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THE IMPACT OF MINIMUM WAGE ON AUTOMOTIVE COMPANIES' PERFORMANCE

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ABSTRACT

This paper aims to verify the relationship between minimum wage growth and the financial indicators of automotive companies. As a hi-tech sector, the automotive industry is usually not expected to be affected by minimum wage policies. The introduction of the minimum wage in Germany and the dynamic development of the minimum wage in Eastern European countries make it possible to assess this relationship. German, Czech, Polish, and Slovak automotive company data was obtained from the Orbis database. Panel regression models were applied to test for dependencies. The paper detects the association between the growth of the minimum wage and the increase in personnel cost, which is next to the associations with several financial indicators at the company level. The identified impact is specific to small and medium-sized companies.

Keywords: automotive sector, company financial indicators, nominal minimum wage, panel regression model

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INTRODUCTION

The strategy of the traditional Western European carmakers in recent decades has been to relocate their manufacturing activities to Eastern Europe. This process has included the acquisition of traditional Eastern European car manufacturers, the creation of greenfield factories in Eastern Europe, and changes within the supply chain driven by the need to involve local automotive component suppliers. An appropriate illustration is provided by Adascalitei and Guga (2020), who discussed the

relationship between Renault and Dacia. Relatively low wages in the target countries played a significant role in this process (Jurgens & Krzywdzinski, 2008). The wage differential between Western and Eastern European countries is still high, but there is intense pressure for wage increases in Eastern Europe. One of the factors causing wage inflation is minimum wages. There has been synchronization within the EU, which requires minimum wage increases, causing differences between Member States. The EU's Directive on a fair minimum wage is just being implemented (European Parliament, 2022).

The impact of minimum wage policies on overall salary dynamics and country-specific wage distributions in the automotive industry is crucial for cost engineers who aim to predict the costs of carmakers' internal and supplier manufacturing processes for targeted manufacturing locations. Even if it might seem that a minimum wage does not impact the automotive industry of high-cost countries such as Germany, country region-specific wage structures can be utilized to underline the argument that there could be impacts on enterprise-specific personnel costs and profitability factors. Rossi (2020) created a concept to generate a country-region-specific salary spectrum to facilitate estimates of gross annual salaries for different qualification levels of indirect labor within an automotive supplier plant. A similar spectrum is embedded within Table 1 by utilizing forecasts from the Federal Statistical Office of Germany based on 2022 data. Comparing these wages with the minimum wage of 12 EUR/hour in 2022 appears to be a valid argument that changes in the national minimum could generate impacts on the cost and profitability factors of small German automotive suppliers.

Table 1: Salary spectrum (average wages in EUR per hour) of small automotive suppliers in Saxony and Saarland in 2022, when the minimum wage was set to 12 EUR per hour.

		Saxony (Eastern Germany)		Saarland (Western Germany)	
Occupation	**Level of education**	**Females**	**Males**	**Females**	**Males**
Technician	Higher Secondary	20.78	22.86	23.35	25.69
Office clerks	Secondary	17.69	19.46	19.88	21.87
Toolmakers	Secondary	16.43	18.08	18.46	20.31
Support office clerks	Secondary	15.96	17.56	17.93	19.73
Skilled operator	Secondary	14.43	15.88	18.76	20.64
Fork lifter driver	Primary or lower	13.76	15.14	15.46	17.01
Unskilled operator	Primary or lower	13.63	15.00	15.32	16.86
Packer	Primary or lower	12.69	13.96	14.26	15.69

Source: Federal Statistical Office of Germany.

The basic theoretical tool for examining wages is the conflict between labor demand and labor supply, where the quantity of labor is given in relation to the wage. Suppose we consider the market for low-skilled labor. In that case, the equilibrium will be disturbed by an increase in the minimum wage above the equilibrium wage, and the result will be a fall in the quantity of labor demanded. How large a fall will depend on the steepness of the labor demand curve; in the case of a very steep demand curve, the reduction in the quantity of labor demanded will be very small (Samuelson & Nordhaus, 2009). The ambiguous effects of raising or introducing a minimum wage have long been the subject of David Card, whose Nobel Prize-winning research is summarized in Card & Krueger (2016). Unions, which engage in collective bargaining, have a significant impact on wage levels. The influence of unions grew from their introduction in the first third of the last century until the end of the last century, when many industries were

gradually deregulated, international competition increased, and governments were not as friendly to unions as in the past (Samuelson & Nordhaus, 2009). The minimum wage instrument is increasingly being used in part because of the declining power of unions (Keune, 2011).

