ANALYSIS OF FINANCIAL PERFORMANCE INDICATORS IN RELATION TO GENDER DIVERSITY IN TOP MANAGEMENT TEAMS OF SMALL AND MEDIUM-SIZED ENTERPRISES

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Abstract: This study examines the impact of gender diversity in top management on the financial performance of small and medium-sized enterprises (SMEs) in the Czech Republic. We focus on two sectors: manufacturing and information and communication technologies. Financial performance is assessed using the return on assets (ROA) and return on equity (ROE) ratios. Data for 396 entities were obtained from the Czech Statistical Office and the ARES database. The results show that gender diversity in top management has a positive impact on return on assets (ROA). However, no impact on return on equity (ROE) was found. These results suggest that gender-diverse leadership can lead to more efficient use of company assets, although it may not have a direct impact on profitability for investors. This research contributes to the existing literature on gender diversity and corporate performance. It offers valuable insights for managers and policymakers on the potential benefits of inclusive leadership for the prosperity of SMEs in the Czech Republic.

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Introduction

Research on gender diversity in top management is still a highly topical issue (Biswas et al., 2023; Schumann et al., 2024). According to the World Economic Forum's report, the share of women in senior management positions was 32.2% globally in 2023, meaning women continue to be outnumbered by men in senior leadership positions (Hausmann et al., 2023).

A number of studies focused on gender diversity in management suggest that there is a link between gender-diverse corporate leadership and financial performance (e.g., Lee et al., 2023; Almarayeh, 2023). However, the studies are not consistent in characterizing this relationship. By tracking various financial performance indicators, the authors of the studies provide evidence of a positive relationship between gender-diverse top management, a negative relationship, or an inability to confirm the existence of a relationship. In the studies, typically ratio accounting indicators of financial performance such as return on assets (ROA), return on equity (ROE), or possibly return on sales (ROS) or market indicators, e.g., Tobin's Q, are monitored.

Further research is needed to fully understand the mechanisms through which gender diversity influences firm outcomes.

The purpose of the study is to investigate the effect of gender diversity at the top-level management of small and medium-sized enterprises on their financial performance.

1. Literature review

Harrison & Klein (2007) acknowledge the lack of a single, unified theory to predict the relationship between gender diversity on corporate boards and firm financial performance. Research in this area draws upon diverse social theories from various perspectives, including Upper Echelons Theory (e.g., Brahma et al., 2019; Naveed et al., 2021), Resource Dependence Theory (e.g., Wicker & Kerwin, 2022; Liu et al., 2015), Gender Role Theory (e.g., Chen et al., 2021), Agency Theory (e.g., García-Meca et al., 2021) and Critical Mass Theory (e.g. Egerova, & Noskova, 2019).

Upper Echelons Theory proposes that a firm's performance is significantly influenced by the characteristics of its TMT (Hambrick & Manson, 1984). This theory suggests that the cognitive abilities of individuals in top

positions shape their strategic decision-making, ultimately impacting the strategies implemented by the organization (Filbeck et al., 2017).

Gender Role Theory suggests that societal expectations for gendered behavior hinder women's professional aspirations (Compton et al., 2014) and view gender diversity as detrimental to performance due to leadership stereotypes (Chen et al., 2021).

Agency theory posits that managers (agents) and shareholders (principals) have conflicting objectives, which leads to additional costs. This conflict arises from information asymmetry, where managers have better information than shareholders (Ben Selma et al., 2022). Agency theory suggests that female board representation can mitigate the problems caused by the separation of management and ownership in a competitive world (Chen et al., 2021).

Critical mass theory was first formulated by Kanter (1977). This theory is based on the assumption that if a critical mass of women is not reached on boards of directors or in management teams, then such women are seen as tokens, if it is one woman, or as symbolic representation (Kristie, 2011). In the original formulation of the theory, Kanter (1977) defines four groups according to how social categories are proportionally represented. The first group is a uniform group, which is composed of only one homogeneous group, the second group is a skewed group, where representatives of the second group also appear, but only in a very small representation (1-20%). In this case, it is a group of tokens that do not actually have any influence on decision-making in the group. In the next group, the tilted group, the representatives of the second group are no longer just tokens, but their number is higher and they form a minority group that has the potential to form an alliance, thanks to which they can have an influence on decision-making. The last group is a balanced group, where both groups are potential and have an equal influence on decision-making in the organization.

