting them to the collection of documents of the Trade Register, only 314 companies, i.e. only 14% of the companies, met this condition in all the demanded years. Two more companies had to be excluded from the analysis of profitability and six more had to be excluded from the analysis of returns due to some data missing from their financial statements. Therefore, 312 or 308 merging companies were analysed. We have to note that this fact needs to be taken into account when interpreting the following conclusions. When interpreting the p-values of undermentioned tests it is essential to bear in

mind the fact that the sample of 312 (308) companies cannot be considered completely random as it exclusively consists of the merging companies that published their financial statements in compliance with the act on accounting in all 4 demanded periods. The included companies had average value of owner's equity in the moment of merger 44.7%, after three years after the merger the value of owner's equity increased at level 51.5%.

As regards the actual statistical assessment of the effect of mergers on profitability and returns of merged companies 3 years after the merger, we proceeded in three steps. First, we looked for an answer to the question whether a merger affects the value of profitability and returns of the merged company 3 years after the merger regardless of the size of companies. Profitability of the merging and merged companies were represented by earnings after tax (EAT);² returns were evaluated in relation to the total capital (indicator return on assets – ROA calculated as earnings before interests and taxes – EBIT/total assets) and then in relation to equity (indicator return on equity – ROE calculated as earnings after taxes – EAT/Owner's equity). Second, we tried to answer whether a merger effect on the value of profitability and returns of the merged company 3 years after the merger is influenced by the size of the merged company. Third, we explored the question whether the merger effect on the value of profitability and returns of merged companies 3 years after the merger appeared in levels based on size. For these purposes, the merged companies were divided into four categories: *mini* companies with the value of total assets up to 20 million CZK, *small* companies with the value of total assets over 20 million CZK but 100 million CZK at maximum, *medium* companies with the value of total assets over 100 million CZK but up to 500 million CZK, and *large* companies with the value of total assets over 500 million CZK. Due to the small amount of companies within categories *mini* and *small*, these were united into one category (hereinafter referred to as *small*). All statistical tests were conducted at the statistical significance level $\alpha = 5\%$.

With regard to the homogeneity of the sample, we are also aware of other factors that may affect the effect of the merger on the individual financial ratios used in our analysis. However, having the number of cases we did not find beneficial to stratify the whole sample with regard to considered factors – it would lead both to too small subsamples and also fragmented minor models that would not be comprehensively interpretable. The purpose of our research was to outline the main trends and the mentioned factors were covered by random effect terms. In subsequent research, we consider a model that will have other possible factors affecting an effect of the merger under control.

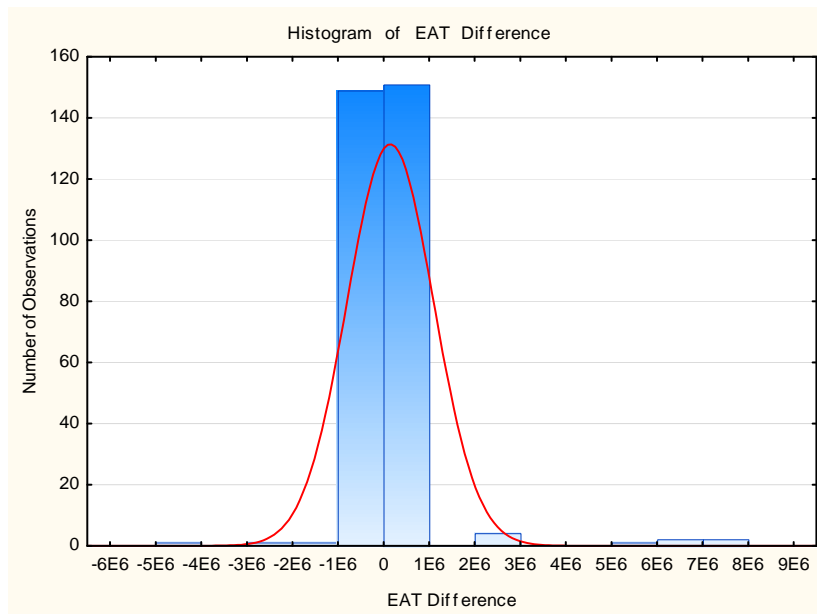
² For comparison with the results of an analysis of profitability of merged companies based on the EBIT indicator see Valouch, Konečný and Králová (2013).

2. Results (Effect of Mergers on EAT of Merged Companies)

At the first stage, the impact of mergers on the amount of net profit after tax was analysed for all the included companies, i.e. regardless of the size of the merged companies. As we have found a significant violation of normality assumption of analysed data, we could not use parametric tests for the actual analysis. Because the histogram of variable *EAT three years after a merger minus EAT of the merging companies as of the decisive day* indicates a symmetric density, we could use the Wilcoxon matched pairs test.

Figure 1

Histogram of the Difference EAT 3 Years after the Merger – EAT as of the Merger Day



Source: Authors' work and calculations.

The following hypothesis was formulated and tested using the Wilcoxon matched pairs test:

H_0 : The merger has no effect on the value of EAT of the merged company.

against

H_1 : The EAT value of the merged company 3 years after the merger is larger than the sum of EAT of the merging companies as of the decisive day (moment of merger).