From a macroeconomic perspective, wages and wage growth are included in the Phillips curve, which relates the unemployment rate to the rate of wage growth, interpreted as wage inflation. The Phillips curve and its extended version imply wage movements in response to the unemployment rate, but these are realized in the real economy with a lag or not at all. Reasons for this include the so-called "insider-outsider" models, in which trade unions play an important role (trade unions do not represent the unemployed, so their wage demands may not be taken into account), the costs of firing and hiring workers, and the costs of training workers (Dornbusch et al., 2017). These theoretical premises have important implications for corporate management. Agell & Lommerud (1997) described the positive effect of the minimum wage on the allocation of human capital, accompanied by higher productivity requirements and training of workers. Ahmat et al. (2019) used a survey of hotel workers in Malaysia to show that increases in the minimum wage have had a positive impact on job satisfaction, work motivation, and perceived quality of life.

Our work aims to explore whether setting a minimum wage has an impact on the financial indicators of automotive firms, especially on their personnel costs. Given the introduction of the minimum wage in Germany in 2015 and the dynamic growth of the minimum wage in Eastern European countries, the conditions are right to investigate our objective between 2011 and 2018.

LITERATURE REVIEW

The German low-wage sector increased significantly after German reunification in 1990, while a big fraction of the low-qualified workforce had no protection against wage inequity. At the end of 2014, more than 4.8 million individuals in the German workforce were working for a wage lower than 8.5 EUR/hour (Amlinger et al., 2016). Driven by this increasing wage inequality and resulting political pressure, a national minimum wage was introduced by the coalition of the Social Democratic Party and the Christian Democratic Union in January 2015 at a level of 8.5 EUR/hour. In addition to the national minimum wage, German law considers some industry and job category-specific minimum wages that are independent of the national minimum wage (Bossler et al., 2022). Within the worldwide economic debate around the introduction of minimum wages, the potential effects on the labor market and employment have always been in focus (Bosch & Weinkopf, 2014). The same discussion was initiated in Germany, where the introduction of a national minimum wage was primarily observed with skepticism and fears that companies might react with substantial job cuts. Several German simulation studies, which were published slightly before the introduction of the national minimum wage, reinforced the skepticism and concerns within the community of researchers and economists since they detected substantial negative impacts on the German labor market (Schulten & Weinkopf, 2015). Massive job losses in Western Germany and even more dramatic job losses in Eastern Germany were predicted (Bosch & Weinkopf, 2014).

Shortly after the introduction of the minimum wage in Germany, some studies focused on detecting the real impact on the total level of employment. Bellmann et al. (2016) investigated the impact of the minimum wage in Germany at the end of 2015. For their investigation, they utilized data from a specific representative panel of enterprises, which contained 16,000 companies of all company sizes and industries. Based on their investigation, they came to the result that companies reacted primarily with reservations in hiring new employees, adjusting working hours, or setting higher prices. Some companies within the observed panel postponed investment to a lesser extent. Significant job cuts or the substitution of labor by machines were not observed. Amlinger et al. (2016) indicated a large relationship between company size and the percentage of employees within the total workforce whose wages were impacted by the new law. They also highlighted the difference in wage distributions in Western and Eastern Germany in 2014, reviewing both distributions and concluding that the shift in the overall salary spectrum might have stronger impacts on the wage distribution in Eastern Germany. Some years after the introduction of the minimum

wage, more studies have focused on the determination of the effect of the German national minimum wage on the total level of employment. Also, these studies could not identify a significant effect (Caliendo et al., 2018; Holtemöller & Pohle, 2020).