The positive effect of gender diversity in TMT on firm financial performance has been supported by numerous studies. Bouteska & Mili (2022) have found that a higher proportion of women in TMT leads to better ROA and ROE ratios. This finding is consistent with the research of Egerová & Nosková (2019), Jeong & Harrison (2017), Ullah et al. (2019), and Chen et al. (2021). In contrast, Mohammad et al. (2018) were unable to detect any relationship between ROA and gender diversity in TMT, a conclusion supported by Hedija & Němec (2020). Prosvirkina & Wolfs (2021), on the other hand, reported a negative relationship between gender-diverse TMT and financial performance measured by ROA and ROE. Overall, the evidence

suggests that gender diversity in TMT is associated with firm financial performance, but the nature of this relationship remains somewhat unclear.

The following hypotheses have been formed:

Hypothesis 1: Gender diversity in TMT will have a significant and positive impact on firm financial performance (ROA).

Hypothesis 2: Gender diversity in TMT will have a significant and positive impact on firm financial performance (ROE).

Research on the impact of gender diversity in TMT on firm financial performance has primarily focused on large companies (e.g., Vafaei et al., 2015; Hutchinson et al., 2015). These studies have largely demonstrated a positive relationship between gender diversity in TMT and corporate financial performance. Egerová & Nosková (2019) conducted one of the few studies that did not exclusively examine a sample of large firms, but rather included management teams from SMEs. Their study revealed a positive association between gender diversity in top management and ROA and ROE metrics.

In contrast, firm size itself may have a negative impact on performance in terms of total assets for non-financial companies (Olawale et al., 2017). On the other hand, family-owned businesses exhibit significantly higher corporate financial performance in SMEs compared to larger firms (Chu, 2011). Alabdullah et al. (2018) have concluded in their study that firm size has no impact on financial performance as measured by ROA.

Based on this, the following hypotheses have been formulated:

Hypothesis 3: The association between gender diversity in firm TMT and firm financial performance is significant for small firms.

Hypothesis 4: The association between gender diversity in firm TMT and firm financial performance is significant for medium-sized firms.

2. Research method and data analysis

The statistical population of this study includes a dataset of 396 enterprises operating in the Czech Republic, which were selected randomly. Of these, 296 entities were classified in the manufacturing sector (C10-C33) and 100 in the information and communication technology (ICT) sector (J58-J63). The manufacturing sector was selected due to its pivotal role in the Czech economy, accounting for 31% of total GDP. In recent years, the ICT sector has also been gaining increasing prominence in the Czech Republic. Secondary data for the research were manually collected from the Orbis

database and supplemented with missing information from company annual reports for the period 2021-2022. Only active entities with 10 to 250 employees were included in the analysis, ensuring a focus on the small and medium-sized enterprise segment.

Financial performance of enterprises in the research was expressed by financial performance indicators. Due to the composition of the research sample, which includes non-listed companies, it is not possible to use the Tobin's Q indicator. Therefore, the study uses the accounting ratios ROA, expressed as EBIT/assets, and ROE, expressed as EBIT/equity, as the dependent variables. Data for the ratios were obtained from annual reports.

The independent variables express the representation of women in the TMTs of the analyzed firms. In the study, the variable expressing the number of women in management (PWOMEN) is defined as a percentage share. The values for the variable are obtained from the Orbis database, where female managers are explicitly listed among the TMT members.

Control variables reflect factors that can potentially contribute to financial performance. The study uses the size of the organization (SIZE), age of the organization (AGE), number of employees (EMPL), size of the TMT (SIZE_TMT), reaching critical mass (TMT_30%), education of women in TMT (EDUC) and the industry in which the firm operates (D_INDUSTRY) as control variables.

This study utilizes regression analysis for empirical investigation of the impact of gender diversity on financial performance. Following previous studies (e.g., Tleubayev et al., 2020; Willows & van der Linde, 2016), the ordinary least squares (OLS) method is chosen as one of the models for the analysis. In conjunction with this method, the generalized linear model (GLM) is also employed, which represents a more flexible variant of the OLS method and allows for the modeling of dependent variables that deviate from a normal distribution. To enhance the validity of the outputs, the generalized least squares (GLS) method is also utilized, which assumes a normal distribution of errors but allows for heteroscedasticity and autocorrelation. In the presence of heteroscedasticity and autocorrelation, GLS provides more precise estimates of model parameters and narrower intervals. It is a robust method (Baltagi, 1998; Fox, 2002). Normality of distribution is tested using the Shapiro-Wilks test and the presence of heteroscedasticity in the data is tested using the Breusch-Pagan LM test. To analyze data, Statistica Tibco software was used.