The results of the Wilcoxon matched pairs test are presented in the Table 1.

Table 1

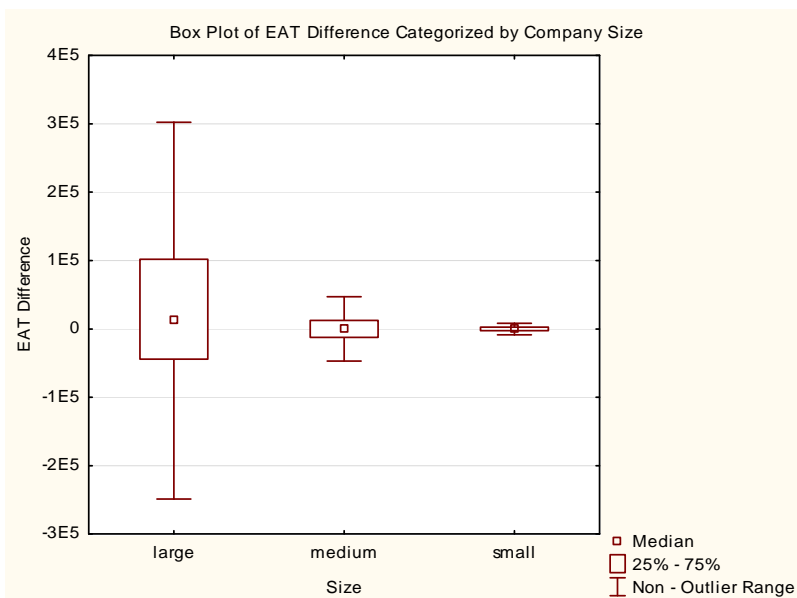
The Results of the Wilcoxon Matched Pairs Test for EAT

Pair of Variables	Wilcoxon Matched Pairs Test Marked test are significant at $p < .05000$			
	Valid N	T	Z	p-value
EAT; EAT after 3 years	312	22 072.00	1.468598	0.141943

Source: Authors' work and calculations.

The results show that the value for the two-tailed test is 0.1419. At the significance level 5% a significant effect of a merger on EAT of merged companies three years after the merger was not proved. The p value of the one-tailed test that the merger increased is $p = 0.0710$. Also in this case, the Wilcoxon test did not prove at the significance level $\alpha = 5\%$ that a merger led to a statistically significant increase in EAT of merged companies three years after the merger. However, as the value of p is relatively low, close to the significance level of 5%, we can conclude that a merger probably has a positive effect on EAT.

Figure 2

The Box Plot of EAT 3 Years after the Merger minus EAT as of the Merger Day Categorized by the Size of Merging Companies

Source: Authors' work and calculations.

At the second stage of the analysis, we explored whether the effect of a merger on the value of EAT of a merged company 3 years after the merger is influenced by the size of the merged company. Also in this case we rejected the assumption

of data normal distribution for each of the three company categories based on size and non-parametric tests had to be used. The box plot on the Figure 2 shows that the difference between EAT 3 years after a merger and EAT as of the merger day has similar medians for small and medium companies, the median for large companies is slightly higher and the variability for the large companies is the highest.

The following hypothesis was then tested using the Kruskal-Wallis test:

H_0 : The size of the company does not influence the merger effect on EAT 3 years after the merger.

against

H_1 : The size of the company influences the merger effect on EAT 3 years after the merger.

The Kruskal-Wallis test results are presented in the Table 2.

Table 2

The Results of Kruskal-Wallis Test for EAT Difference

Kruskal-Wallis ANOVA by Ranks; EAT difference				
Independent (grouping) variable: size				
Kruskal-Wallis test: H (2, N = 312) = 2.380152 p = .3042				
<i>Dependent: EAT difference</i>	<i>Code</i>	<i>Valid N</i>	<i>Sum of ranks</i>	<i>Mean rank</i>
Small	1	74	11 186.00	151.1622
Medium	2	119	17 827.00	149.8067
Large	3	119	19 815.00	166.5126

Source: Authors' work and calculations.

As the Table 2 shows, the Kruskal-Wallis test did not prove at the significance level $\alpha = 5\%$ that the merger effect on the value of EAT depends on the size of the company ($p = 0.3042$). The achieved results were also compared with the median test: its results are presented in the Table 3.

Table 3

The Results of the Median Test

Median Test, Overall Median = 220.000; EAT difference				
Independent (grouping) variable: size				
Chi-Square = 1.713377 df = 2 p = .4246				
<i>Dependent: EAT difference</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>Total</i>
<= Median: observed	40.0	62.0	54.0	156.0
expected	37.0	59.5	59.5	
obs. – exp.	3.0	2.5	-5.5	
> Median: observed	34.0	57.0	65.0	156.0
expected	37.0	59.5	59.50	
obs. – exp.	-3.0	-2.5	5.5	
Total: observed	74.0	119.0	119.0	312.0

Source: Authors' work and calculations.

