

Determinants of working capital management for noncertified and certified firms from the EFQM Excellence Model

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ABSTRACT

The study's main aim is to examine the important determinants that affect working capital (WRC) for non-quality-certified and quality-certified firms from the European Foundation for Quality Management (EFQM) Excellence Model and to explore the impacts of quality certificates on WRC. The study is conducted using the secondary data of 328 firms, including 21 quality-certified firms. The secondary data were retrieved from the Albertina database from 2017 to 2021. The two-step system generalized method of moments (GMM) estimation was employed to test the hypotheses. The empirical findings indicate that firm size and operating cash flow have a positive impact on WRC. On the other hand, financial leverage and profitability have a negative relationship with WRC. The quality certificates from the European Foundation have a positive impact on both types of WRC. The findings of this study will be beneficial to the firms' directors, managers, academics, and leaders to sustain the optimum level and forecast future WRC requirements.

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1. Introduction

Working capital management (WRCM) is the management of a firm's finances in the short term. There are two basic elements of working capital (WRC): current liabilities and current assets. There are many components of the two basic elements that create short-term liabilities and current assets. Managing these components is a continuing process. The decisions concerning the materials, sale of goods, and inventory management are directly related to WRC. Therefore, WRCM is used to decide an appropriate level of short-term liabilities, current assets, and their structure. Zimon and Zimon (2020) argued that it is a problem for the firm's management to determine the optimal level of WRC. Hence, the management of the firms are continually looking for methods, solutions, and tools that will assist them in managing WRC.

Effective WRCM depends upon the controlling and planning of current liabilities and current assets. Efficient utilization of the WRC determinants is

crucial for the smooth functioning of the firm's routine operating activities, resulting in improved profitability and performance. Efficient WRCM plans for and manages current liabilities and current assets to reduce the risk of insolvency, meet payable short-term obligations, and avoid unnecessary investments and excessive borrowing (Nwude, Allison, and Nwude 2021). A firm needs to maintain a specific level of WRC as it requires taking loans from financial institutes. There are no direct theories about WRC that explain the relationship with its management; however, the relationship could be explained by the theoretical underpinnings of capital structure (Nyeadi, Sare, and Aawaar 2018). WRC, according to some authors, allows firms to survive during a crisis (Tsuruta 2019; He, Mukherjee, and Baker 2017). Hence, the topic got more importance after the financial crises (2007–2009) and in the current Coronavirus disease (COVID-19) pandemic situation globally.

WRCM is one of the most significant decisions that managers and other management of the firm make.

Abbadi and Abbadi (2012) argued that numerous factors affect WRCM, and they change over time. Yadav, Kamath, and Manjrekar (2009) stated that WRC policy varies with economic cycles, so it is dynamic over time. Although the WRCM is a vast topic, there is rare empirical research on the determinants that affect the WRC, specifically for quality award-winning (or certified) firms. Yousaf (2022b) argued that the literature on WRC determinants is limited in scope because most researchers examined the relationship between the WRC and the firm's profitability. Not much is known about the determinants that affect the WRC. However, the current research is going to contribute to the limited existing literature on WRC. We chose the manufacturing industry for the current study because, among other characteristics, it is both capital and labor intensive, requires significant investments, has a high operating risk, and has a lengthy development cycle. As a result, the industry must improve its efficiency in the context of WRCM. The main goal of this research is to examine the important determinants of WRC for non-quality-certified and quality-certified firms. So, the current research investigates how the determinants are useful for the firm's authorities in maintaining an optimum level of WRC.

The European Foundation for Quality Management (EFQM) is a nonprofit foundation. The main objective of the EFQM Excellence Model is to raise the competitiveness of European organizations. The European Foundation is well known in Europe and the rest of the world for implementing total quality management (TQM). The previous literature shows that quality awards and certificates play an important role in improving the firm's performance. Firms with quality awards and certificates perform better and earn more profits than their competitors (Gray, Ross, and Badrick 2022; Zapletalová 2021; Yousaf and Bris 1970; Zimon and Dellana 2019; Abad, Lafuente, and Vilajosana 2013; Zink 2012). There are many studies that explore the impacts of quality awards (and certificates) on the firm's performance. However, this is the first study that examines the impacts of the EFQM model's quality certificates on WRC. As stated earlier, there is rare empirical research that focuses on the determinants of WRC. Hence, the current research contributes to the existing literature on the topic. To the best of our knowledge, this is also the first study that examines a comprehensive analysis by emphasizing the WRC for non-certified and quality-certified firms separately, as we included both types of working capital: net working capital (NWC) and gross working capital (GWC). To investigate the relationship between WRC and quality certificates from the

model, we included a dummy variable. We also included six dummy interaction terms for the certified firms separately to study comprehensively which determinants affect WCR in which direction. The current research also contributes to the existing literature in econometrics and statistics, as we included one dummy variable and six dummy interaction terms and then explained them from financial and economic points of view. Hence, the research contributes not only to the literature but also to practical knowledge in many contexts.

Including the introduction section, the article is divided into five sections. Section 2 provides a literature review as well as the development of research hypotheses. Section 3 presents the methodology and research design. The results of the empirical research are presented in Section 4. The last section discusses implications and conclusions of the research.

2. Literature review and hypotheses development

Most of the WRCM research conducted in earlier studies is quantitative. According to certain scholars, 89% of WRCM research is quantitative (Simon et al. 2021; Kayani, De Silva, and Gan 2019). A number of scholars have measured the efficiency of WCM by employing different sectors (Yousaf 2022b; Kasiran, Mohamad, and Chin 2016; Kaur and Singh 2013; Afza and Nazir 2011). Various authors used WRC as an independent variable to quantify the relationship between WRCM and firm performance (Farhan et al. 2021; Thi and Phung 2021; Chauhan 2023; Senan et al. 2021; Högerle et al. 2020; Pham, Nguyen, and Nguyen 2020). Some authors employed the following components of WRC: (i) cash conversion cycle, (ii) days sales outstanding, (iii) days payable outstanding, and (iv) days inventory outstanding. These authors included components of WRC to investigate the relationship between WRCM and the firm's performance (Banerjee, Dutta, and Zhu 2021; Högerle et al. 2020; Goel and Sharma 2015). WRC determinants have a crucial role in corporate performance and operating activities within a firm. Therefore, some researchers considered WRC as a dependent variable to examine the WRC determinants' relationship between WRCM and firm performance (Sardo and Serrasqueiro 2022; Kinasih et al. 2019; Singh and Kumar 2017; Abbadi and Abbadi 2012).

