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Human Capital Efficiency and Firm Performance of Quality-Certified Firms from EFQM Excellence Model: A Dynamic Panel Data Study

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Purpose: The study's main purpose is to investigate the impacts of human capital efficiency (HCE) on the firm performance of non-certified and quality-certified firms from the European Foundation for Quality Management (EFQM) Excellence Model. The study also examines the relationship between firm performance and quality-certificates from the European Foundation.
Design/methodology/approach: By using a sample of 282 non-certified and 22 quality-certified firms from 2017 to 2021, the current study employed a two-step system generalized method of moments (GMM) estimation to analyse the empirical data. The dummy variable is used to examine the relationship between quality-certificates and firm performance. The dummy interaction term is employed to quantify the impacts of HCE on the firm's performance for quality-certified firms.
Findings: The results revealed that quality-certificates and firm performance have a positive relationship. Quality-certified firms perform better and earn more profits than non-certified firms. HCE has a positive impact on firm performance for both types of firms. Moreover, the quality-certified firms utilize HCE in an efficient way to earn more profits compared to the non-certified firms.
Originality: This is the first study to use a comprehensive analysis to emphasize the HCE for non-certified and quality-certified firms separately. The effects of quality-certificates on firm performance in the context of HCE are also being highlighted for the first time in this research.
Practical implications: The current study's findings are fruitful for academics, managers, researchers, policymakers, and other firm management. The findings will encourage the management of the firms to implement the total quality management (TQM) approach within their firms.

Keywords: *Human capital, Quality management, Czech firms, Firm size, Firm age*

1 Introduction

The European Foundation for Quality Management (EFQM) was established in Brussels in 1989. The primary goal of this European Foundation was to promote long-term growth in European economies and increase the competitiveness of European organizations. The Foundation has become the most popular Foundation among European organizations to establish the total quality management (TQM) approach and implement a performance management tool (Zapletalová, 2023; Vukomanovic et al., 2014; Westlund, 2001). The EFQM Model is based on TQM principles. According to Giménez-Espín et al. (2020), the Model could be used to improve the performance of any firm and to improve attaining and maintaining excellence. Most of the earlier studies investigated that quality

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award-winning firms perform better and earn more profits than non-award firms (Zink, 2012; Zhang and Xia, 2013; Boulter et al., 2013; Augustyn, 2021; Zhang et al., 2022; Tarí et al., 2023). Some authors report the same results for those firms that have quality-certificates from the European Foundation (Yousaf, 2023b; Yousaf and Bris, 2020; Yousaf, 2022a; Yousaf and Bris, 2021). Although the European Foundation is quite popular worldwide for implementing the TQM approach, Czech firms are not keen on implementing quality models. As a result, in the context of the TQM strategy, Czech firms are not in competition with those of neighbouring nations (Zapletalová, 2023; Nenadál et al., 2018). Hence, empirical studies are important for Czech firms to examine the impact of quality-certificates (and awards) on firm performance.

The Value-Added Intellectual Coefficient (VAIC) model is a monetary-based measuring approach that helps to determine the efficiency of intellectual capital (IC). The VAIC model was developed by Pulic (2000). Human capital efficiency (HCE) is used as a component of IC efficiency in the VAIC model (Faruq et al., 2023; Soewarno and Tjahjadi, 2020). An efficient use of human capital (HC) at firms' level is an important factor in increasing the overall performance of firms. HCE refers to how effectively a firm uses its HC: the knowledge, skills, and experience of its employees. Several scholars used the VAIC model in their studies to investigate the relationship between IC and firm performance; however, studies on the relationship between firm performance and HCE separately are limited (Mohan, 2020). Therefore, more studies are needed on this important topic.

There are many studies that explore the impact of quality awards on firm performance. But there are rare studies that discuss the impacts of quality-certificates from the European Foundation on firm performance (Yousaf, 2022a). These quality-certificates from the Foundation are very important for implementing the TQM approach in firms and to obtain Global and Prize Awards from the Foundation (Yousaf, 2022a). As stated earlier, there is rare literature that focuses separately on HCE and firm performance. Hence, the current research is going to fill these gaps. According to our best knowledge, this is the first study that highlights the impacts of quality-certificates on firm performance in the context of HCE. Furthermore, this is the first study to separate the HCE for non-certified and certified firms in order to conduct a comprehensive analysis. With the purpose of quantifying the association between HCE and quality-certificates as well as the association between HCE and the firm performance of the quality-certified firms, we incorporated a dummy variable and a dummy interaction term. Thus, the current study makes a valuable contribution to the existing body of literature and holds practical implications in the fields of econometrics and statistics, as it elucidates the conceptualization of the dummy variable and dummy interaction term from financial and economic perspectives. Consequently, this research contributes not solely to academic literature but also to practical knowledge within various contexts.