Neither the median test proved that the merger effect on EAT depends on the size of the company and thus the results are in agreement with the results of the Kruskal-Wallis test.

At the last step, we tested the particular company categories based on size (categories of large, medium and small companies based on the volume of their total assets). We used the Wilcoxon matched pairs test and tested a similar hypothesis as in the case of the entire sample of companies; just this time divided into size categories. The key results of the Wilcoxon matched pairs right-tailed test are presented in the Table 4.

Table 4

The Results of the Wilcoxon Matched Pairs Test for EAT by Company Size Categories

	Wilcoxon Matched Pairs Test	
	<i>Number of valid</i>	<i>p-value</i>
Small companies	74	0.4263
Medium companies	119	0.3934
Large companies	119	0.05761

Source: Authors' work and calculations.

Even when the sample of analysed companies was divided based on their size, the Wilcoxon test did not prove that a merger increases the value of EAT 3 years after the merger when compared with EAT of the merging companies at the moment of merger in any of the size categories. However, in the case of large companies the p-value is close to 0.05, it means that the statistical significance of EAT value increase in this company category was not proved at the significance level $\alpha = 5\%$ only very closely. For this reason, we can assume that large companies are helped by a merger as regards a positive effect on their EAT. Should the main reason for a merger be an increase in the company's net profit after taxation, we can say that a merger can be recommended to large companies. On the other hand, a positive effect on the value of EAT 3 years after a merger was not proved for the categories of small and medium companies; therefore, from the perspective of this indicator, we would not recommend a merger to these companies.

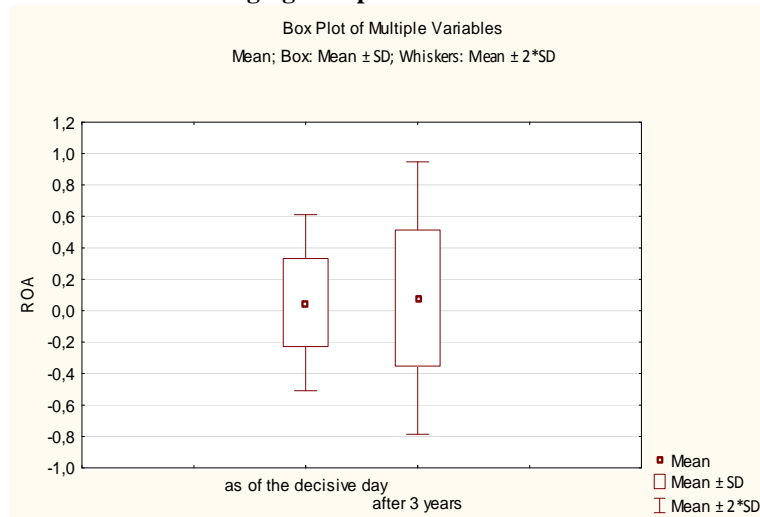
3. Results (Effect of Mergers on ROA of Merged Companies)

Besides the effect of mergers on EAT of merged companies, we tested the merger effect on the value of return on assets of merged companies 3 years after the merger in relation to the return on assets of merging companies at the moment of merger. The number of analysed merged companies was 308 (financial

statements of four companies had data missing or outliers). The box plots on Figures 3 and 4 show that the mean and the median of ROA three years after a merger increased slightly.

Figure 3

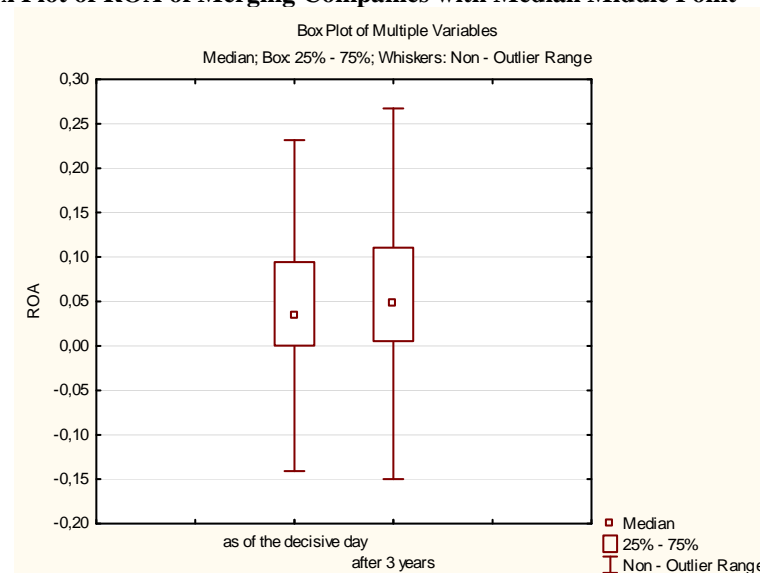
The Box Plot of ROA of Merging Companies with Mean Middle Point



Source: Authors' work and calculations.

Figure 4

The Box Plot of ROA of Merging Companies with Median Middle Point



Source: Authors' work and calculations.