The following subsections describe the relevant determinants that affect WRC, and we developed hypotheses for each determinant based on the prior literature.

2.1. Financial leverage (FLV)

Earlier literature shows that financial leverage (FLV) has a negative impact on WRC. A firm with more FLV has less WRC (Salawu and Alao 2014). A firm has less money for daily operations when it needs to pay debts. Therefore, the firm is likely to utilize the WRC efficiently. Wasiuzzaman and Arumugam (2013) argued that a firm with high debt ratios should be careful about its WRC. In the current research, FLV has been measured as the ratio of total debt to total assets. Most of the scholars have reported a negative relationship between FLV and WRC (Sharma, Bakshi, and Chhabra 2020; Prasad et al. 2019; Nyeadi, Sare, and Aawaar 2018; Rehman, Wang, and Kabiraj 2017; Singh and Kumar 2017; Abbadi and Abbadi 2012). Various scholars have reported a negative relationship between the variables. Based on previous research, we proposed a negative relationship in the following hypotheses for both types of firms.

H_{1a} : FLV is negatively associated with both types of working capital (NWC and GWC) for non-certified firms.

H_{1b} : FLV is negatively associated with both types of working capital (NWC and GWC) for the certified firms from the EFQM model.

2.2. Firm age (AGE)

Firm age (AGE) is also an important factor that affects WRC, as it symbolizes the length of the association of a firm with its customers and suppliers. AGE is measured by subtracting the year of firm registration from the year of sample data in this study. Tjandra, Murhadi, and Herlambang (2022) and Seth et al. (2020) examined a negative relationship between AGE and WRC. On the contrary, Sardo and Serrasqueiro (2022) and Prasad et al. (2019) quantified a positive relationship between AGE and WRC. Kinasih et al. (2019) and Singh and Kumar (2017) reported a statistically insignificant relationship between the variables. Based on the previous research findings, the effect of AGE on WRC is expected to be either positive or negative for noncertified and certified firms. Hence, the proposed hypotheses are:

H_{2a} : There is a significant relationship between AGE and both types of WRC for noncertified firms.

H_{2b} : AGE is significantly associated with both types of WRC for the certified firms.

2.3. Firm profitability (ROA)

Various authors used different proxies to measure firm profitability (performance). In recent studies, many scholars employed return on asset (ROA) as a proxy

to measure the firm's performance, including Samo and Murad (2019); Akgün and Memiş Karataş (2021); Kayani, de Silva, and Gan (2020); Anton and Nucu (2020); Shirodkar et al. (2022); Ali et al. (2022); and Ahmet, Halil, and Burcu (2022). Moreover, research by Yousaf and Dey (2022) revealed that ROA is the best proxy to determine firm performance. Therefore, we considered ROA as a proxy in the current study. The former literature has demonstrated both negative and positive results regarding the relationship between ROA and WRC (Singh and Kumar 2017; Mansoori and Muhammad 2012; Wasiuzzaman and Arumugam 2013). According to Dalci and Ozyapici (2018), the mixed results in some studies regarding this relationship may be due to the impact of leverage, which they exclude from their research. Baños-Caballero, García-Teruel, and Martínez-Solano (2010) and Chiou, Cheng, and Wu (2006) argued that the negative relationship between ROA and WRC makes it easy for profitable firms to raise external capital. Therefore, the firms try to keep the cash level at a minimum.

Some researchers reported a negative relationship between ROA and WRC (Seth et al. 2020; Soukhakian and Khodakarami 2019). Conversely, some scholars reported a positive relationship between the variables (Jaworski and Czerwonka 2022a; Kinasih et al. 2019; Rehman, Wang, and Kabiraj 2017). Based on the prior research findings, the following hypotheses are proposed separately for noncertified and quality-certified firms.

H_{3a} : There is a significant relationship between ROA and both types of WRC for noncertified firms.

H_{3b} : ROA is significantly associated with both types of WRC of the certified firms.

2.4. Operating cash flow (OCF)

Operating cash flow (OCF) is also an important determinant that affects WRC. The reason is that the firms with better cash flow have an opportunity to grow their WRC investment (Atseye, Ugwu, and Menyo Takon 2015). Higher OCF positively impacts WRC investment because the firms have more cash to invest. This situation allows firms to use a flexible WRC policy. Conversely, negative OCF encourages firms to have a tight WRC policy due to the lower accessibility of cash, requiring funding for their WRC (Hill, Kelly, and Highfield 2010).

Some researchers have reported that OCF has a negative effect on WRC (Rehman, Wang, and Kabiraj 2017; Mansoori and Muhammad 2012; Chiou, Cheng, and Wu 2006). On the other hand, many studies did not report a statistically significant

relationship between OCF and WRC (Tjandra, Murhadi, and Herlambang 2022; Sharma, Bakshi, and Chhabra 2020; Afza and Nazir 2008). However, Abbadi and Abbadi (2012); Singh and Kumar (2017); Sardo and Serrasqueiro (2022) investigated a positive relationship between the variables. To summarize the above discussion, we formulated the following hypotheses.

H_{4a} : There is a significant relationship between OCF and both types of WRC for noncertified firms.

H_{4b} : There is a significant relationship between OCF and both types of WRC for the certified firms.

2.5. Firm size (FS)

Large firms have easier access to external financial sources compared to small firms (Chandrapala and Knápková 2013; Hill, Kelly, and Highfield 2010). Due to easy access to external funding, large firms have flexible inventory and receivables policies (Rehman, Wang, and Kabiraj 2017). Large firms need more money for daily operations; however, the firms also have better cash management. Wasiuzzaman and Arumugam (2013) stated that large firms require less money to invest in WRC. Small firms require more money for a higher WRC as the firms are more vulnerable to risk (Koralun-Bereznicka 2014). Thus, a negative relationship might be observed between WRC and firm size (FS).