Actually, no study identifies the potential impact of the minimum wage on the salary structure of the German automotive industry – neither on the car manufacturer nor the supplier level. Even though a large proportion of companies pay wages according to the collective agreements of the large employer agencies and the "Industriegewerkschaft Metall", the most important union within the German automotive industry, a larger amount of small and medium-sized automotive suppliers are leaving the employer agencies. This was especially recognized for companies located at the lower stages of the supply chain (Haipeter & Banyuls, 2007). The only regulation of wages that remains within these companies is the level of the national minimum wage. Next to purely market-driven changes caused by buyers and sellers in the labor market, institutional factors such as stronger pressure from trade unions or the application of political instruments affecting the labor market can lead to very fast adaptation of salaries within an economy or a specific industry. In this regard, the introduction of national or industry-specific minimum wages can cause drastic changes within the salary spectrum of an entire country or region. This also applies to the automotive industry and affects suppliers worldwide, regardless of whether their manufacturing plants are in developed or emerging countries. Gregory & Zierahn (2022) investigated the impact of the introduction or increase of minimum wages on the wages of workers in the German roofing industry since 1997, when the minimum wage was introduced in Germany for selected industries (including the roofing industry). They found a significant increase in real daily wages of up to about 6% for workers in the lower income quantile, but wages in the 60th income quantile were also affected in the former East Germany between 1997 and 2008. This can be seen as fulfilling the objective of the economic policy of the time, which was to improve the earnings of low-wage workers (at least those who did not lose their jobs because of the introduction of the minimum wage) and to reduce overall wage inequality. However, the authors estimated that the minimum wage caused a reduction in real daily wages of up to around 5 % for the highest income quantiles, which mainly were skilled and experienced workers in the former East Germany.

Martišková et al. (2021) investigated different strategies to diminish wage inequity in high and low-wage sectors within Czechia and Slovakia. They explained that monthly salaries were relatively high within the Czech and Slovak automotive industries compared to the full-time salary at the level of the national minimum wage. Despite this, they highlighted the national minimum wage as a reference point for bargaining on wages at an enterprise level and supported this argument with the results of interviews with 20 representatives of company trade unions. An even stronger impact of minimum wage policies on the salary spectrum in automotive companies can be expected for countries such as India, where the industry is impacted strongly by irregular workers or contractors across the supply chain. Nair and Friedmann (2021) stated that irregular workers contribute almost 75% of the total workforce within Indian automotive component plants. Although performing the same activities as regular workers with the same qualification level, they receive only a fraction of regular salaries and are paid, in most cases, at the level of the minimum wage. Barnes et al. (2016) came to similar results, identifying that, on average, three-quarters of Indian automotive workers do not have regular contracts and receive a salary that is only 9% higher than the minimum wage for unskilled operators, while not uncommonly being paid under the level of the minimum wage.

Autor et al. (2016) identified spillover effects within the bands of the salary spectrum located above the new level of the minimum wage and explained that they could potentially move up the entire salary spectrum step by step. They detected the biggest impact of wage increases within the fraction of workers in the bottom 5% of the salary spectrum. A 10% increase in the minimum wage resulted in a 3% rise in wages within the lower section of the wage distribution. The salaries located at the 10th and 20th percentile improved by 1.6% and 0.7%, respectively, while no wage increases could be detected above the 25th percentile of the wage distribution. A study conducted by Dube et al. (2019), which focused on the retail industry, highlighted similar results and argued that

companies might raise the wages of their entire workforce, even though only a small fraction of them would be impacted by the mandatory first stage wage increase driven by the minimum wage law. Even though earning above the minimum wage level and within another band of the company's internal wage distribution, workforce members are interested in their relative payments compared to peers within the same and other qualification levels. Higher qualified staff members might feel uncomfortable and treated unfairly if employers do not reestablish former salary differences compared to lower qualified or subordinated qualified job functions (Dube & Zipperer, 2015). This explanation is in line with the findings from Cengiz et al. (2019), who identified spillover effects within the salaries of actual employees but not for new hires who entered the company at the new minimum. The work of del Río Casasola & Paz (2023) addressed the broader theoretical context of wage and productivity growth by validating a structuralist center-periphery view of international production fragmentation.