The Wilcoxon matched pairs test was used for the actual statistical analysis verifying the significance of the increase because even in this case the assumption of data normal distribution was not met and parametric tests could not be used. The following hypothesis was formulated:

H_0 : A merger does not affect the value of ROA of the merged company.
against

H_1 : A merger increases the value of ROA of the merged company 3 years after the merger.

The results of the Wilcoxon matched pairs test are presented in the Table 5.

Table 5

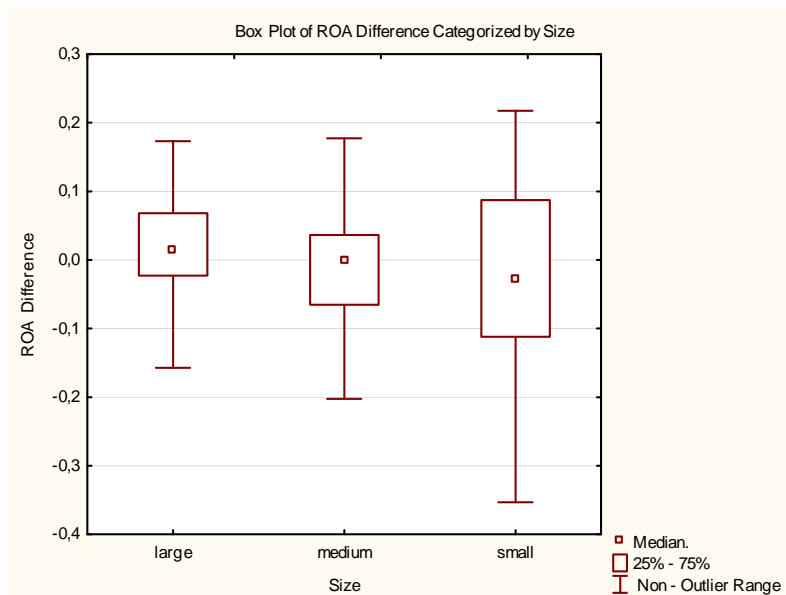
The Results of the Wilcoxon Matched Pairs Test for ROA of All Companies, Two-tailed Alternative

Pair of Variables	Wilcoxon Matched Pairs Test			
	Valid N	T	Z	p-value
ROA; ROA after 3 years	308	23 638.00	0.099092	0.921065

Source: Authors' work and calculations.

Figure 5

The Box Plot of ROA Differences Categorized by the Size of Merging Companies with Median Middle Point



Source: Authors' work and calculations.

The p-value for the hypothesis that the ROA after a merger increased is $p = 0.92/2 = 0.4605$, i.e. again insignificant. The Wilcoxon test of the sample of all companies did not prove that a merger affects the increase in the ROA in the period of 3 years after the merger. Next, we explored whether the merger effect on ROA of a merged company is influenced by the size of the company in question. To evaluate this we again used the Kruskal-Wallis test of the following hypothesis:

H₀: The company size does not influence the merger effect on ROA of the merged company 3 years after the merger.

against

H₁: The company size influences the merger effect on ROA of the merged company 3 years after the merger.

The box plot on Figure 5 of the medians of ROA differences divided based on company size indicates that there is no significant difference between small, medium and large companies – all three medians are close to zero.

The graph is supplemented by the following descriptive statistics.

Table 6

Descriptive Statistics of Differences in ROA of Merging Companies by Size

		Size = large Descriptive statistics					
Variable	Valid N	Mean	Median	Minimum	Maximum	Quartile Range	Std. dev.
ROA difference	117	0.014094	0.013900	-0.739367	1.556066	0.090970	0.191361
		Size = medium Descriptive statistics					
Variable	Valid N	Mean	Median	Minimum	Maximum	Quartile Range	Std. dev.
ROA difference	117	0.034538	-0.000896	-0.854819	6.768163	0.1018463	0.644804
		Size = small Descriptive statistics					
Variable	Valid N	Mean	Median	Minimum	Maximum	Quartile Range	Std. dev.
ROA difference	74	0.041016	-0.028286	-2.070214	4.100864	0.199237	0.612792

Source: Authors' work and calculations.

The tables show that the medians of differences in ROA are very similar in all the three categories and close to zero. A possible interpretation is that a merger did not change anything important concerning the ROA of these companies for any of the size categories. There was a slight increase in the category of large companies; small and medium companies manifested a slight decrease.

The assumption of the insignificance of company size influence on the merger effect was then tested using the Kruskal-Wallis test, which really did not show any influence of the size; the p-value is $p = 0.1019$ (see Tab. 7).

Table 7

The Results of the Kruskal-Wallis Test for ROA Difference

Kruskal-Wallis ANOVA by Ranks; ROA difference Independent (grouping) variable: size Kruskal-Wallis test: $H(2, N = 308) = 4.567487$ $p = .1019$				
<i>Dependent: ROA difference</i>	<i>Code</i>	<i>Valid N</i>	<i>Sum of ranks</i>	<i>Mean rank</i>
Small	1	74	10 732.00	145.0270
Medium	2	117	17 159.00	146.6581
Large	3	117	19 695.00	168.3333

Source: Authors' work and calculations.