There are inconsistent arguments regarding the impacts of FS on WRC. Salawu and Alao (2014) reported a positive relationship between FS and WRC. The scholars argued that large firms could make WRC investments because there are plenty of financing alternatives. Jaworski and Czerwonka (2022b); Sharma, Bakshi, and Chhabra (2020); and Nyead, Sare, and Aawaar (2018) also found the positive impact of FS on WRC. On the contrary, Sardo and Serrasqueiro (2022); Prasad et al. (2019); Rehman, Wang, and Kabiraj (2017); and Abbadi and Abbadi (2012) examined a negative relationship between FS and WRC. Singh and Kumar (2017) and Kinasih et al. (2019) explored a nonsignificant relationship between the variables. Mixed findings are reported by the researchers in prior studies; therefore, the effect of FS on the WRC requirement can be either negative or positive.

H_{5a} : There is a significant impact of FS on both types of WRC for non-certified firms.

H_{5b} : There is a significant impact of FS on both types of WRC for the certified firms.

2.6. Sales growth (SLG)

Sales growth (SLG) is also an essential determinant that affects WRC. SLG measures the increasing demand for a firm's products. Mixed findings have been reported in the previous literature regarding the relationship between SLG and WRC. For example, Tjandra, Murhadi, and Herlambang (2022); Singh and Kumar (2017); Mansoori and Muhammad (2012); and Akinlo (2012) explored the positive impact of SLG on WRC. Wasiuzzaman and Arumugam (2013) argued that SLG increases short-term investments and inventory levels, leading to rising WRC. Salawu and Alao (2014) also explored a positive relationship between WRC and SLG in Nigerian manufacturing firms. However, various empirical studies have examined a negative relationship between the variables. For instance, Sardo and Serrasqueiro (2022); Prasad et al. (2019); Kinasih et al. (2019); Nyead, Sare, and Aawaar (2018) reported a negative impact of SLG on WRC. Based on the contradictory findings, we proposed the following hypotheses about the relationship between the variables.

H_{6a} : There is a significant relationship between SLG and both types of WRC for noncertified firms.

H_{6b} : There is a significant relationship between SLG and both types of WRC of the certified firms.

2.7. Dummy variable (EFQM)

The findings of previous studies revealed that the firms with quality awards performed better than their competitors (Starke et al. 2012; Boulter, Bendell, and Dahlgard 2013; Augustyn, Elshaer, and Akamavi 2021; Zhang et al. 2022). Some scholars have explored the same findings about the quality-certified firms from the European Foundation (Yousaf 2022a; Yousaf and Bris 2021; Yousaf 2022). On the other hand, a few researchers investigated the opposing results. For instance, Safari et al. (2020) examined a weak link between winning quality awards and their financial performance by analyzing 112 Iranian firms' data. In the same way, Yousaf, Bris, and Haider (2021) employed the data of 332 Czech firms, including 20 certified firms, to explore the relationship between WRCM and the firm's profitability. The findings showed that having a quality certificate from the European Foundation decreased the firm's profitability.

Unlike the previous studies, we used a dummy variable (EFQM) to check the impacts of the quality certificates on WRC. Most of the prior studies reported a positive impact of quality awards and certificates on firm performance. However, the quality certificate from the model might have a positive or negative

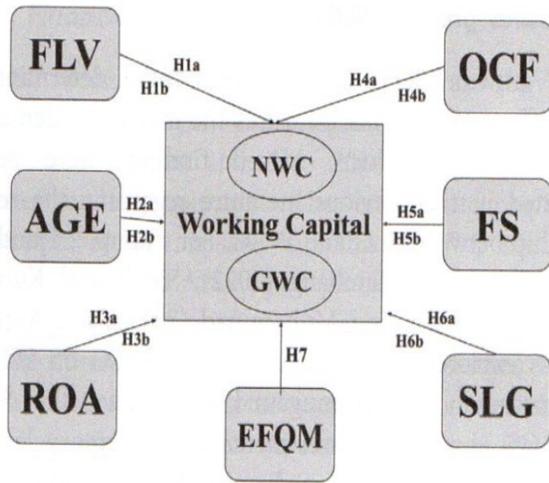


Figure 1. The conceptual model.

impact on WRC. Hence, we formulated the following hypothesis to examine the impacts of quality certificates on WRC.

H₇: The quality certificates from the EFQM model have a significant impact on both types of WRC.

To summarize the above discussion about the determinants that affect the WRC of certified and noncertified firms, the conceptual model is presented according to the suggested hypotheses in Figure 1.

3. Methodology

3.1. Source of data

We obtained information on the quality-certified manufacturing firms from the EFQM recognition database. We retrieved unbalanced dynamic panel data for both types (certified and noncertified) of firms from the Albertina database from 2017 to 2021.¹ Numerous researchers have gained secondary data from the database, such as Drábková and Pech (2022); Kučera, Vochozka, and Rowland (2021); Urbancová and Vrabcová (2022); Činčalová and Hedija (2020); Vrbka (2020); and Horak et al. (2020). The sample of noncertified firms was selected randomly and has 328 Czech firms. The number of certified firms is 21, as only 21 firms have quality certificates from the European Foundation. The number of certified firms in the prior studies was also small for the analysis or comparison (Yousaf 2022b; Yousaf and Bris 2021). However, the number of total samples in the present research is enough to draw the analysis, as suggested by Krejcie and Morgan (1970).

¹ The data used in the current study are available at <https://www.bisnode.cz/produkt/albertina/>.

3.2. Dependent variables

Many researchers have considered NWC as the dependent variable (Çelik, Bilen, and Bilen 2016; Singh and Kumar 2017; Nyeadi, Sare, and Aawaar 2018). Some authors employed both NWC and GWC as the dependent variables (Sharma, Bakshi, and Chhabra 2020). Hence, we also used NWC and GWC as the dependent variables in the present research to study a comprehensive analysis of both types of firms.