The literature review shows that research on the impact of the minimum wage is often limited to examining its effect on unemployment or how it affects hiring. There is some work looking at changes in wages and total income, particularly for low-income households. The impact of changes in the minimum wage on companies is rarely examined, however, and most of the findings are more general about productivity, automation, and innovation. Previous work examining the impact of minimum wages on companies has also focused on low-wage sectors such as restaurants and accommodations. Our study, therefore, helps to fill a research gap by focusing on the impact of the minimum wage on the detailed financial characteristics of firms in the automotive sector in the Central European region. The significance of the work lies in examining a sector that can be assumed not to be affected at all by the level of the minimum wage; moreover, we are looking at countries for which the automotive sector is an important industry.

METHODOLOGY

This study covers companies engaged in the principal activities classified by the NAICS 2017 codes 3361, 'Motor vehicle manufacturing', and 3362, 'Motor vehicle body and trailer manufacturing.' Carmaker's suppliers listed under code 3339, 'Other general-purpose machinery manufacturing', also are included. The data on the companies were sourced from the Orbis database of Bureau van Dijk, where the following indicators were used: cash flow, profit/loss before tax (P/L before tax), operating profit/loss (EBIT), profit margin, EBIT margin, return on assets using profit/loss before tax (ROA before tax), return on assets using net income (ROA net income), return on equity using profit/loss before tax (ROE), liquidity ratio, solvency ratio, number of employees, and costs of employees. A similar representative set of company indicators has been used, e.g., by Klepáč and Hampel (2018). The possible dependence of company indicators on the minimum wage was analyzed over the period between 2011 and 2018. Companies from the Czech Republic (CZE), Germany (GER), Poland (PLN), and Slovakia (SVK) are represented within the analyzed sample. The quantitative information dedicated to the national minimum wage (NMW) was taken from the Eurostat database. The data were captured bi-annually and were converted to annual data using an average.

Companies' financial data suffer from frequently missing values; for this reason, we included only companies with at least 75% of the data available for the whole reference period for each indicator. Two strategies for selecting companies in each country were used for the analyses: all companies and companies classified as small and medium in the Orbis database. In addition, within Germany, a subset of companies located in the former Eastern Germany (EGER) was created. The numbers of companies included in each selection strategy are highlighted in Table 2, which shows the different levels of reporting of firms' financial results across countries. Germany, for example, potentially represents the highest number of firms in the sector under study, providing a deficient level of reporting. Additionally, in Germany, EBIT, profit margin, and ROA based on net income for small and medium-sized enterprises are missing. Besides, it is important to note that, in Poland, companies do not report the headcount of their employees.

Table 2: Number of companies included in the analysis according to selection strategies.

Country	All companies	Small and medium companies	Former Eastern Germany
Czech Republic	230	68	x
Germany	79	24	16
Poland	182	101	x
Slovakia	96	39	x

Source: author's work.

Panel regression was used to detect possible dependencies that align with, e.g., Holtemöller and Pohl (2020). Firm characteristics enter the regression sequentially as dependent variables, with the main independent variable being the NMW. To avoid spurious regressions, time dummy variables were included in the model. If the dependent and independent variables had only a common trend, falsely giving the impression of dependence, the time dummies would capture this trend, and the independent variable would not be statistically significant. In the case of Germany, the NMW was set to zero before its introduction, making it close to a variable for testing structural change. The model took the form:

$$CI_{it} = \beta_0 + \beta_1 NMW_{it} + \beta_2 Dt1_{it} + \cdots + \beta_8 Dt7_{it}, \quad (1)$$

where *CI* denotes the company indicator, *NMW* the nominal minimum wage, *Dt*1, …, *Dt7* are time dummy variables (note that due to avoid multicollinearity not all years are covered by them), *i* is a denotation of the company and *t* represents years. Models with fixed effects (FE) and random effects (RE) are estimated and assessed by the Hausman test. The null hypothesis of this test can be stated as the FE and RE model estimates are consistent and RE has lower variance than the FE model estimates; the alternative hypothesis is that only the FE model estimates are consistent. If we reject the null hypothesis, we choose the FE model; if we do not reject the null hypothesis, we choose the RE model. Fixed effects models include a constant for each unit, which may be too burdensome for the model and consequently reduce the degrees of freedom and, thus, the chance of demonstrating the significance of the independent variable. While this problem is solved by the so-called "within transformation", the deployment of a random effects model is preferable (if the Hausman test points it out). In addition to the models mentioned above, one can also encounter so-called "pooled regression", where the assumption of an identical constant for each unit is considered, which is very rarely met in practice. The significance level was set to 0.05, and calculations were performed using MATLAB R2023b and Gretl 2023c software.