3. Results

The study begins with descriptive statistics. Table 1 presents values for mean and standard deviation. Descriptive statistics provide essential information about the parametric data of the variables in this study. No multicollinearity issues were detected among the variables.

The variable ROA had a mean value of 8.23. Firm ROEs had mean values of 20.42. The maximum value of the percentage of women in TMT was 100%, and the maximum size of TMT was 14 individuals. On average, however, women were represented at 18.63%, and the average size of TMT was approximately 4 people. The average age of an organization is approximately 23 years, and the average size is 15.05. The oldest organization is 52 years old, while the youngest organization has been operating for only two years. In terms of the number of employees, the largest firm had 249 employees, and the smallest firm had 10 employees. The average number of employees was approximately 61.

Table 1.
Descriptive statistics

Variable	Acronym	Mean	SD	Minimum	Maximum
1. Rentability of assets	ROA	8.23	14.10	-68.3	124
2. Rentability of equity	ROE	20.42	78.66	-549.2	799
3. Gender diversity	P_WOMEN	18.63	25.28	0.0	100
4. Size of the organization	SIZE	15.05	1.24	9.9	19
5. Age of the organization	AGE	23.24	8.17	2.0	52
6. Number of employees	EMPL	60.40	48.92	10.0	249
7. Size of the TMT	SIZE_TMT	3.34	2.17	1.0	14
8. Reaching critical mass	TMT_30%	0.29	0.45	0.0	1
9. Education	EDUC	0.22	0.42	0.0	1
10. Industry	D_INDUSTRY	0.75	0.44	0.0	1

Source: own proceedings, 2024

To analyze the nature of the linear relationship between gender diversity in TMT and financial performance, OLS, GLS, and GLM models are employed. The results of the models are presented in Tables 2-3. The first model in Table 2 is the OLS model. This model shows a positive effect of the PWOMEN variable on the financial indicator ROA, which is in line with the research conducted on SMEs by Egerová & Nosková (2019). This also confirms Hypothesis 1. In addition to gender diversity in management, the

variables EMPL and D_INDUSTRY also have an impact on ROA, which has a negative effect on financial performance. The Breusch-Pagan LM test does not reject the existence of heteroscedasticity in the data, which means that the OLS model may not necessarily have optimal properties, therefore it is more appropriate to use one of the more robust models. Nevertheless, the GLS model confirms the results of the OLS model, as do the results of the GLM model.

Table 2.
Panel of linear regression models - ROA

Model	Ordinary least squares (OLS)	Generalized least squares (GLS)	Generalized linear model (GLM)
Dependent variable	ROA	ROA	ROA
const.	0.5633 (0.5784)	0.1116 (2.5311)	0.5633 (0.3345)
PWOMEN	0.0121** (2.520)	0.0001*** (16.0614)	0.01213** (6.3501)
SIZE	0.3267 (0.9821)	0.3123 (1.02088)	0.3266 (0.9646)
AGE	0.2953 (−1.048)	0.1620 (1.9551)	0.2952 (1.0984)
EMPL	0.025** (−2.250)	0.0863* (2.9404)	0.02501** (5.0626)
SIZE_TMT	0.5136 (0.6539)	0.3860 (0.7513)	0.5136 (0.4275)
TMT_30%	0.1076 (−1.613)	0.0480** (3.9088)	0.1076 (2.6004)
EDUC	0.1243 (1.540)	0.1054 (2.6205)	0.1243 (2.3727)
D_INDUSTRY	0.0247** (−2.255)	0.0032*** (8.6794)	0.0247** (5.0851)
Number of observations	396	396	396
Determination coefficient	0.0575	0.0676	0.618
Breush-Pagan LM test	94.4148 (0.0000***)		
Note:	t-values are in parentheses except for the BP LM test Significance levels are ***p<0.01, **p<0.05, *p<0.1		

Source: own proceedings, 2024

The study then turns to the ROE indicator in Table 3. Using the OLS model, no relationship was found between ROE and the other variables. The p-values for all independent variables were quite high. The only variable that approached significance was the constant, suggesting a potential influence of the variables on ROE as a whole. The BP LM test does not rule out the presence of heteroscedasticity in the data, which again leads to the conclusion that it is more appropriate to use one of the other models. The GLS model also confirms the null hypothesis only for the constant. The p-values for the other variables are too high in this case as well, and none approach the significance level. The results of the previous models are confirmed only by the last GLM model used.