3.3. Independent variables

FLV, ROA, AGE, OCF, FS, SG, and dummy interaction terms are the variables that are considered independent variables. The dummy variable (EFQM) is also an independent variable that takes the value 1 if the firm is certified by the EFQM Excellence Model; otherwise, it takes the value zero. Table 1 shows the variables and their measurements as follows.

3.4. Regression equations

The following models (Model 1 and Model 2) are used to examine the determinants of both types of WRC for non-certified and certified firms.

$$\begin{aligned}
 \text{NWC}_{it} = & \alpha + \beta_1 (\text{NWC}_{it-1}) + \beta_2 (\text{FLV}_{it}) \\
 & + \beta_3 (\text{AGE}_{it}) + \beta_4 (\text{ROA}_{it}) \\
 & + \beta_5 (\text{OCF}_{it}) + \beta_6 (\text{FS}_{it}) \\
 & + \beta_7 (\text{SLG}_{it}) + \beta_8 (\text{EFQM}_i) \\
 & + \beta_9 (\text{EFQM} * \text{FLV}_{it}) \\
 & + \beta_{10} (\text{EFQM} * \text{AGE}_{it}) \\
 & + \beta_{11} (\text{EFQM} * \text{ROA}_{it}) \\
 & + \beta_{12} (\text{EFQM} * \text{OCF}_{it}) \\
 & + \beta_{13} (\text{EFQM} * \text{FS}_{it}) \\
 & + \beta_{14} (\text{EFQM} * \text{SLG}_{it}) + \eta_i + \varepsilon_{it}
 \end{aligned}
 \tag{Model 1}$$

$$\begin{aligned}
 \text{GWC}_{it} = & \alpha + \beta_1 (\text{GWC}_{it-1}) + \beta_2 (\text{FLV}_{it}) \\
 & + \beta_3 (\text{AGE}_{it}) + \beta_4 (\text{ROA}_{it}) \\
 & + \beta_5 (\text{OCF}_{it}) + \beta_6 (\text{FS}_{it}) \\
 & + \beta_7 (\text{SLG}_{it}) + \beta_8 (\text{EFQM}_i) \\
 & + \beta_9 (\text{EFQM} * \text{FLV}_{it}) \\
 & + \beta_{10} (\text{EFQM} * \text{AGE}_{it}) \\
 & + \beta_{11} (\text{EFQM} * \text{ROA}_{it}) \\
 & + \beta_{12} (\text{EFQM} * \text{OCF}_{it}) \\
 & + \beta_{13} (\text{EFQM} * \text{FS}_{it}) \\
 & + \beta_{14} (\text{EFQM} * \text{SLG}_{it}) + \eta_i + \varepsilon_{it}
 \end{aligned}
 \tag{Model 2}$$

Table 1. Summary of the selected determinants.

Variables	Abbreviations	Measurements	Citations
Dependent Variables			
Working capital	NWC (net working capital)	(Current asset – current liabilities)/total asset	Jaworski and Czerwonka (2022b); Sharma, Bakshi, and Chhabra (2020); Onaolapo and Kajola (2015); Wasiuzzaman and Arumugam (2013)
	GWC (gross working capital)	Current assets/Total assets	Sharma, Bakshi, and Chhabra (2020)
Independent Variables			
Financial leverage	FLV	Long-term debt/total assets	Jaworski and Czerwonka (2022a); Nyead, Sare, and Aawaar (2018); Abbadi and Abbadi (2012)
Age of the firm	AGE	Number of years since the firm registered	Kinasih et al. (2019); Singh and Kumar (2017)
Firm profitability	ROA (return on assets)	Net income/total assets	Mazanec (2022); Yousaf, Bris, and Haider (2021); Onaolapo and Kajola (2015); Wasiuzzaman and Arumugam (2013)
Operating cash flow	OCF	Log(total revenue – operating expense)	Sharma, Bakshi, and Chhabra (2020); Afza and Nazir (2008); Abbadi and Abbadi (2012)
Firm size	FS	Log (total assets)	Abbadi and Abbadi (2012); Singh and Kumar (2017); Tjandra, Murhadi, and Herlambang (2022)
Sales growth	SLG	(Current year sale – previous year sales)/previous year sales	Sardo and Serrasqueiro (2022); Sharma, Bakshi, and Chhabra (2020); Prasad et al. (2019); Singh and Kumar (2017)
Dummy variable	EFQM	EFQM = 1, if the firm certified from EFQM Excellence Model; EFQM = 0 for noncertified firms	Yousaf (2022); Yousaf, Bris, and Haider (2021); Yousaf (2022a)
Dummy interaction terms		Represents the above independent variables for certified firms	

Table 2. Descriptive statistics.

Stats	Mean	Maximum	Minimum	Standard Deviation	No. of observations
For certified firms					
NWC	0.316	0.628	0.017	0.211	83
GWC	0.521	0.834	0.270	0.175	81
FLV	0.149	0.421	0.004	0.151	86
AGE	23.690	29.000	9.000	6.068	79
ROA	7.276	19.250	-6.200	6.987	81
OCF	0.125	0.257	-0.015	0.070	80
FS	6.176	6.663	5.149	0.467	79
SLG	0.031	0.264	-0.228	0.087	80
EFQM	1	1	1	0	85
For noncertified firms					
NWC	0.327	0.616	0.014	0.161	1323
GWC	0.555	0.843	0.278	0.159	1322
FLV	0.129	0.461	0.006	0.117	1322
AGE	23	48	5	6.895	1313
ROA	4.980	19.250	-7.670	6.501	1322
OCF	0.096	0.290	-0.030	0.069	1320
FLS	5.776	6.631	5.111	0.424	1322
SLG	0.042	3.839	-0.774	0.245	1318

In the above Model 1 and Model 2, $i=1, 2, 3, \dots, n$ denote the number of firms; and t signify time from 2017 to 2021. β values represent the regression coefficients of the explanatory variables, and α symbolizes the intercept. Π_i denotes unobserved firm-specific effects, and ε_{it} represents the error term.

4. Empirical results

The empirical findings of the current study are presented in Table 2.