Following the introduction section of this current research, the next section emphasizes the literature review and hypotheses development. After the methodology section, the empirical findings are described briefly in the empirical results section. The last section discusses conclusions, the scope of further study, and the practical implications of the present study.

Literature review and hypotheses development

Human capital efficiency (HCE)

Human capital (HC) is a broad concept that has been defined by a number of academics. According to Tran and Vo (2020), there are three concepts of HC. The first concept is called the investment perspective, which means HC is the result of the investment, so the value of HC is invested to improve personal intelligence and physical strength and expand skills and knowledge. The second concept of partial output considers that HC is the exclusive skills, knowledge, experience, and appropriate working capacity of technical innovators and managers. The third concept of HC is the total value of personal skills, intelligence, knowledge, and physical strength used to produce products. This concept of HC is not limited to technical personnel or managers; it could be the working capacity of any person. Micah et al. (2012) and Baron (2011) argued that human resources are knowledge, talents, skills, development ability, and energy that can be used to deliver services or produce goods. According to Rehman et al. (2022), the quality of the workforce can be improved by investing in HC, as it is a very important source of economic growth.

An educated and skilled workforce plays an essential role in improving efficiency by developing and adopting new skills and promoting knowledge (Mohan, 2020). Therefore, HCE is an important part of national wealth and a primary source of organizational growth. According to Yousaf (2022a), HCE originates from the HC theory, and it helps firms to gain further opportunities and to decrease market threats. Managers of the firms observe and monitor their workforce and then use this information for goal setting, continuous improvement, and improving the quality of their products and services. Nikandrou et al. (2014) argued that workforce training is important as it provides firm-specific knowledge and skills to improve firm performance. Therefore, these workforce characteristics are important to improving the firm's performance. HCE is a function of value-added and HC, and it is used as a component of IC efficiency in the VAIC model (Tran and Vo, 2020). Hence, HCE is computed by the ratio of value-added and HC by employing firm-level data to explore the impacts of HCE on firm performance. With or without using the VAIC model, many authors explored the relationship between HCE and firm performance (Slavković et al., 2023; Bataineh et al., 2022; Aybars and Mehtap, 2022; Xu

and Li, 2020; Nguyen, 2020; Bayraktaroglu et al., 2019).

Firm performance

Firm performance is an important topic in the literature for academics, managers, policymakers, leaders, and many others. Several proxies, such as return on equity (ROE), return on invested capital, return on capital employed, return on assets (ROA), etc., have been used to measure the firm's performance in the earlier studies. The same proxies are also employed by several authors in previous literature to measure firm profitability (Niazi et al., 2023; Jaworski and Czerwonka, 2022; Yousaf et al., 2021). A study by Yousaf and Dey (2022) revealed that ROA is the best proxy to measure firm performance after analyzing 297 Czech firms' data from three sectors. However, ROA and ROE are the most common proxies used in the previous literature (Dženopoljac et al., 2023; Habib and Dalwai, 2023; Kayakus et al., 2023; Nawaz and Ohlrogge, 2022; Olohunlana et al., 2022; Kayani et al., 2020; Ahmed and Bhuyan, 2020; Samo and Murad, 2019). Therefore, both ROA and ROE are employed as proxies to measure firm performance in the present research.

Quality certificates and firm performance

The findings of prior research studies have revealed that firms that have obtained quality awards demonstrate a higher level of performance compared to their rivals (Zapletalová, 2023; Augustyn et al., 2021). Several scholars have explored the aforementioned results pertaining to firms that have been accredited for their quality by the European Foundation (Yousaf, 2023c; Yousaf, 2022b). In comparison, a limited number of scholars have examined the conflicting results. To illustrate, Yousaf et al. (2021) conducted research utilizing data from 332 firms, among which 20 were certified firms, in order to investigate the relationship between firms' profitability and management of working capital. The findings indicated that the acquisition of a quality certificate from the European Foundation was linked to a decrease in the firms' profitability. In a comparable vein, based on data derived from 112 Iranian firms, the research carried out by Safari et al. (2020) demonstrated that there was no significant connection between obtaining quality awards and the financial performance of firms. Consequently, the authors concluded that the models of excellence are not suitable for Iran's business environment. This empirical investigation underscores the fact that quality certification does not automatically ensure a competitive advantage for firms. However, the majority of the results obtained from the previous investigations have focused on the examination of the favourable influence exerted by quality certificates and accolades on firm performance. Hence, as a logical consequence, the subsequent hypothesis has been developed:

H1: The European Foundation's quality certificates have a positive impact on firm performance.