Because the p-value of the Kruskal-Wallis test is relatively small, though greater than 0.05 we continued exploring the merger effect on ROA separately for small, medium and large companies.

For that reason the last part of the analysis of the merger effect on ROA of merged companies was an analysis of the particular company categories based on size. Again we tested the following hypothesis:

H_0 : A merger does not affect the ROA of large (medium, small) companies three years after.

against

H_1 : The ROA of large (medium, small) companies is higher three years after a merger than the ROA of the merging companies at the moment of merger.

Also in this case, all assumptions for application of the Wilcoxon matched pairs test were met (the assumption of continuous distribution in all categories, the assumption of symmetry around the median); the results of the test are presented in the Tables 8, 9 and 10.

Table 8

The Results of the Wilcoxon Matched Pairs Test for ROA of Large Companies

Size = large Wilcoxon Matched Pairs Test Marked test are significant at $p < .05000$				
<i>Pair of Variables</i>	<i>Valid N</i>	<i>T</i>	<i>Z</i>	<i>p-value</i>
ROA; ROA after 3 years	117	2 672.00	2.120088	0.033999

Source: Authors' work and calculations.

The results presented in Table 8 indicate that the p-value for the two-tailed alternative is about 0.034; we can say that we were able to prove a significant effect of a merger on the return on assets of large companies 3 years after the

merger (when compared with the return on assets of merging companies at the moment of merger) at the significance level $\alpha = 5\%$. The p-value of the one-tailed alternative is 0.017, which means that the significant increase in return on assets 3 years after the merger was proved for large companies at the significance level $\alpha = 5\%$. We can conclude that the companies categorized as large within the sample were able to increase their economic efficiency significantly within 3 years after the merger. On the other hand, the Wilcoxon test did not prove a significant effect of a merger on the ROA of medium and small companies at the significance level $\alpha = 5\%$, as shown in the two Tables 9 and 10.

Table 9

The Results of the Wilcoxon Matched Pairs Test for ROA of Medium Companies

	Size = medium Wilcoxon Matched Pairs Test Marked test are significant at $p < .05000$			
<i>Pair of Variables</i>	<i>Valid N</i>	<i>T</i>	<i>Z</i>	<i>p-value</i>
ROA; ROA after 3 years	117	3 136.00	0.858098	0.390839

Source: Authors' work and calculations.

Table 10

The Results of the Wilcoxon Matched Pairs Test for ROA of Small Companies

	Size = small Wilcoxon Matched Pairs Test Marked test are significant at $p < .05000$			
<i>Pair of Variables</i>	<i>Valid N</i>	<i>T</i>	<i>Z</i>	<i>p-value</i>
ROA; ROA after 3 years	74	1 263.000	0.670711	0.502405

Source: Authors' work and calculations.

The results show that a merger does not help increase efficiency of property use for medium and small companies within 3 years after the merger, while study (Lang, 2003) ascertained that in small companies the total assets increase significantly 3 years after the merger. The results of this study prove that small companies cannot use the increase in assets to increase their returns.

4. Results (Effect of Merger on ROE of Merged Companies)

The owners of merged companies are interested not only in the total production efficiency of the company represented by the ROA indicator, but also the return on equity which more closely represents the ability of the company to return on investments from the owners' point of view. For this reason, the analysis also includes the evaluation of merger impacts on the return on equity (ROE).

First, the merger effect on ROE of merged companies 3 years after the merger was tested regardless of the size of the companies, then we tested the categories of companies based on the size of their total assets.

Table 11

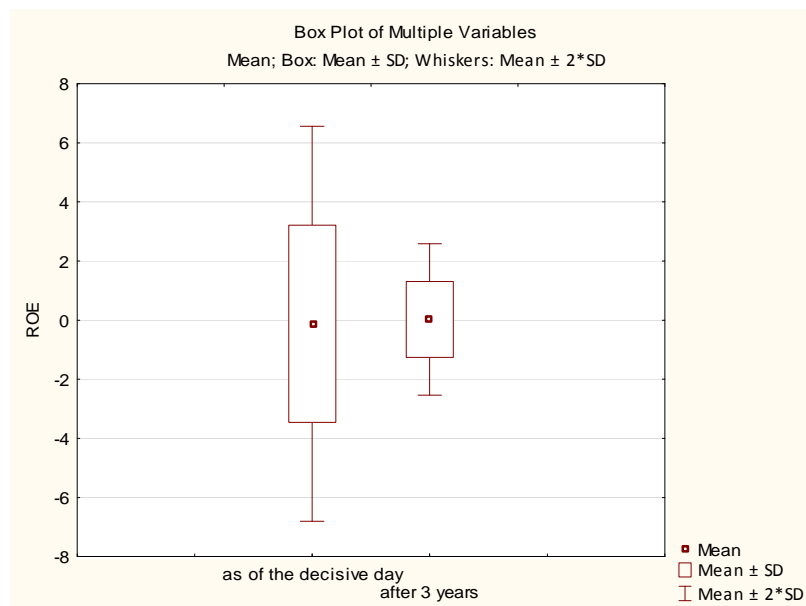
Descriptive Statistics of the Differences in ROE of Merging Companies Regardless of their Size

Variable	Descriptive Statistics						
	Valid N	Mean	Median	Minimum	Maximum	Quartile Range	Std. dev.
ROE	311	-0.119762	0.047765	-51.0083	12.50000	0.200571	3.341622
ROE after 3 years	308	0.027693	0.098434	-13.2500	4.23077	0.205937	1.280845
ROE difference	308	0.144464	0.015298	-14.8689	51.26842	0.277732	3.627764

Source: Authors' work and calculations.