Table 2 shows the descriptive statistics of two groups: certified firms and noncertified firms. The mean values of NWC and GWC of the certified firms are 0.316 and 0.521, and those of the noncertified

firms are 0.327 and 0.555. The minimum and maximum AGE values are slightly different; however, the mean value of AGE is almost the same in both types of firms. The positive mean values of both types' firms indicate that the selected firms earned profits during 2017–2021. NWC, GWC, AGE, ROA, OCF, and FS are not volatile because the mean values of the variables are above their standard deviations. On the other hand, FLV and SLG are volatile, as their standard deviation values are above their mean values. However, the means and standard deviations of most of the variables for both types of firms are slightly different from each other.

Table 3 indicates the pairwise correlation coefficients of the chosen variables. FLV, FS, and the

Table 3. Correlation coefficients.

	NWC	GWC	FLV	AGE	ROA	OCF	FS	SLG	EFQM
NWC	1								
GWC	0.700*	1							
FLV	-0.236*	-0.266*	1						
AGE	0.098*	-0.031	-0.206*	1					
ROA	0.284*	0.139*	-0.164*	0.003	1				
OCF	0.193*	0.006	-0.092*	-0.005	0.930*	1			
FS	-0.057*	-0.006	-0.144*	0.086*	0.222*	0.188*	1		
SLG	-0.056*	0.003	0.036	-0.093*	0.121*	0.120*	0.025	1	
EFQM	-0.016	-0.050	0.041	0.024	0.084*	0.102*	0.220*	-0.011	1

* $p < 0.05$.**Table 4.** Fisher-type unit-root test results.

Variables	Without trend	p -value	with trend	p -value
NWC	-13.95	0.00	-12.57	0.00
GWC	-12.17	0.00	-15.23	0.00
FLV	-13.42	0.00	-17.08	0.00
AGE	-6.21	0.00	-4.29	0.00
ROA	-14.93	0.00	-7.14	0.00
OCF	-16.18	0.00	-6.68	0.00
FS	-5.68	0.00	-9.27	0.00
SLG	10.83	0.00	-11.58	0.00
EFQM	-	-	-	-
EFQM*FLV	-4.73	0.00	-4.47	0.00
EFQM*AGE	-2.36	0.00	-3.91	0.00
EFQM*ROA	-4.58	0.00	-2.93	0.00
EFQM*OCF	-0.45	0.00	-3.23	0.00
EFQM*FS	-4.09	0.00	-1.76	0.03
EFQM*SLG	-4.43	0.00	-1.87	0.00

dummy variable (EFQM) negatively correlate with both types of WRC: NWC and GWC. On the other hand, ROA and OCF are positively correlated with both types of WRC. AGE and SLG are positively correlated with NWC and GWC, respectively. Conversely, SLG and AGE are negatively correlated with NWC and GWC, respectively. Most of the correlation coefficients are significant at the 0.05 level of significance.

The Breusch-Pagan (BP) test is used to detect heteroskedasticity in the fitted values of NWC. The null hypothesis is constant variance. The p -value of the BP test is 0.324, which is greater than the level of significance (0.05). Hence, there is no heteroskedasticity in the data. The same test is applied to diagnose heteroskedasticity in the fitted values of GWC. The p -value of the BP test is 0.192, which indicates that the data is free from heteroskedasticity.

To avoid spurious regression results, we employed a test to determine whether the data were stationary or not. Hence, we used the Fisher-type unit-root test for all the variables to check the panel unit root. We have the unbalanced panel data, and the earlier studies show that the Fisher-type unit-root test is the best test to check the unit root of the unbalanced panel data (Yousaf and Bris 2021; Maddala and Wu 1999). The null hypothesis for the test is: all panels contain unit roots. The test findings in Table 4 show that most of

the data for the selected variables are stationary, as the p -values of the variables are less than 0.05.

The data are free from unit-roots and heteroskedasticity; we can run the regression to estimate Model 1 and Model 2.

We can use different panel data models to test the research hypotheses, but we adopted the generalized method of moments (GMM) estimation to avoid endogeneity and bias. The difference GMM and system GMM estimators are frequently used for the econometric study of dynamic economic associations in panel data. If N (observations) is large and T (time) is small, then the system GMM is preferred over the difference GMM estimator in the dynamic panel models (Grohmann, et al. 2015; Baltagi 2008; Bobba and Coviello 2007; Blundell and Bond 2000). Furthermore, concerning WRC, many authors employed the two-step system GMM estimator in the most recent studies, such as Fernández-López, Rodeiro-Pazos, and Rey-Ares (2020); Rey-Ares, Fernández-López, and Rodeiro-Pazos (2021); Hussain et al. (2021); Altaf (2020); and Kayani, de Silva, and Gan (2020). Consequently, we also applied the two-step system GMM estimation to estimate Model 1 and Model 2. Table 5 displays the results of the GMM estimations.

Table 5 shows the two-step system GMM results, where $EFQM = 1$ denotes quality-certified firms, and $EFQM = 0$ represents noncertified firms. When $EFQM = 0$, then all the interaction terms will become zero, and NWC and GWC for the non-certified firms will be like this:

$$\begin{aligned} NWC_{it} = & \alpha + \beta_1(NWC_{it-1}) + \beta_2(FLV_{it}) \\ & + \beta_3(AGE_{it}) + \beta_4(ROA_{it}) \\ & + \beta_5(OCF_{it}) + \beta_6(FS_{it}) \\ & + \beta_7(SLG_{it}) + \eta_i + \varepsilon_{it} \end{aligned}$$

$$\begin{aligned} NWC_{it} = & -0.777 + 1.555(NWC_{it-1}) - 0.007(FLV_{it}) \\ & + 0.049(AGE_{it}) - 0.008(ROA_{it}) \\ & + 0.782(OCF_{it}) + 0.088(FS_{it}) \\ & - 0.117(SLG_{it}) + \eta_i + \varepsilon_{it} \end{aligned}$$

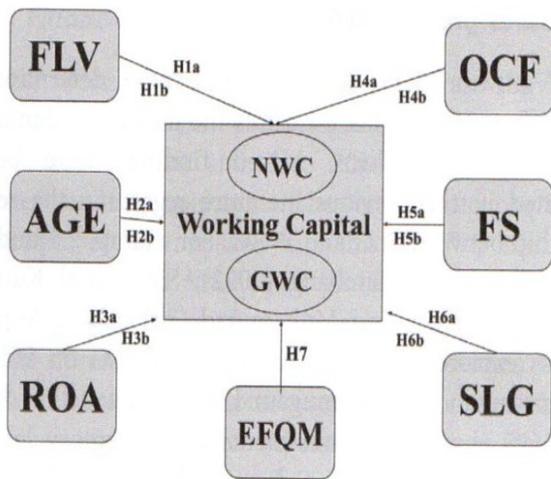


Figure 1. The conceptual model.

impact on WRC. Hence, we formulated the following hypothesis to examine the impacts of quality certificates on WRC.