Table 3.
Panel of linear regressions models - ROE

Model	Ordinary least squares (OLS)	Generalized least squares (GLS)	Generalized linear model (GLM)
Dependent variable	ROE	ROE	ROE
const.	0.1454 (1.459)	0.0067*** (7.3329)	0.1454 (2.1279)
PWOMEN	0.4460 (0.7628)	0.2669 (1.2323)	0.446 (0.5819)
SIZE	0.2670 (−1.112)	0.32685 (0.9613)	0.2669 (1.2358)
AGE	0.5419 (0.6104)	0.8612 (0.03054)	0.5419 (0.3726)
EMPL	0.9105 (0.1124)	0.7423 (0.1080)	0.9105 (0.0126)
SIZE_TMT	0.6704 (0.4259)	0.8300 (0.0460)	0.6704 (0.181)
TMT_30%	0.4328 (−0.7853)	0.3978 (0.7149)	0.4327 (0.6167)
EDUC	0.6055 (0.5169)	0.8696 (0.02692)	0.6054 (0.2672)
D_INDUSTRY	0.5375 (−0.6172)	0.4460 (0.5806)	0.5375 (0.3809)
Number of observations	396	396	396
Determination coefficient	0.0094	0.0083	0.0091
Breush-Pagan LM test	-0.0137	-0.0148	-0.0140
Dependent variable	122,6148 (0.0000***)		
Note:	t-values are in parentheses except for the BP LM test		
	Significance levels are ***p<0.01, **p<0.05, *p<0.1		

Source: own proceedings, 2024

The coefficient of determination values for the employed linear models indicate an unsatisfactory performance of these models. Consequently, nonlinear regression analysis models are utilized for further analysis. These models incorporate a quadratic term of the PWOMEN variable, aiming to investigate the potential existence of an inverted U-shaped relationship between financial performance and the proportion of women in the TMT sector, as suggested by the study of Wang et al. (2017). As presented in Table 3, the nonlinear influence of the PWOMEN variable on financial performance, similarly to the linear models, is only observed for the ROA indicator at a significance level of $p < 0.1$ (p-value = 0.0895). Furthermore, the coefficient of determination demonstrates the model's satisfactory performance in the case of the ROA indicator, with a value of 0.6729, approaching 1. The coefficient associated with the PWOMEN variable exhibits a negative value, while the coefficient for PWOMEN2 is positive. Wang et al. (2017) stipulate the existence of an inverted U-shaped relationship when the coefficients significantly differ from zero, and additionally, coefficient $b_{11} > 0$ and coefficient $b_{21} < 0$. This model presents the opposite scenario, implying a U-shaped relationship. The table further reveals that gender diversity in management does not exert a significant nonlinear impact on the ROE indicator.

Table 4.
Non-linear regression models

Dependent variable	ROA	ROE
const.	0.0000 (7.8910)	0,2129 (1.2474)
PWOMEN	0.0895* (-1.7024)	0.9561 (-0.0551)
PWOMEN2	0.0846* (11.741)	0.1458 (5.5817)
SIZE	0.6535 (-0.4491)	0.3759 (-0.8864)
AGE	0.1107 (-1.5984)	0.2326 (1.1953)
EMPL	0.0295** (-2.1844)	0.6743 (0.4206)
SIZE_TMT	0.5614 (-0.5812)	0.6650 (-0.4333)
TMT_30%	0.7874 (-0.2698)	0.4311 (-0.7880)
EDUC	0.2027 (1.2759)	0.5139 (0.6532)
D_INDUSTRY	0.0218** (-2.3022)	0.4405 (-0.7722)
Number of observations	396	396
Determination coefficient	0.6729	0.2788
Note: t-values are in parentheses Significance levels are ***p<0.01, **p<0.05, *p<0.1		

Source: own proceedings, 2024

Extant research (e.g., Tleubayev et al., 2020; Brahma et al., 2020) has primarily documented the influence of gender-diverse teams on large firms. While a limited number of studies (e.g., Egerová, & Nosková, 2019; Adusei et al., 2017) have explored SMEs, they fail to investigate whether the effect of gender diversity in leadership on financial performance varies depending on firm size, particularly between small and medium enterprises.