HCE and firm performance

The relationship between HCE and the firm's performance has been examined by numerous authors. In the prior literature, most scholars have reported a positive relationship between HCE and the firm's performance (Maji and Goswami, 2017; Chowdhury et al., 2019; Tran and Vo, 2020; Nguyen, 2020; Slavković et al., 2023; Faruq et al., 2023). On the other hand, a few scholars have reported an insignificant relationship between HCE and the firm's performance (Smriti and Das, 2018; Puntillo, 2009; Firer and Williams, 2003). A study by Soewarno and Tjahjadi (2020) revealed that HCE is not associated with ROA and ROE in many models. To sum up the above discussion, most of the researchers found a positive relationship between the variables. Consequently, the following hypotheses are formulated for non-certified and certified firms individually.

H2: HCE is positively associated with firm performance for non-certified firms.

H3: There is a significant positive relationship between HCE and performance of the quality-certified firms.

Control variables

Firm age (AGE) and firm size (SIZE) are important variables that affect the firm's performance. Numerous studies have used AGE and SIZE as independent variables (or control variables) to examine the effects of the variables on firm performance. Prior studies revealed that large firms enjoy economies of scale, relatively lower adjustment costs, and easy access to the credit markets (Chandrapala and Knápková, 2013; Tanaka, 2021). A number of scholars, such as Li et al. (2021); Khan et al. (2018); and Molodchik et al. (2016), examined the positive impact of SIZE on firm performance. Conversely, Masnoon and Saeed (2014); Ullah et al. (2017); Tran and Vo (2020); and Ullah et al. (2020) reported the opposite relationship between both variables.

According to Chhibber and Majumdar (1999), new firms frequently go through an initial period of developing skills in marketing, production, and management; therefore, older firms perform better than new firms. Kuntluru et al. (2008) and Tanaka (2021) explored a positive relationship between AGE and the firm's performance. On the contrary, the studies by Park et al. (2010); Charoenrat and Harvie (2013); Li et al. (2021); and Faruq et al. (2023) found a negative relationship between the variables.

To summarise the above discussion, on the one hand, prior studies show that quality awards and certificates improve firm performance. On the other hand, most of the studies stated that the HCE has a positive impact on firm performance. Therefore, it would be interesting to explore the relationship between quality-certificates and firm performance and the relationship between firm performance and HCE for non-certified firms and certified firms. Therefore, the research hypotheses that are formulated based on the conclusions of the earlier studies, the following conceptual framework of HCE, control variables, and proxies of firm performance are presented in Figure 1.

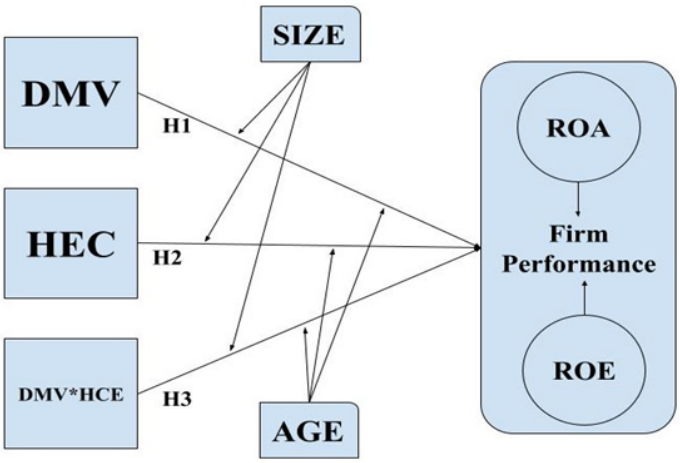

Figure 1: Conceptual framework of the research

Table 1: Summary of selected variables

Variables	Short Form	Formula
Dependent Variables		
Return on Asset	ROA	(Net income) / (Total Assets)
Return on Equity	ROE	(Net income) / (shareholder's equity)
Independent Variables		
Human Capital Efficiency	HCE	(VA) / (HC) Where VA = Value added, HC= Total cost invested on employees
Dummy Variable	DMV	DMV = 1 for quality-certified firms; DMV = 0 for non-certified firms
Dummy Interaction Term	DMV*HCE	HCE of the certified firms only
Control Variables		
Firm Size	SIZE	Log (Total assets)
Firm Age	AGE	Number of years since the firm registered

Methodology

Data

We acquired the data regarding the firms that have been certified for their quality from the EFQM recognition database. The total count of firms that have received quality-certificates is 22, since only 22 firms from the construction and manufacturing sectors have been granted quality-certificates by the European Foundation. The secondary data of 22 quality-certified firms and 282 non-certified firms was obtained from the Albertina database. The Albertina database is very popular and reliable in Visegrad countries (V4). Činčalová and Hedija (2020) contended that the database includes information pertaining to a vast amount exceeding 2.7 million subjects. Additionally, many recent studies (Lososová and Zdeněk, 2023; Yousaf and Dehning, 2023; Hamplová et al., 2022; Dokulil et al., 2022; Drábková and Pech, 2022; Urbancová and Vrabcová, 2022) have used data from the Albertina database. The number of quality-certified firms in the prior studies was also small for the analysis (Yousaf, 2023c; Yousaf, 2022b). The sample of non-certified firms was selected randomly; however, the total sample (304 firms) is enough for the analysis (Fleiss et al., 1969; Israel, 1992).