RESULTS

The average values of firm indicators for the total dataset are shown in Figure 1. The standardization of variables is necessary for the common representation of different characteristics. The relative proportions of the characteristics of each country are maintained. The polygon break for a given country is due to a missing firm characteristic. A first glance at absolute indicators such as cost of employees, cash flow, and EBIT shows that larger companies are mainly included in the case of Germany. However, German companies are also characterized by lower ROA, higher ROE, and a lower Solvency ratio than companies from Eastern European countries. Differences between Eastern European companies can be recognized in the lower Liquidity ratio and EBIT for Slovakia, while lower Profit/Loss before tax and higher EBIT and profit margins were detected for Poland.

Figure 1: Standardized averages of companies' indicators (all company's cases) for different countries. Source: author's work based on the Orbis database.

The average indicators for small and medium-sized companies are shown in Figure 2. Although the average number of employees in Germany is comparable to the Czech Republic, the cost of employees, cash flow, EBIT, and Profit/Loss are significantly higher in Germany. In Poland, a significant drop into negative values is present for EBIT and Profit/Loss, while the Liquidity ratio and Profit margin are higher than in the other countries. Figure 2 also shows the case of companies located in the former Eastern Germany. These are all companies, both medium and small, but the average characteristics are close to this category. The average size is larger than that of the small and medium-sized companies in Germany, which is reflected in the cost and number of employees. Profit/Loss is significantly lower (practically zero), ROE on average, reaches negative values, and ROA is visibly lower.

Table 3 shows the results of the panel regression for all companies. In general, it can be seen which firm characteristics are statistically significantly affected by NMW (p-value below 0.05) and what is the direction of the response of a given characteristic to a statistically significant increase in NMW (a positive parameter indicates an increase, a negative parameter a decrease in the characteristic). The specific values are not as interesting as the comparison between countries. The positive statistically significant response of NMW growth to the cost of employees is visible in all countries, while the impact is higher in Germany. This phenomenon is associated with a significant increase in the number of employees (unfortunately, it cannot be assessed in Poland), a possible effect of the NMW increase (see, e.g., Ramos-Herrera, 2023). In all investigated cases, the negative effects of NMW growth are significant for both ROA

(except Slovakia) and ROE (except Poland). In the Czech Republic, the growth of the NMW had a significant negative impact on EBIT margin (verging on significance also on Profit margin). In Poland and Slovakia, NMW growth caused a significant increase in Cashflow and Solvency ratio. In Slovakia, a significant positive effect on EBIT and Profit/Loss was also detected, while in Poland, the effect was negative but only at the margin of significance.