This study employs statistical software Statistica Tibco to identify a function representing the relationship between gender diversity in TMT and financial performance in small enterprises. The results consistently suggest a U-shaped function, implying a non-linear relationship. The mathematical representation of this function is:

$$ROA = 9.9145-0.1208*PWOMEN+0.0021*PWOMEN2 \qquad (1)$$

To find the inflection point, the function was derived according to PWOMEN:

$$\frac{\partial ROA}{\partial PWOMEN} = -0,1208 + 0,0021x \qquad (2)$$

By setting this equation to zero and solving for the relevant variable, the inflection point was determined to be 57.52%. This inflection point is graphically depicted in Figure 1.
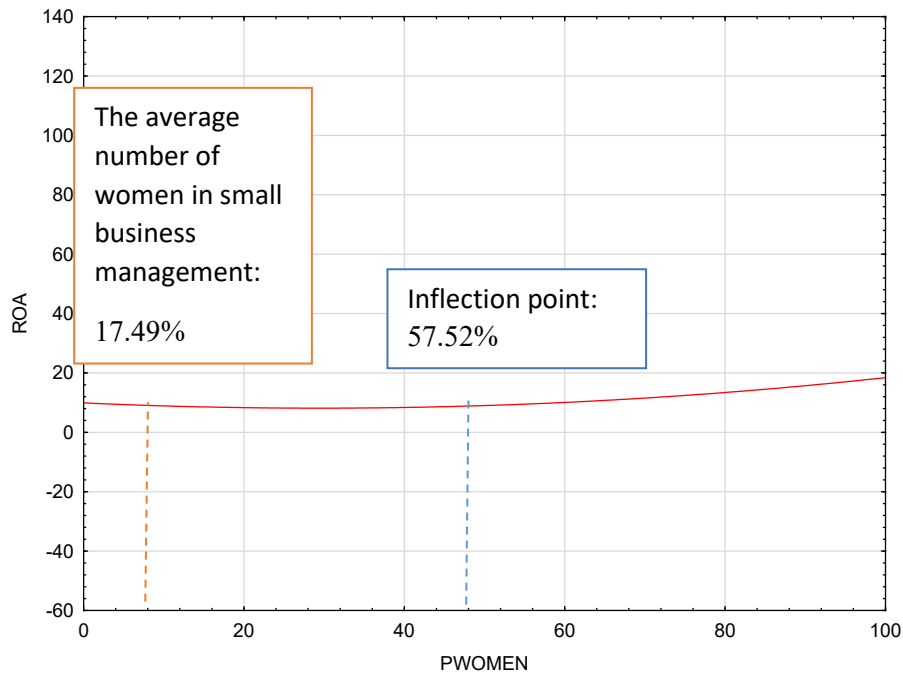
Source: own proceedings, 2024

Figure 1. Small enterprises

In the Czech Republic, SMEs exhibit an average of 17.49% female representation in TMT. This value falls considerably below the identified inflection point (57.52%), suggesting that SMEs in the Czech Republic likely operate in the initial, positive slope of the U-shaped curve. In other words, increasing gender diversity in TMTs of Czech SMEs is likely to have a positive impact on financial performance.

The relationship between gender diversity in TMT and financial performance (ROA) in medium-sized enterprises, operating in manufacturing and ICT sectors in the Czech Republic, was found to follow a quadratic form:

$$ROA = 5.5976 - 0.0226 * PWOMEN + 0.0012 * PWOMEN2 \qquad (3)$$

To determine the inflection point, the function was differentiated with respect to PWOMEN, resulting in:

$$\frac{\partial ROA}{\partial PWOMEN} = -0.0226 + 0.0012x \qquad (4)$$

The average female representation in TMTs of medium-sized enterprises in the Czech Republic is 20.01%. This value exceeds the identified inflection point (18.83%), suggesting that these SMEs are likely to