Figure 6

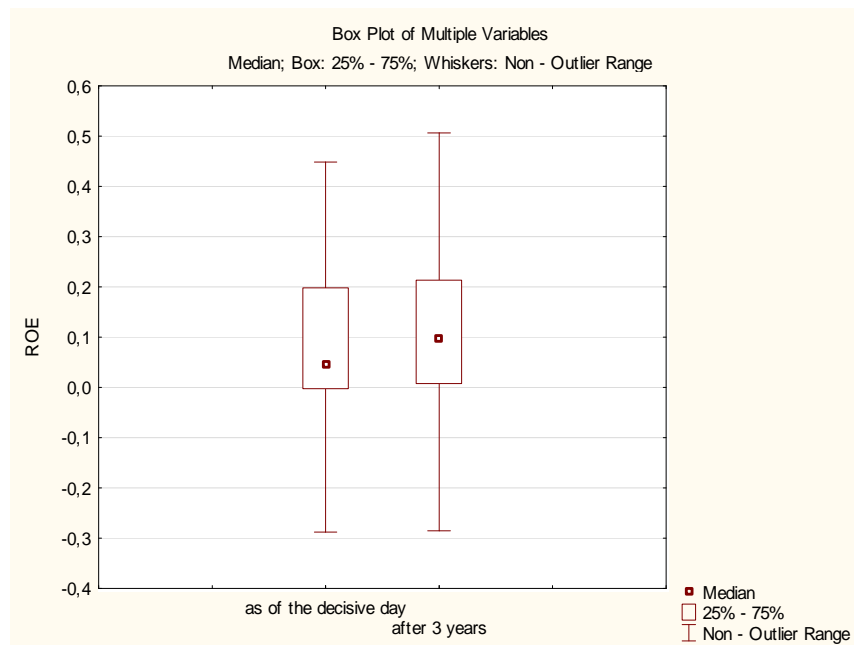
The Box Plot of ROE of Merging Companies with Mean Middle Point



Source: Authors' work and calculations.

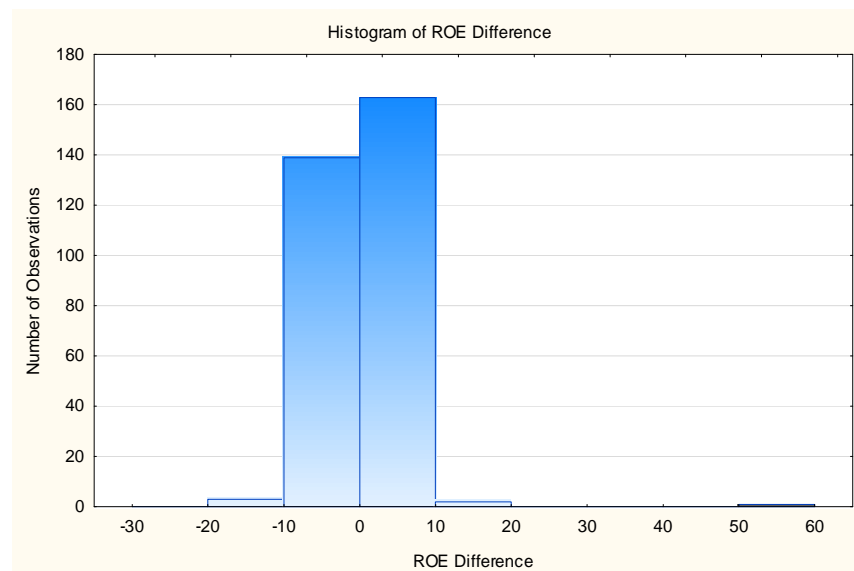
The presented table and box plots above show that the mean and the median of ROE rose slightly three years after mergers. Also in this case we found out that the distribution of differences in ROE 3 years after the merger and the merger date is not normal and non-parametric tests had to be used. However, the histogram of the ROE differences is not symmetrical, as shown in Figure 8 and thus the Wilcoxon matched pairs test could not be used.

Figure 7
The Box Plot of ROE of Merging Companies with Median Middle Point



Source: Authors' work and calculations.

Figure 8
Histogram of the Difference in ROE



Source: Authors' work and calculations.