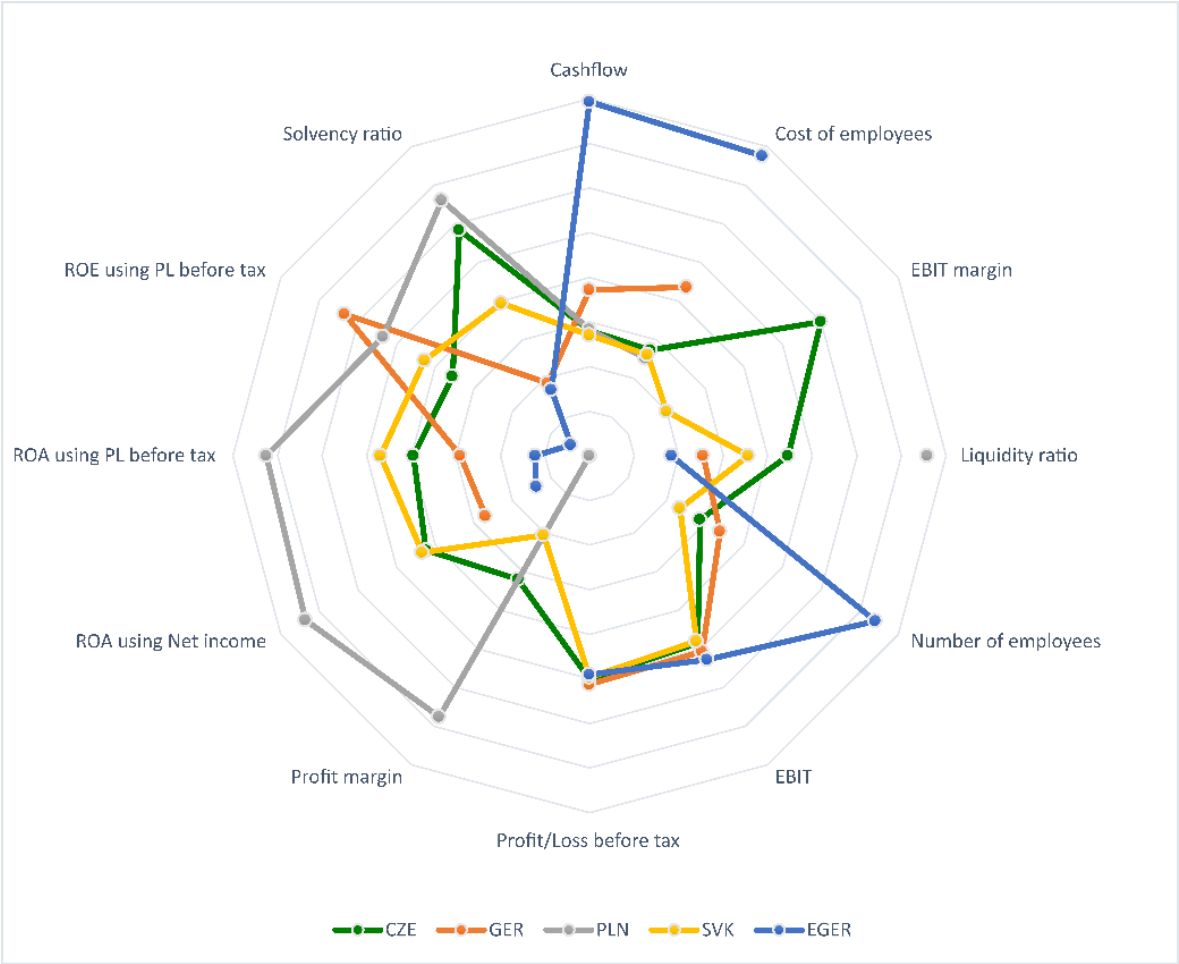

Figure 2: Standardized averages of companies' indicators (small and medium companies case) for different countries and all companies case for EGER.

Source: author's work based on the Orbis database.

The results for small and medium-sized companies are shown in Table 4. Consistent with the results for the full set of companies, the cost of employees is statistically significantly positively affected by NMW growth in all four countries, but the size of the effect for Germany is not so high as in the case of all companies. The effect on the number of employees is significantly positive for Germany and Slovakia, but the effect is significantly negative in the Czech Republic. The estimated effect on ROA and ROE is negative but significant only for Poland for ROA and Germany for ROE. A significant negative effect on EBIT and Profit/Loss is evident in Poland, but only with a borderline p-value. A similar case exists with EBIT for Germany. NMW's growth significantly positively affected the Solvency ratio for the Czech Republic and Slovakia. The last column of Table 4 shows the results for companies from the former Eastern Germany. There is no significant effect of NMW growth on the cost of employees, which is due to the rather small sample size. There are significant positive impacts of NMW growth on the liquidity ratio (here with low substantive impact) and number of employees, as well as

significant negative impacts on EBIT and profit/loss.

DISCUSSION

Our results are consistent with the general effect of NMW increases on wage costs and the financial performance of companies, especially in low-wage sectors (see e.g., Eriksson and Pytlikova, 2004), Bodnár et al. (2018) and Chorna (2021). Barnes (2017) found that even though the automotive industry should be essential for the transformation leading to development, prosperity, and rising living standards in India, this is not the case in reality. In Barnes (2017), page 37, we can read that "Understandably, some have predicted that the expansion of auto production in India should lead to similar "high road" labor relations, based on high wages, long-term employment contracts, stable career paths, social protection, and enterprise-based benefits. However, the evidence suggests otherwise. The Indian auto industry has instead reproduced "low road" employment relations based on high wage inequality and employment relations over-reliant upon labor contractors." These facts are highlighted in the case of India, but certain elements are also evident in Eastern European countries.