H₇: The quality certificates from the EFQM model have a significant impact on both types of WRC.

To summarize the above discussion about the determinants that affect the WRC of certified and noncertified firms, the conceptual model is presented according to the suggested hypotheses in Figure 1.

3. Methodology

3.1. Source of data

We obtained information on the quality-certified manufacturing firms from the EFQM recognition database. We retrieved unbalanced dynamic panel data for both types (certified and noncertified) of firms from the Albertina database from 2017 to 2021.¹ Numerous researchers have gained secondary data from the database, such as Drábková and Pech (2022); Kučera, Vochozka, and Rowland (2021); Urbancová and Vrabcová (2022); Činčalová and Hedija (2020); Vrbka (2020); and Horak et al. (2020). The sample of noncertified firms was selected randomly and has 328 Czech firms. The number of certified firms is 21, as only 21 firms have quality certificates from the European Foundation. The number of certified firms in the prior studies was also small for the analysis or comparison (Yousaf 2022b; Yousaf and Bris 2021). However, the number of total samples in the present research is enough to draw the analysis, as suggested by Krejcie and Morgan (1970).

3.2. Dependent variables

Many researchers have considered NWC as the dependent variable (Çelik, Bilen, and Bilen 2016; Singh and Kumar 2017; Nyeadi, Sare, and Aawaar 2018). Some authors employed both NWC and GWC as the dependent variables (Sharma, Bakshi, and Chhabra 2020). Hence, we also used NWC and GWC as the dependent variables in the present research to study a comprehensive analysis of both types of firms.

3.3. Independent variables

FLV, ROA, AGE, OCF, FS, SG, and dummy interaction terms are the variables that are considered independent variables. The dummy variable (EFQM) is also an independent variable that takes the value 1 if the firm is certified by the EFQM Excellence Model; otherwise, it takes the value zero. Table 1 shows the variables and their measurements as follows.

3.4. Regression equations

The following models (Model 1 and Model 2) are used to examine the determinants of both types of WRC for non-certified and certified firms.

$$\begin{aligned}
 \text{NWC}_{it} = & \alpha + \beta_1 (\text{NWC}_{it-1}) + \beta_2 (\text{FLV}_{it}) \\
 & + \beta_3 (\text{AGE}_{it}) + \beta_4 (\text{ROA}_{it}) \\
 & + \beta_5 (\text{OCF}_{it}) + \beta_6 (\text{FS}_{it}) \\
 & + \beta_7 (\text{SLG}_{it}) + \beta_8 (\text{EFQM}_i) \\
 & + \beta_9 (\text{EFQM} * \text{FLV}_{it}) \\
 & + \beta_{10} (\text{EFQM} * \text{AGE}_{it}) \\
 & + \beta_{11} (\text{EFQM} * \text{ROA}_{it}) \\
 & + \beta_{12} (\text{EFQM} * \text{OCF}_{it}) \\
 & + \beta_{13} (\text{EFQM} * \text{FS}_{it}) \\
 & + \beta_{14} (\text{EFQM} * \text{SLG}_{it}) + \eta_i + \varepsilon_{it}
 \end{aligned}
 \tag{Model 1}$$

$$\begin{aligned}
 \text{GWC}_{it} = & \alpha + \beta_1 (\text{GWC}_{it-1}) + \beta_2 (\text{FLV}_{it}) \\
 & + \beta_3 (\text{AGE}_{it}) + \beta_4 (\text{ROA}_{it}) \\
 & + \beta_5 (\text{OCF}_{it}) + \beta_6 (\text{FS}_{it}) \\
 & + \beta_7 (\text{SLG}_{it}) + \beta_8 (\text{EFQM}_i) \\
 & + \beta_9 (\text{EFQM} * \text{FLV}_{it}) \\
 & + \beta_{10} (\text{EFQM} * \text{AGE}_{it}) \\
 & + \beta_{11} (\text{EFQM} * \text{ROA}_{it}) \\
 & + \beta_{12} (\text{EFQM} * \text{OCF}_{it}) \\
 & + \beta_{13} (\text{EFQM} * \text{FS}_{it}) \\
 & + \beta_{14} (\text{EFQM} * \text{SLG}_{it}) + \eta_i + \varepsilon_{it}
 \end{aligned}
 \tag{Model 2}$$

¹ The data used in the current study are available at <https://www.bisnode.cz/produkty/albertina/>.

Table 1. Summary of the selected determinants.