Therefore, the sign test was used. The following hypothesis was formulated:

H_0 : A merger does not affect the ROE of merged companies.

against

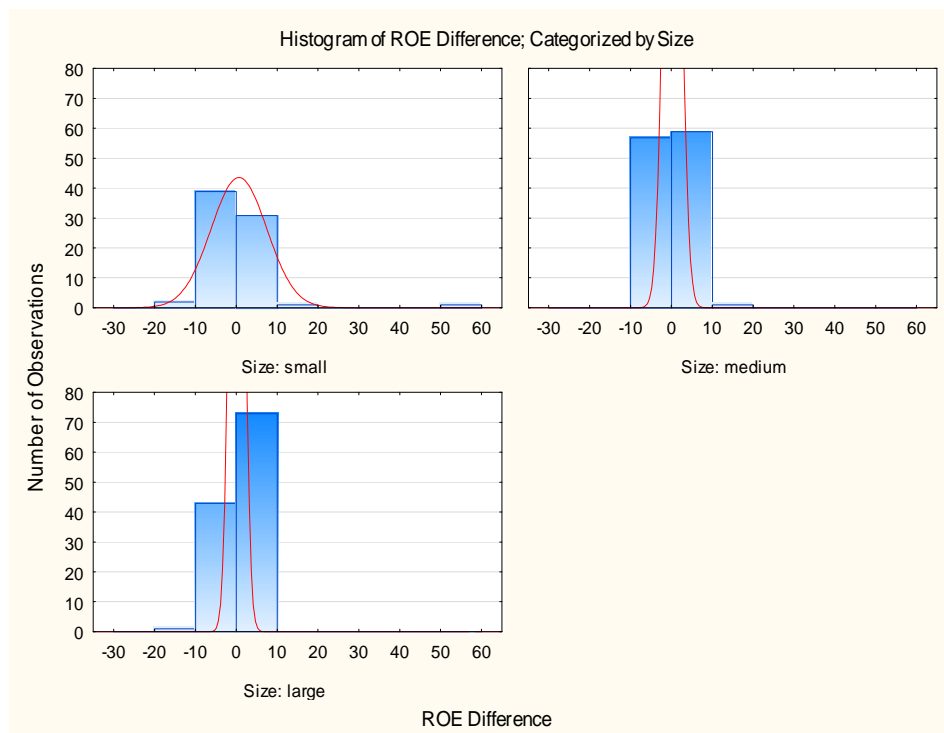
H_1 : The ROE of a merged company is higher 3 years after a merger than the ROE of merging companies as of the moment of merger.

The conducted paired sign test did not prove that a merger leads to a statistically significant increase in ROE. The p-value was 0.09496. It means, a statistically significant increase in ROE was not proved at the significance level $\alpha = 5\%$, although the p-value is relatively low, which leads us to the assumption that mergers within the analysed sample of Czech companies may contribute to increasing ROE.

In the second step, we tested the assumption that the merger effect on the ROE is influenced by the size of the company measured by the value of total assets. Also in this case the assumption of normal distribution was rejected for all size categories and thus non-parametric tests had to be used. The shapes of histograms for particular size categories are presented in the Figure 9.

Figure 9

Histograms of Differences in ROE of Merged Companies Based on their Size



Source: Authors' work and calculations.

Because these histograms are not symmetrical, we used the median test for the evaluation of the merged company size influence on the merger effect on ROE. Within the test, the following hypothesis was formulated:

H_0 : The company size does not influence the merger effect on ROE of the merged company.

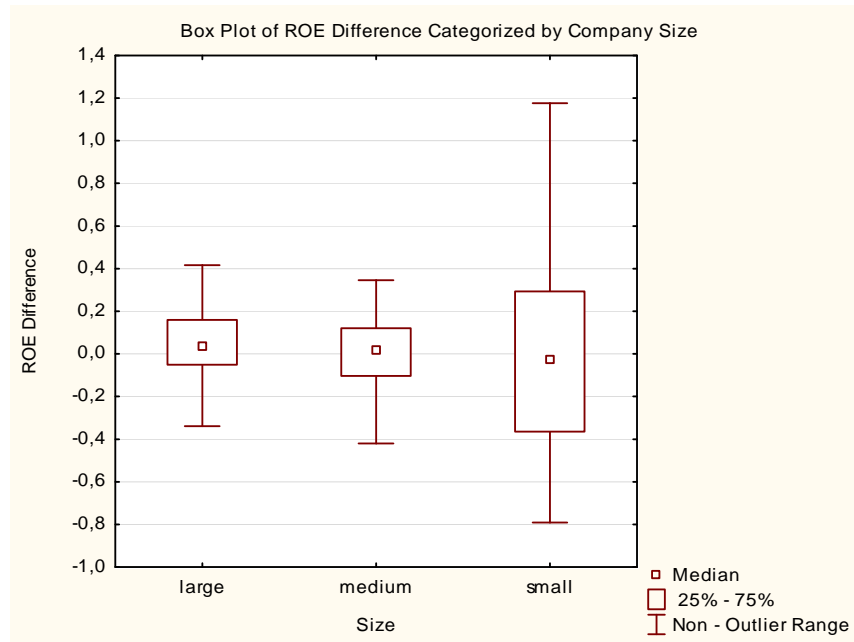
against

H_1 : The company size influences the merger effect on ROE of the merged company 3 years after the merger.

The Figure 10 and Tables 12 and 13 show descriptive statistics and the results of the median test for ROE.