The quality-certified and non-certified firms are selected from the construction and manufacturing sectors in the present research due to three reasons: (i) Both sectors are the capital-intensive as well as labour-intensive. (ii) There are various specific characteristics of the sectors, for instance, a large amount of investment, a high financial and operating risk, a long development cycle, etc. (iii) The sectors contribute more than 25% of Czechia's gross domestic product (GDP). The share of the construction sector was about 5.20%, and the manufacturing sector was 20.83% of the country's GDP in 2021 (World Bank Statistics). Moreover, Gajdosikova & Valaskova (2022) discussed the same arguments in the context of Slovak firms and argued that both sectors are not only important in the Slovak Republic but also globally. The authors claimed that both sectors have been significantly affected by COVID-19 in recent years. Therefore, the construction and manufacturing sectors need to improve their HCE in order to improve their competitiveness.

Variables

Firm performance (proxies, ROE and ROA) is the dependent variable. The independent variables are HCE, a dummy variable (DMV), and a dummy interaction term (DMV*HCE). The value of DMV=1 if the firm has a quality-certificate from the European Foundation; otherwise, DMV=0. The dummy interaction term (DMV*HCE) represents the HCE of the certified firms only. The control variables are SIZE and AGE. The details of the variables are presented in Table 1.

Regression models

To investigate the relationship between HCE and firm performance, the following regression models are estimated.

$$\textbf{ROA it} = \beta_0 + \beta1\ (\text{ROA it-1}) + \beta2\ (\text{HCE it}) + \beta3\ (\text{SIZE it}) + \beta4\ (\text{AGE it}) + \beta5\ (\text{DMV it}) + \beta6\ (\text{DMV*HCE it}) + \eta i + \varepsilon it \qquad \textbf{Model 1}$$

$$\textbf{ROE it} = \beta_0 + \beta1\ (\text{ROE it-1}) + \beta2\ (\text{HCE it}) + \beta3\ (\text{SIZE it}) + \beta4\ (\text{AGE it}) + \beta5\ (\text{DMV it}) + \beta6\ (\text{DMV*HCE it}) + \eta i + \varepsilon it \qquad \textbf{Model 2}$$

In the above Model 1 and Model 2, β_0 is the intercept, the remaining β values denote the regression coefficients, i=1, 2, 3…. N represents the total count of firms, while t signifies the duration spanning from 2017 to 2021. Furthermore, εit stands for error terms at time t for firm i, and ηi signifies unobserved firm-specific effects. DMV is a dummy variable, and DMV*HCE is a dummy interaction term. The value of DMV will be one for quality-certified firms; however, the value of DMV will be zero for non-certified firms.

Empirical results

Table 2 displays the descriptive statistics for non-quality certified firms and quality-certified firms. The values of the mean and median of ROA and ROE are slightly dissimilar from each other. However, it is clear from the positive average values of ROE and ROA that both types of firms earned profits from 2017 to 2021 (during the study period). However, the values of the mean and median of ROA and ROE for the quality-certified firms are higher compared to non-quality firms, which indicates that the quality-certified firms earned more profits and performed better. In general, skewness defines the direction and quantity of the skew. The data is perfectly symmetrical if the value of skewness is zero. The skewness should be zero for a normal distribution, but it is improbable for practical data. Kurtosis defines the height and sharpness of the central peak in comparison to that of an ordinary bell curve. A positive kurtosis value specifies a heavy-tailed distribution; conversely, a negative value of kurtosis illustrates a light-tailed distribution. For the standard normal distribution, Simon et al. (2017) proposed that skewness and kurtosis should be within the range ±3, and ±10, respectively. Hence, most of the kurtosis and skewness values in Table 2 show the normal distribution according to the range recommended by Simon et al. (2017).

The variance inflation factor (VIF) test and correlation coefficients of total firms are presented in Table 3. All the selected variables are positively associated with ROE and ROA, except AGE. AGE is negatively correlated not only with ROE and ROA but also with HCE. However, DMV and DMV*HCE are positively correlated with the proxies of firm performance. We calculated VIF to address the problem of multicollinearity in the sample. Nachane (2006) posited that the presence of multicollinearity may pose a severe problem, particularly when the value derived from the VIF test exceeds 10. As per the findings presented

in Table 3, it is evident that no issue of multicollinearity is observed in the selected independent variables, as all VIF test values fall below the threshold of 10.