Variables	Abbreviations	Measurements	Citations
Dependent Variables			
Working capital	NWC (net working capital)	(Current asset – current liabilities)/total asset	Jaworski and Czerwonka (2022b); Sharma, Bakshi, and Chhabra (2020); Onaolapo and Kajola (2015); Wasiuzzaman and Arumugam (2013)
	GWC (gross working capital)	Current assets/Total assets	Sharma, Bakshi, and Chhabra (2020)
Independent Variables			
Financial leverage	FLV	Long-term debt/total assets	Jaworski and Czerwonka (2022a); Nyeadi, Sare, and Aawaar (2018); Abbadi and Abbadi (2012)
Age of the firm	AGE	Number of years since the firm registered	Kinasih et al. (2019); Singh and Kumar (2017)
Firm profitability	ROA (return on assets)	Net income/total assets	Mazanec (2022); Yousaf, Bris, and Haider (2021); Onaolapo and Kajola (2015); Wasiuzzaman and Arumugam (2013)
Operating cash flow	OCF	Log(total revenue – operating expense)	Sharma, Bakshi, and Chhabra (2020); Afza and Nazir (2008); Abbadi and Abbadi (2012)
Firm size	FS	Log (total assets)	Abbadi and Abbadi (2012); Singh and Kumar (2017); Tjandra, Murhadi, and Herlambang (2022)
Sales growth	SLG	(Current year sale – previous year sales)/previous year sales	Sardo and Serrasqueiro (2022); Sharma, Bakshi, and Chhabra (2020); Prasad et al. (2019); Singh and Kumar (2017)
Dummy variable	EFQM	EFQM = 1, if the firm certified from EFQM Excellence Model; EFQM = 0 for noncertified firms	Yousaf (2022); Yousaf, Bris, and Haider (2021); Yousaf (2022a)
Dummy interaction terms		Represents the above independent variables for certified firms	

Table 2. Descriptive statistics.

Stats	Mean	Maximum	Minimum	Standard Deviation	No. of observations
For certified firms					
NWC	0.316	0.628	0.017	0.211	83
GWC	0.521	0.834	0.270	0.175	81
FLV	0.149	0.421	0.004	0.151	86
AGE	23.690	29.000	9.000	6.068	79
ROA	7.276	19.250	-6.200	6.987	81
OCF	0.125	0.257	-0.015	0.070	80
FS	6.176	6.663	5.149	0.467	79
SLG	0.031	0.264	-0.228	0.087	80
EFQM	1	1	1	0	85
For noncertified firms					
NWC	0.327	0.616	0.014	0.161	1323
GWC	0.555	0.843	0.278	0.159	1322
FLV	0.129	0.461	0.006	0.117	1322
AGE	23	48	5	6.895	1313
ROA	4.980	19.250	-7.670	6.501	1322
OCF	0.096	0.290	-0.030	0.069	1320
FLS	5.776	6.631	5.111	0.424	1322
SLG	0.042	3.839	-0.774	0.245	1318

In the above Model 1 and Model 2, $i=1, 2, 3, \dots, n$ denote the number of firms; and t signify time from 2017 to 2021. β values represent the regression coefficients of the explanatory variables, and α symbolizes the intercept. η_i denotes unobserved firm-specific effects, and ε_{it} represents the error term.

4. Empirical results

The empirical findings of the current study are presented in Table 2.

Table 2 shows the descriptive statistics of two groups: certified firms and noncertified firms. The mean values of NWC and GWC of the certified firms are 0.316 and 0.521, and those of the noncertified

firms are 0.327 and 0.555. The minimum and maximum AGE values are slightly different; however, the mean value of AGE is almost the same in both types of firms. The positive mean values of both types' firms indicate that the selected firms earned profits during 2017–2021. NWC, GWC, AGE, ROA, OCF, and FS are not volatile because the mean values of the variables are above their standard deviations. On the other hand, FLV and SLG are volatile, as their standard deviation values are above their mean values. However, the means and standard deviations of most of the variables for both types of firms are slightly different from each other.

Table 3 indicates the pairwise correlation coefficients of the chosen variables. FLV, FS, and the

Table 3. Correlation coefficients.

	NWC	GWC	FLV	AGE	ROA	OCF	FS	SLG	EFQM
NWC	1								
GWC	0.700*	1							
FLV	-0.236*	-0.266*	1						
AGE	0.098*	-0.031	-0.206*	1					
ROA	0.284*	0.139*	-0.164*	0.003	1				
OCF	0.193*	0.006	-0.092*	-0.005	0.930*	1			
FS	-0.057*	-0.006	-0.144*	0.086*	0.222*	0.188*	1		
SLG	-0.056*	0.003	0.036	-0.093*	0.121*	0.120*	0.025	1	
EFQM	-0.016	-0.050	0.041	0.024	0.084*	0.102*	0.220*	-0.011	1

* $p < 0.05$.

Table 4. Fisher-type unit-root test results.

Variables	Without trend	p -value	with trend	p -value
NWC	-13.95	0.00	-12.57	0.00
GWC	-12.17	0.00	-15.23	0.00
FLV	-13.42	0.00	-17.08	0.00
AGE	-6.21	0.00	-4.29	0.00
ROA	-14.93	0.00	-7.14	0.00
OCF	-16.18	0.00	-6.68	0.00
FS	-5.68	0.00	-9.27	0.00
SLG	10.83	0.00	-11.58	0.00
EFQM	-	-	-	-
EFQM*FLV	-4.73	0.00	-4.47	0.00
EFQM*AGE	-2.36	0.00	-3.91	0.00
EFQM*ROA	-4.58	0.00	-2.93	0.00
EFQM*OCF	-0.45	0.00	-3.23	0.00
EFQM*FS	-4.09	0.00	-1.76	0.03
EFQM*SLG	-4.43	0.00	-1.87	0.00

dummy variable (EFQM) negatively correlate with both types of WRC: NWC and GWC. On the other hand, ROA and OCF are positively correlated with both types of WRC. AGE and SLG are positively correlated with NWC and GWC, respectively. Conversely, SLG and AGE are negatively correlated with NWC and GWC, respectively. Most of the correlation coefficients are significant at the 0.05 level of significance.

The Breusch-Pagan (BP) test is used to detect heteroskedasticity in the fitted values of NWC. The null hypothesis is constant variance. The p -value of the BP test is 0.324, which is greater than the level of significance (0.05). Hence, there is no heteroskedasticity in the data. The same test is applied to diagnose heteroskedasticity in the fitted values of GWC. The p -value of the BP test is 0.192, which indicates that the data is free from heteroskedasticity.

To avoid spurious regression results, we employed a test to determine whether the data were stationary or not. Hence, we used the Fisher-type unit-root test for all the variables to check the panel unit root. We have the unbalanced panel data, and the earlier studies show that the Fisher-type unit-root test is the best test to check the unit root of the unbalanced panel data (Yousaf and Bris 2021; Maddala and Wu 1999). The null hypothesis for the test is: all panels contain unit roots. The test findings in Table 4 show that most of

the data for the selected variables are stationary, as the p -values of the variables are less than 0.05.