operate beyond the initial, positive slope of the U-shaped curve. In other words, further increases in gender diversity in TMTs of these SMEs may not lead to substantial additional gains in financial performance.
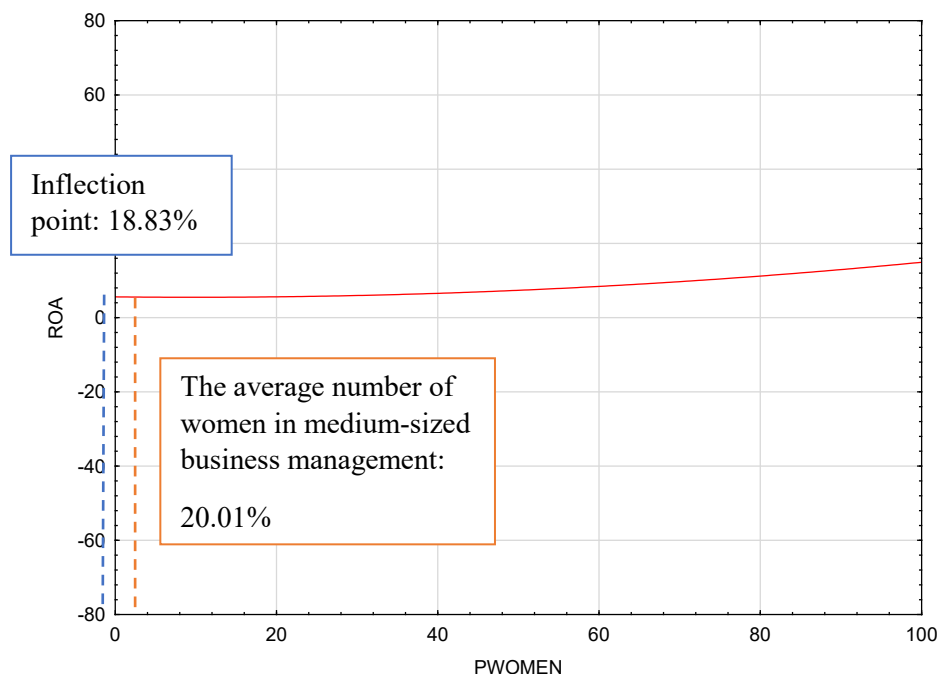
Source: own proceedings, 2024

Figure 2. Medium-sized enterprises

4. Discussion

The models employed in the study demonstrate that the female share in TMT positively impacts the ROA indicator in SMEs operating in the manufacturing and ICT sectors. However, this effect is not statistically significant. Similar conclusions have been drawn by studies conducted by, for example, Cunha et al. (2022), whose findings suggest a positive effect of gender diversity on boards and TMT on ROA, Lafuente and Vaillant (2019), who have found a positive effect of gender diversity in TMT on ROA if women are present in management. Similar conclusions are also confirmed by Repetti (2020). In comparison to the study by Egerová and Nosková (2019), this study arrives at similar results for the ROA indicator; however, no significant statistical effect has been found for the ROE indicator. The ROA indicator, in addition to the female share in TMT, also depends on the number of employees and the economic sector in which the company operates.

These two variables have a negative impact on ROA, but the relationship is again statistically insignificant.

The analysis reveals that the relationship between the PWOMEN and ROA variables exhibits a U-shaped function for small businesses. The positive effect of female representation in TMT becomes apparent once a 57.52% share is reached. Chen et al. (2021) explain this shape by the influence of agent theory, resource dependence theory and gender role theory. According to this study, after reaching the inflection point, the positive impact of agent theory and resource dependence theory outweighs the disadvantages associated with gender role theory. The average share of women in TMT in small enterprises comes out to 17.49%, the share for visible positive impact is not achieved in this case. The inflection point on the curve, expressing the dependence of the two variables in the case of medium-sized enterprises, is at 18.83%. The average number of women in TMT in the medium-sized enterprises, included in the research sample, is 20.01%. The inflection point is exceeded in the case of medium-sized enterprises in manufacturing and ICT. The research is primarily limited by its focus on available secondary data from databases containing information on business entities. As a result, it cannot consider internal environment elements such as corporate culture, internal processes, communication styles, characteristics of female managers themselves, etc. Another limitation lies in the nature of the available data on the composition of management teams of companies listed in the database. It is not possible to track how long a woman has been in a managerial position, and therefore, it is not possible to gain an overview of potential trends in development. Furthermore, it is considered a limitation that the study focuses only on TMT and not on middle or operational management levels.

Conclusions

This paper investigates the impact of gender diversity in top management on the financial performance of small and medium-sized enterprises (SMEs) operating in the manufacturing and ICT sectors in the Czech Republic. Regression analysis models (OLS, GLS, GLM, nonlinear model) were employed to examine the relationship. Data collection took place in the first half of 2024 and was obtained from the Orbis database and annual reports. A total of 396 companies were included in the study. ROA and ROE were used as indicators of financial performance, the percentage of women

in TMT was used as the independent variable, and size of the organization (SIZE), age of the organization (AGE), number of employees (EMPL), size of the TMT (SIZE_TMT), education of women in TMT (EDUC), and the industry in which the firm operates (D_INDUSTRY) were used as control variables.

The research findings indicate a positive relationship between gender-diverse TMT and only the ROA financial indicator. Statistical models reveal that this relationship is nonlinear in nature. The function curve of this relationship approximates a U-shape, which aligns with previous studies (e.g., Chen et al., 2021). The nonlinear relationship is evident in both small and medium-sized enterprises.

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