The Breusch-Pagan (B.P.) test is utilized to identify heteroskedasticity in the estimated values of ROA and ROE. The B.P. test's null hypothesis is that the variance remains constant. The p-value obtained from the B.P. test for ROA is 0.126, surpassing the predetermined level of significance of 0.05. Consequently, there is an absence of heteroskedasticity in the data. Similarly, the B.P. test is applied to detect heteroskedasticity in the estimated values of ROE. The p-value derived from the B.P. test for ROE is 0.215, further indicating that there is no presence of heteroskedasticity within the data.

To avoid spurious regression results, the Fisher-type unit root test was used to diagnose the stationarity in the data. Maddala and Wu (1999) suggested that the Fisher test could also apply to the unbalanced panel data, so anybody can apply the individual augmented Dickey-Fuller (ADF) test. To test the stationarity, we proposed the following hypothesis:

H4: At least one panel is stationary.

The Fisher-type unit-root test was applied with two choices: without a time trend and with a time trend. The test outcomes revealed that all the chosen variables are stationary because the p-values are zero in all cases[1].

We employed the two-step system GMM estimation to estimate Model 1 and Model 2 in the current study. Roodman (2009) argued that GMM is the best technique for panel data if "T is small and N is large", as many problems like serial correlation, homogeneity, unobservable heterogeneity, and endogeneity could be handled in GMM. Moreover, with the value of the Hansen test in GMM, one can easily observe the validity of instrumental variables (IV). Additionally, numerous scholars employed the two-step system GMM in the most recent studies (Yousaf, 2023a; Rehman et al., 2022; Gul et al., 2022; Růčková and Škuláňová, 2022; Oppong et al., 2019). Consequently, we also employed the two-step system GMM to estimate Model 1 and Model 2[2].

Table 2: Descriptive Statistic

Stats	ROA	ROE	HCE	SIZE	AGE	DMV	DMV*HCE
Non-quality certified firms							
Mean	4.45	8.63	1.27	5.77	28.49		
Median	4.33	8.03	1.85	8.53	25.72		
S.D.	7.12	12.32	1.83	10.19	6.40		
Minimum	-27.58	-51.07	0.16	4.05	3.54		
Maximum	42.77	68.17	21.54	49.19	48.12		
Skewness	0.71	0.64	8.12	0.62	-0.20		
Kurtosis	6.05	5.15	12.45	3.27	3.88		
N	825	840	832	843	834		
Quality certified firms							
Mean	8.49	13.59	2.47	6.33	24.69	1	2.41
Median	6.12	9.88	1.65	10.22	28.00	1	1.66
SD	8.75	14.31	1.90	20.68	6.07	0	1.87
Minimum	-6.20	-24.78	0.39	5.19	10.00	1	0.39
Maximum	34.07	51.15	10.44	17.88	30.00	1	10.38
Skewness	0.96	0.73	2.43	0.59	-1.03	1.23	2.34
Kurtosis	3.40	3.87	8.87	2.91	2.83	1.09	8.76
N	89	91	87	92	98	98	87

(Source: Authors)

[1] Untablutaled results of B.P test and Fisher-type unit root are available from the author(s) on request.
[2] We also run the regression by switching the values of DMV and got the same results with opposite signs.

Table 3: Correlation coefficients

	ROA	ROE	HCE	SIZE	AGE	DMV	DMV*HCE	VIF
ROA	1							
ROE	0.87*	1						
HCE	0.41*	0.33*	1					1.35
SIZE	0.16*	0.10*	0.30*	1				1.2
AGE	-0.04	-0.12*	-0.05	0.11*	1			1.03
DMV	0.10*	0.07*	0.19*	0.30*	0.01	1		2.75
DMV*HCE	0.15*	0.12*	0.42*	0.36*	-0.04	0.78*	1	3.28

Note: *p < 0.05

(Source: Authors)

Table 4: Empirical results: Two-step system GMM

	ROA (Model 1)		ROE (Model 2)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.
Lag of ROA/ROE	0.624	0.120***	0.402	0.094***
HCE	0.427	0.618*	0.942	0.863
SIZE	0.426	6.046	20.414	17.339
AGE	-0.008	0.560	-0.370	1.601
DMV	10.265	4.667**	35.063	20.615*
DMV*HCE	2.041	0.944**	7.162	2.835**
Constant	-2.203	47.028	-104.13	133.696
No. of Observations	939		939	
No. of instruments	9		15	
Wald Chi-square	598.07 (0.000)***		220.73 (0.000)***	
AR (1)	0.008***		0.013**	
AR (2)	0.658		0.703	
Hansen Test	0.139		0.264	

Note: *P < 0.10, **P < 0.05, ***P < 0.01

(Source: Author)