Table 3: Results of the panel regression model (1) for datasets including all companies in different countries. Symbol b_1 denotes the estimate of the parameter β_1, and p denotes the resulting p-value of the NMW significance test.

	CZE		GER		PLN		SVK	
Variable	b_1	p	b_1	p	b_1	p	b_1	p
Cashflow [thou. EUR]	3.484	0.558	77.828	0.394	22.236	0.000	15.654	0.028
Cost of employees [thou. EUR]	29.540	0.000	302.482	0.000	24.716	0.000	26.906	0.000
EBIT margin	-0.010	0.006			-0.006	0.124	-0.013	0.078
Liquidity ratio	0.000	0.689	0.000	0.925	0.003	0.164	0.000	0.458
Number of employees	0.231	0.019	2.686	0.000			0.807	0.000
EBIT [thou. EUR]	4.260	0.268	28.263	0.682	-231.158	0.061	17.461	0.039
P/L before tax [thou. EUR]	7.052	0.120	-5.660	0.958	-225.438	0.067	18.552	0.031
Profit margin	-0.007	0.078			0.002	0.640	-0.011	0.108
ROA using Net income	-0.018	0.000	-0.002	0.018	-0.014	0.022	-0.012	0.115
ROA using PL before tax	-0.016	0.002	-0.003	0.006	-0.014	0.023	-0.013	0.114
ROE using PL before tax	-0.076	0.004	-0.023	0.003	-0.011	0.699	-0.175	0.004
Solvency ratio	0.012	0.127	-0.001	0.424	0.018	0.037	0.023	0.027

Source: author's work

Table 4: Results of the panel regression model (1) for datasets covering small and medium companies in different countries. Symbol b_1 denotes the estimate of the parameter β_1, and p denotes the resulting p-value of the NMW significance test. The case of all companies located in the former Eastern Germany region is placed in the column labeled EGER.

	CZE		GER		PLN		SVK		EGER	
Variable	b_1	p	b_1	p	b_1	p	b_1	p	b_1	p
Cashflow [thou. EUR]	0.624	0.071	-0.028	0.796	0.373	0.308	-0.190	0.581	4.787	0.162
Cost of empl. [thou. EUR]	1.675	0.000	0.881	0.000	0.910	0.005	1.796	0.000	1.436	0.129
EBIT margin	-0.014	0.132			-0.011	0.260	-0.003	0.842		
Liquidity ratio	0.004	0.067	0.000	0.604	0.004	0.314	0.001	0.413	0.000	0.006
Number of employees	-0.075	0.006	0.011	0.000			0.049	0.027	0.063	0.004
EBIT [thou. EUR]	0.098	0.792	-0.239	0.059	-440.721	0.057	-0.470	0.164	-3.639	0.002
P/L bef. tax [thou. EUR]	0.200	0.588	-0.186	0.148	-440.517	0.056	-0.511	0.146	-3.708	0.003
Profit margin	-0.010	0.291			0.002	0.850	-0.003	0.789		
ROA using Net income	-0.015	0.175			-0.025	0.040	-0.007	0.628	-0.002	0.381
ROA using PL before tax	-0.013	0.275	-0.002	0.200	-0.031	0.015	-0.009	0.562	-0.002	0.302
ROE using PL before tax	-0.035	0.588	-0.026	0.001	-0.051	0.300	-0.097	0.161	-0.041	0.192
Solvency ratio	0.033	0.029	0.001	0.805	0.008	0.555	0.071	0.000	-0.002	0.515

Source: author's work

Paper Martišková et al. (2021) dealt with negotiating wage inequality in the Czech Republic and Slovakia. They noted that the Kaitz index (the ratio of the minimum wage to the average wage) for the whole economy ranged between 33.0% and 39.3% in the Czech Republic and between 40.3% and 47.4% in Slovakia from 2011 to 2018. In comparison, the Kaitz index related to average wages in the automotive sector varied between 25.7% and 29.4% in the Czech Republic and between 30.9% and 33.9% in Slovakia over the same period. The differences between the overall and the sectoral average wages point out that the wage level in the automotive sector was below the total average and thus, the impact of the NMW setting may have been substantial on wages within the automotive sector. Furthermore, an international comparison of the Kaitz index can be used to explain the different impacts of NMW growth on small and medium-sized companies in the Czech Republic and Slovakia.