Figure 10

The Box Plot of ROE Differences Categorized by the Size of Merging Companies



Source: Authors' work and calculations.

The graphs and tables show that as regards medians of ROE differences, large companies achieved the best results: the median of ROE difference between the moment of merger and three years after the merger is the highest. The worst result was achieved by small companies. However, the result of the median test (p -value = 0.1286) indicates that the differences between ROE of the particular size categories are not statistically significant at the significance level $\alpha = 5\%$. It means that the merger effect on ROE does not depend on the size of the company.

However, as the p-value of the median test is relatively low, we continued exploring the merger effect on the ROE as divided into small, medium and large companies.

Table 12
Descriptive Statistics for Individual Company Size Categories

		Size = large Descriptive Statistics					
Variable	Valid N	Mean	Median	Minimum	Maximum	Quartile Range	Std. dev.
ROE difference	117	-0.011968	0.036400	-12.3375	4.136056	0.210444	1.503084

		Size = medium Descriptive Statistics					
Variable	Valid N	Mean	Median	Minimum	Maximum	Quartile Range	Std. dev.
ROE difference	117	0.084194	0.016974	-5.72373	18.59173	0.223628	1.886823

		Size = small Descriptive Statistics					
Variable	Valid N	Mean	Median	Minimum	Maximum	Quartile Range	Std. dev.
ROE difference	74	0.0487089	-0.024816	-14.8689	51.26842	0.657694	6.777586

Source: Authors' work and calculations.

Table 13
The Results of the Median Test for ROE

Median Test, Overall Median = .015298; ROE difference Independent (grouping) variable: size Chi-Square = 4.101640 df = 2 p = .1286				
Dependent: ROE difference	Small	Medium	Large	Total
<= Median: observed	44.0	58.0	52.0	154.0
expected	37.0	58.5	58.5	
obs. - exp.	7.0	-0.5	-6.5	
> Median: observed	30.0	59.0	65.0	154.0
expected	37.0	58.5	58.5	
obs. - exp.	-7.0	0.5	6.5	
Total: observed	74.0	117.0	117.0	308.0

Source: Authors' work and calculations.

Thus in the last part of the analysis of merger effect on the ROE of merged companies, the companies were again divided into the size categories based on the value of total assets of the merged company. The sign test was used due to the asymmetry of histograms. The following hypothesis was formulated for each of the size categories:

H_0 : A merger has no effect on the ROE of large (medium, small) companies.
against

H_1 : The ROE of the merged company 3 years after the merger is higher than the ROE of the merging companies at the moment of merger.

The resulting p-values of the sign right-tailed test for particular size categories of merged companies are presented in the Table 14.

Table 14

The Results of the Sign Test of the ROE for Individual Size Categories of Merged Companies

Size category	The resulting one-tailed p-values of the sign test
Large companies	0.00467
Medium companies	0.4267
Small companies	0.8523

Source: Authors' work and calculations.

The results of the sign test prove that at the significance level $\alpha = 5\%$ mergers lead to a statistically significant increase in the ROE three years after a merger for large companies only (when compared with the ROE of merging companies at the moment of merger). On the other hand, a statistically significant increase in the ROE of merged medium and small companies within three years after the merger was not proved when compared with the ROE of merging companies at the moment of merger.

Conclusion

The statistical analysis performed for the sample of 308 merged companies with headquarters in the Czech Republic in which mergers were implemented in 2001 – 2010 ascertained at the significance level $\alpha = 5\%$ that 3 years after a merger there is no statistically significant increase in net earnings after taxes (EAT) in any of the company size categories as compared with the value of EAT of merging companies at the moment of merger. However, a significant increase in EAT 3 years after a merger was not proved only closely for large companies by the Wilcoxon matched pairs test; therefore, for these companies we can consider a possible positive impact of mergers on EAT. As regards the statistical analysis of merger effect on the return on assets (ROA) of merged companies, a statistically significant increase in ROA of merged companies 3 years after the merger when compared with the ROA of merging companies at the moment of merger was found for large companies at the significance level $\alpha = 5\%$. This leads us to the conclusion that large companies were able to increase the

efficiency of their use of invested capital, although further results show that the increase is not substantial. Large companies can probably use synergic effects of mergers better which leads to an increase in returns of their business activities. There was no statistically significant increase in returns on assets in medium and small companies; with respect to descriptive statistics of small and medium companies it seems that mergers do not help these company size categories and even decrease their returns. Should the main motive for a merger be the increase in business activity efficiency measured by the returns on assets, a merger could not be recommended to small and medium companies. On the other hand, a merger can be a contribution for large companies. Analogical conclusions were also reached based on the analysis of merger effect on the returns on equities of merged companies. Also in this case a statistically significant increase in returns on equity of merged companies 3 years after a merger was proved at the significance level = 5% for large companies only. Thus we can state, based on the analysed sample of companies merging in the Czech Republic in 2001 – 2010 and the returns on equity that mergers are the most profitable for large companies. In contrast, mergers are not profitable for small and medium companies from the perspective of returns on equities and thus increase in profitability for company owners.

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