Table 4 shows the two-step system GMM results where DMV = 1 denotes the quality-certified firms, and DMV = 0 represents non-certified firms. When DMV = 0, then DMV and DMV*HCE will become zero, and Model 1 and Model 2 for the non-certified firms will be like this:

$$\mathbf{ROA}_{it} = \beta_0 + \beta_1 (\mathrm{ROA}_{it-1}) + \beta_2 (\mathrm{HCE}_{it}) + \beta_3 (\mathrm{SIZE}_{it}) + \beta_4 (\mathrm{AGE}_{it}) + \eta_i + \varepsilon_{it}$$

$$\mathbf{ROA}_{it} = -2.203 + 0.624 (\mathrm{ROA}_{it-1}) + 0.427 (\mathrm{HCE}_{it}) + 0.426 (\mathrm{SIZE}_{it}) - 0.008 (\mathrm{AGE}_{it}) + \eta_i + \varepsilon_{it}$$

Similarly, Model 2 for the non-certified firms will be like in the following:

$$\mathbf{ROE}_{it} = \beta_0 + \beta_1 (\mathrm{ROE}_{it-1}) + \beta_2 (\mathrm{HCE}_{it}) + \beta_3 (\mathrm{SIZE}_{it}) + \beta_4 (\mathrm{AGE}_{it}) + \eta_i + \varepsilon_{it}$$

$$\mathbf{ROE}_{it} = -104.13 + 0.402 (\mathrm{ROE}_{it-1}) + 0.942 (\mathrm{HCE}_{it}) + 20.414 (\mathrm{SIZE}_{it}) - 0.370 (\mathrm{AGE}_{it}) + \eta_i + \varepsilon_{it}$$

When DMV = 1 for the certified firms, then Model 1 can be estimated for the certified firms in the following:

$$\mathbf{ROA}_{it} = \beta_0 + \beta_1 (\mathrm{ROA}_{it-1}) + \beta_2 (\mathrm{HCE}_{it}) + + \beta_3 (\mathrm{SIZE}_{it}) + \beta_4 (\mathrm{AGE}_{it}) + \beta_5 (\mathrm{DMV}_{it}) + \beta_6 (\mathrm{DMV} * \mathrm{HCE}_{it}) + \eta_i + \varepsilon_{it}$$

$$\mathbf{ROA}_{it} = (\beta_0 + \beta_5) + (\beta_2 + \beta_6)(\mathrm{HCE}_{it}) + \beta_1 (\mathrm{ROA}_{it-1}) + \beta_3 (\mathrm{SIZE}_{it}) + \beta_4 (\mathrm{AGE}_{it}) + \eta_i + \varepsilon_{it}$$

$$\mathbf{ROA}_{it} = (-2.203 + 10.265) + (0.427 + 2.041)(\mathrm{HCE}_{it}) + 0.624 (\mathrm{ROA}_{it-1}) + 0.424 (\mathrm{SIZE}_{it}) - 0.008 (\mathrm{AGE}_{it}) + \eta_i + \varepsilon_{it}$$

$$\mathbf{ROA}_{it} = 8.062 + 2.468 (\mathrm{HCE}_{it}) + 0.624 (\mathrm{ROA}_{it-1}) + 0.624 (\mathrm{SIZE}_{it}) - 0.008 (\mathrm{AGE}_{it}) + \eta_i + \varepsilon_{it}$$

Similarly, we can estimate Model 2 for the certified firms in the following:

$$\mathbf{ROE}_{it} = \beta_0 + \beta_1 (\mathrm{ROE}_{it-1}) + \beta_2 (\mathrm{HCE}_{it}) + + \beta_3 (\mathrm{SIZE}_{it}) + \beta_4 (\mathrm{AGE}_{it}) + \beta_5 (\mathrm{DMV}_{it}) + \beta_6 (\mathrm{DMV} * \mathrm{HCE}_{it}) + \eta_i + \varepsilon_{it}$$

$$\mathbf{ROE}_{it} = (\beta_0 + \beta_5) + (\beta_2 + \beta_6)(\mathrm{HCE}_{it}) + \beta_1 (\mathrm{ROE}_{it-1}) + \beta_3 (\mathrm{SIZE}_{it}) + \beta_4 (\mathrm{AGE}_{it}) + \eta_i + \varepsilon_{it}$$

$$\mathbf{ROE}_{it} = (-104.130 + 35.063) + (0.942 + 7.162)(\mathrm{HCE}_{it}) + 0.402 (\mathrm{ROE}_{it-1}) + 20.414 (\mathrm{SIZE}_{it}) - 0.370 (\mathrm{AGE}_{it}) + \eta_i + \varepsilon_{it}$$

$$\mathbf{ROE}_{it} = -69.067 + 8.104 (\mathrm{HCE}_{it}) + 0.402 (\mathrm{ROE}_{it-1}) + 20.414 (\mathrm{SIZE}_{it}) - 0.370 (\mathrm{AGE}_{it}) + \eta_i + \varepsilon_{it}$$