The transition to electric vehicle production by Eastern European car manufacturers was addressed in Pavlínek (2023), who determined that the role of wages, and especially the wage differential against Western European manufacturers, co-determines the different dynamics of the transition to the production of electric vehicles or their components in Eastern European countries. Anderson and Holmes (1995) described a hybrid strategy applied in some North American manufacturing sectors, combining technologically advanced product development with low-wage production. Krzywdzinski (2017) observed similar behavior in his study, where labor-use strategies in highly automated automotive supplier plants in a high-wage country (Germany) were compared to those in a low-wage region (Central Eastern Europe). Such cost-optimal utilization of the workforce is consistent with our results on the impact of minimum wage increases on corporate indicators.

A limitation of this work is the availability of firm characteristics. Low morale in reporting mandatory firm data is often common to firms across countries. Deploying data imputation methods could be a certain solution here (see e.g. Uenal & Hampel, 2017). In our case, characteristics that are completely missing in certain countries, such as the headcount of firm employees in Poland, are an insurmountable obstacle. Panel data models can handle missing values, and our required data completion rate of at least 75% should rule out bias in the results. Data imputation could be tried if, due to the low degrees of freedom of the test statistics, no independent variables were significant, but this approach is not correct. Our models, despite a certain number of missing values, provide statistically significant and plausible explanatory results, so data completion is not considered necessary in our case.

In our work, we have tried different strategies for selecting companies. The first choice was complete data, but the number of companies found was very low, and probably such a sample would not be well representative (in particular, there were often missing small companies). When selecting companies with at least 50% of the values, the number of companies was not that much larger than the requirement of 75% of the values. Although the model could handle companies with 50% missing values, there could be a bias in the results, especially if the missing values were not randomly distributed. Thus, the resulting choice of companies with at least 75% of the data is a trade-off based on the description of the differently configured selections.

From a methodological point of view, a possible limitation of our work is the general problems related to regression. In particular, it could be the assumption of a linear functional form of the relationship between the independent and dependent variables, heteroskedasticity, and multicollinearity. For panel regression models, the specific problems are data availability, as discussed above, comparability of data from different periods (manifested especially for long time series), and different data quality in terms of complexity and thoroughness in reporting financial data by different companies (which is related to the possible heterogeneity of the companies under study). These circumstances can be verified and remedied to a large extent, however. Overall, the potential problems certainly do not outweigh the benefits of deploying a panel regression model.

CONCLUSION AND RECOMMENDATION

Our work has shown a significant impact of the NMW on the financial performance of automotive companies, particularly on the growth of total costs of employees. The effects vary across countries and may also differ depending on the size of the observed companies. This fact needs to be incorporated into the strategic planning of automotive companies based on predictions of their external environment, which, for example, Shatilo et al. (2023) presented as part of the development of innovative processes within Ukrainian companies. Furthermore, it is necessary to incorporate the influence of minimum wages in the formation of the state investment policy within the framework of comprehensive approaches, which were presented, e.g., in Veselá et al. (2022). Last but not least, it is necessary that the state sufficiently develops human capital training towards digitalization and competencies suitable for the Industry 4.0 concept. This can increase human capital productivity (as mentioned in Rodchenko et al., 2021), while in the overall assessment, investors will not rate the predicted increase in labor costs as a significant threat.

The fact that the setting of the minimum wage affects to a large extent, certain firm characteristics require both a competent setting of the minimum wage by the state and that firm managers can work with the effects of the minimum wage and react appropriately. On the part of the state, the effects of raising the minimum wage on employment, foreign investment inflows and overall tax yield must be considered. The management of a company must consider the minimum wage as one of the important variables affecting company processes and outputs, as it can affect hiring, employee turnover, and overall productivity. In response to an increase in the minimum wage, management must appropriately adjust the salary spectrum across the firm to reduce increases in overall costs. Cost engineers must incorporate the impact of the minimum wage into the price of the firm's final products, whether components or whole cars. It is desirable to focus on innovations in company processes leading to the automation

of activities previously performed by human labor.

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