Table 4 demonstrates that the statistical significance of both the coefficients of lagged ROA (Model 1) and lagged ROE (Model 2) is observed at the 0.01 level of significance. The positive signs of both coefficients indicate that the performance achieved in the preceding year has a positive impact on the performance observed in the present year. The coefficients of the lagged values of the dependent variables display conformity with the assumption of steady state, which holds great importance in the examination of firm performance and the validity of instruments. This assumption is based on the notion that past performance significantly influences current performance, as evidenced by the studies conducted by Raithatha and Komera (2016) and Okoyeuzu et al. (2021).

The coefficient of HCE is statistically significant at the 0.10 significance level in Model 1 (ROA) for non-certified firms. This positive and significant coefficient of HCE supported H2, i.e., HCE is positively associated with firm performance for non-certified firms. However, the coefficient of HCE of the non-certified firms is statistically not significant in Model 2, as the p-value is greater than the significance level. These findings regarding the positive relationship between HCE and firm performance are consistent with the previous studies (Faruq et al., 2023; Slavković et al., 2023; Tran and Vo, 2020; Nguyen, 2020).

Both coefficients of DMV are statistically significant at the 0.05 level of significance. The positive signs of the coefficients revealed that the quality-certificates have a positive impact on ROE and ROA. The quality-certified firms perform 10.265 units in Model 1 and 35.063 units in Model 2 better than non-certified firms. These significant results supported H1, i.e., The European Foundation's quality certificates have a positive impact on firm performance. These findings are consistent with prior studies, such as Yousaf (2023c) and Yousaf and Bris (2022a), as the authors also reported the same results. Hence, like quality awards, quality-certificates are also helpful to increase the firm's performance. Numerous scholars have made recommendations for quality excellence models to be implemented by Czech firms (Yousaf, 2023c; Zapletalová, 2023; Nenadál et al., 2022; Nenadál et al., 2018). As stated by Zimon and Dellana (2020), the implementation of quality certificates not only improves financial performance but also provides non-financial advantages such as enhanced product quality, increased customer satisfaction, and improved labour productivity, among others. Hence, we propose that firms' management should consider adopting the TQM approach in order to achieve both financial and non-financial gains.

Both coefficients of DMV*HCE are statistically significant at the 0.05 level of significance for the certified firms. The positive signs of both coefficients show that the relationship between firm performance and the HCE of certified firms is positive. These significant findings supported H3, i.e., There is a significant positive relationship between HCE and performance of the quality-certified firms. The magnitude of HCE for certified firms is greater than the magnitude of HCE for non-certified firms, indicating that the relationship between HCE and firm performance is considerably larger for certified firms (2.468 > 0.427 in Model 1 and 8.104 > 0.942 in Model 2)[3]. The results of DMV and DMV*HCE show that firms with quality-certificates not only perform better but also utilize HCE in an efficient way to earn more profits compared to non-certified firms. Therefore, quality-certificates are highly beneficial for firms across various contexts. Consequently, we strongly recommend that firms' management implement the TQM approach within their firms.

Considering the findings of the control variables, the coefficients of the AGE are statistically not significant in Model 1 and Model 2. These non-significant findings revealed that young and old firms do not significantly differ in terms of their firm performance. Similar to the AGE, both SIZE coefficients are statistically not significant. The findings explored that the size of a firm does not significantly affect the firm's performance.

Regarding post-estimation tests, AR (1) is the first-order autocorrelation, and AR (2) is the second-order autocorrelation. In Table 4, the insignificant p-values of AR (2) in both Models (Model 1 and Model 2) encourage us to accept the null of no autocorrelation. The p-value of the Hansen-test is statistically not significant, it means that all instruments used in the Models are valid. The insignificant values of Hansen Tests specify that instrumental variables are not correlated with error terms. Roodman (2009) suggested that the Hansen Test's p value should be within the limits of 0.10 and 0.25. Table 4 shows that the Hansen Test's p value in Model 1 falls within the suggested limit. But the p-value reported in Model 2 is slightly higher than the suggested limit. However, some researchers have reported the outcomes of the GMM technique, whereby the Hansen Test's p-value was much higher than the suggested limit (Yousaf, 2023c; Wintoki et al., 2012). Consequently, similar to the outcomes of Model 1, the outcomes presented in Model 2 are also valid.

Conclusion

The current study's main purpose is to investigate the impact of HCE on firm performance for both quality-certified and non-certified firms. To explore the main purpose, secondary data was gathered from the Albertina database of 282 non-certified and 22 certified firms from the European Foundation. The two-step system GMM estimation was used to test the hypotheses. The outcomes revealed that there is a positive relationship between HCE and firm

[3] We also run the regression by switching the values of DMV and got the same results with opposite signs. Untabulated results are available from the author(s).

performance for both types of firms. The quality-certificates from the European Foundation have a positive impact on the firm's performance. Furthermore, the relationship between HCE and firm performance is significantly stronger in certified firms than in non-certified firms. The empirical findings of the current research showed that firms with quality-certificates not only performed better and earned more profits but also utilized their HCE in an efficient way compared to non-certified firms. As a result, we propose that the Czech Society for Quality encourage firms to implement quality models. We also recommend that the management of the firms take part in the quality award and certificate processes and implement the TQM approach within their firms.

The following limitations should be considered for the current research: (i) A period of only five years (2017-2021) is considered for the analysis as the latest and most available data from the Albertina database covers only five years. (ii) The consequences of coronavirus disease (COVID-19) could be felt globally. Czech firms are also affected by the pandemic. But the current research did not include any factor that is related to COVID-19. (iii) Many economic, financial, and social factors affect the firm's performance. However, only the two most important variables are included as control variables based on the previous studies. (iv) Only 22 certified firms are selected because there are only 22 firms from the construction and manufacturing sectors that have quality certificates from the European Foundation.

There are numerous avenues for further investigation into the relationship between HCE and firm performance. One country, two sectors, one methodology, and a short time period were taken into account in the present research. Further research should be done by considering more countries, more sectors, and a longer time period. Future research can also be possible by including other quality-certificates and awards, such as those from the International Organization for Standardization (ISO), and by considering other proxies of firm performance, such as return on invested capital, return on sales, and return on capital employed.

This paper offers several contributions to the literature and practical knowledge. Theoretically, the research contributes by extending the literature on quality-certificates from the European Foundation because the research contributes to the literature on how quality awards and certificates impact firm performance. Most of the prior literature shows that quality awards have a positive impact on firm profitability or performance. The findings of the current study show that quality-certificates also have a positive impact on the firm's performance. The quality-certificates from the European Foundation not only increase firm performance but also ensure that the quality-certified firms have significantly higher HCE than non-certified firms. Hence, the study's findings will motivate the management of the firms to implement the EFQM Model in their firms. In this way, firms can improve their performance in many contexts.

Data availability statement: The data that support the findings of this study are available at the Albertina database homepage, https://www.bisnode.cz/produkty/albertina/

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Učinkovitost človeškega kapitala in uspešnost podjetij, certificiranih po modelu odličnosti EFQM: Študija dinamičnih podatkovnih plošč

Namen študije: Namen študije je preučiti vpliv učinkovitosti človeškega kapitala na uspešnost podjetij, ki niso certificirana, ter podjetij, ki imajo certifikat kakovosti po modelu odličnosti Evropske fundacije za upravljanje kakovosti (EFQM). Študija prav tako preučuje odnos med uspešnostjo podjetij in njihovim posedovanjem certifikatov kakovosti EFQM.
Metodologija: Na vzorcu 282 necertificiranih in 22 certificiranih podjetij je bila, za obdobje od 2017 do 2021, v raziskavi uporabljena dvostopenjska metoda splošnih trenutkov (GMM). Uporabljena je bila dvojna spremenljivka za preučevanje odnosa med certifikati kakovosti in uspešnostjo podjetij. Dvojni interakcijski izraz je uporabljen za kvantificiranje vplivov HCE na uspešnost podjetja pri certificiranih podjetjih.
Ugotovitve: Rezultati so pokazali, da imata spremenljivki certifikat podjetja in uspešnost podjetja pozitiven odnos. Certificirana podjetja se izkažejo bolje in ustvarijo več dobička kot necertificirana podjetja. HCE ima pozitiven vpliv na uspešnost podjetja. Poleg tega certificirana podjetja učinkovito izkoriščajo HCE za večji dobiček v primerjavi z necertificiranimi podjetji.
Izvirnost: To je prva študija, ki uporablja celovito analizo za poudarjanje HCE za necertificirana in certificirana podjetja. Učinki kakovostnih certifikatov na uspešnost podjetja v kontekstu HCE so prav tako prvič poudarjeni.
Praktične implikacije: Ugotovitve te študije so koristne za akademike, vodje, raziskovalce, oblikovalce politik in druge upravljavce podjetij. Ugotovitve bodo spodbudile upravljanje podjetij k uvedbi pristopa celovitega upravljanja kakovosti (TQM) v svojih podjetjih.

Ključne besede: *Človeški kapital, Upravljanje kakovosti, Češka podjetja, Velikost podjetja, Starost podjetja*