The data are free from unit-roots and heteroskedasticity; we can run the regression to estimate Model 1 and Model 2.

We can use different panel data models to test the research hypotheses, but we adopted the generalized method of moments (GMM) estimation to avoid endogeneity and bias. The difference GMM and system GMM estimators are frequently used for the econometric study of dynamic economic associations in panel data. If N (observations) is large and T (time) is small, then the system GMM is preferred over the difference GMM estimator in the dynamic panel models (Grohmann, et al. 2015; Baltagi 2008; Bobba and Coviello 2007; Blundell and Bond 2000). Furthermore, concerning WRC, many authors employed the two-step system GMM estimator in the most recent studies, such as Fernández-López, Rodeiro-Pazos, and Rey-Ares (2020); Rey-Ares, Fernández-López, and Rodeiro-Pazos (2021); Hussain et al. (2021); Altaf (2020); and Kayani, de Silva, and Gan (2020). Consequently, we also applied the two-step system GMM estimation to estimate Model 1 and Model 2. Table 5 displays the results of the GMM estimations.

Table 5 shows the two-step system GMM results, where $EFQM = 1$ denotes quality-certified firms, and $EFQM = 0$ represents noncertified firms. When $EFQM = 0$, then all the interaction terms will become zero, and NWC and GWC for the non-certified firms will be like this:

$$NWC_{it} = \alpha + \beta_1(NWC_{it-1}) + \beta_2(FLV_{it}) + \beta_3(AGE_{it}) + \beta_4(ROA_{it}) + \beta_5(OCF_{it}) + \beta_6(FS_{it}) + \beta_7(SLG_{it}) + \eta_i + \varepsilon_{it}$$

$$NWC_{it} = -0.777 + 1.555(NWC_{it-1}) - 0.007(FLV_{it}) + 0.049(AGE_{it}) - 0.008(ROA_{it}) + 0.782(OCF_{it}) + 0.088(FS_{it}) - 0.117(SLG_{it}) + \eta_i + \varepsilon_{it}$$

Table 5. Determinants of working capital by using system GMM.

Independent variables	NWC (Model 1)	p-values	GWC (Model 2)	p-values
Lag value	1.555***	(0.003)	0.533*	(0.069)
FLV	-0.007	(0.180)	-0.250***	(0.005)
AGE	0.049	(0.106)	-0.041	(0.223)
ROA	-0.008***	(0.004)	-0.007***	(0.002)
OCF	0.782**	(0.013)	0.019**	(0.045)
FS	0.088**	(0.024)	0.244***	(0.006)
SLG	-0.117	(0.226)	-0.037	(0.106)
EFQM	24.062*	(0.081)	16.405*	(0.090)
EFQM*FLV	-10.418**	(0.018)	-2.728**	(0.049)
EFQM*AGE	0.052	(0.197)	-0.326	(0.209)
EFQM*ROA	0.310*	(0.073)	0.140*	(0.089)
EFQM*OCF	3.821***	(0.002)	6.818**	(0.033)
EFQM*FS	-3.483**	(0.019)	-2.530**	(0.026)
EFQM*SLG	8.860	(0.211)	4.583	(0.696)
Constant	-0.777	(0.619)	-0.057	(0.841)
No. of observation	1,403		1,405	
No. of instruments	23		23	
Wald χ^2	206.43	(0.000)***	102.68	(0.000)***
AR (1)	-3.40	(0.002)***	-0.150	(0.032)**
AR (2)	-0.170	(0.112)	-0.760	(0.445)
Hansen test	55.61	(0.112)	27.890	(0.286)

*** $p < 0.01$. ** $p < 0.05$. * $p < 0.1$.

In the same way, GWC for the noncertified firms will be like the following:

$$\begin{aligned} \text{GWC}_{it} = & -0.057 + 0.533(\text{GWC}_{it-1}) - 0.250(\text{FLV}_{it}) \\ & - 0.041(\text{AGE}_{it}) - 0.007(\text{ROA}_{it}) \\ & + 0.019(\text{OCF}_{it}) + 0.244(\text{FS}_{it}) \\ & - 0.037(\text{SLG}_{it}) + \eta_i + \varepsilon_{it} \end{aligned}$$

When EFQM = 1 for the certified firms, then Model 1 (NWC) can be estimated for the certified firms in the following.

$$\begin{aligned} \text{NWC}_{it} = & \alpha + \beta_1(\text{NWC}_{it-1}) + \beta_2(\text{FLV}_{it}) \\ & + \beta_3(\text{AGE}_{it}) + \beta_4(\text{ROA}_{it}) \\ & + \beta_5(\text{OCF}_{it}) + \beta_6(\text{FS}_{it}) \\ & + \beta_7(\text{SLG}_{it}) + \beta_8(\text{EFQM}_i) \\ & + \beta_9(\text{EFQM} * \text{FLV}_{it}) \\ & + \beta_{10}(\text{EFQM} * \text{AGE}_{it}) \\ & + \beta_{11}(\text{EFQM} * \text{ROA}_{it}) \\ & + \beta_{12}(\text{EFQM} * \text{OCF}_{it}) \\ & + \beta_{13}(\text{EFQM} * \text{FS}_{it}) \\ & + \beta_{14}(\text{EFQM} * \text{SLG}_{it}) + \eta_i + \varepsilon_{it} \end{aligned}$$

$$\begin{aligned} \text{NWC}_{it} = & (\alpha + \beta_8) + (\beta_2 + \beta_9)(\text{FLV}_{it}) + (\beta_3 + \beta_{10})(\text{AGE}_{it}) \\ & + (\beta_4 + \beta_{11})(\text{ROA}_{it}) + (\beta_5 + \beta_{12})(\text{OCF}_{it}) \\ & + (\beta_6 + \beta_{13})(\text{FS}_{it}) + (\beta_7 + \beta_{14})(\text{SLG}_{it}) \\ & + \eta_i + \varepsilon_{it} \end{aligned}$$

$$\begin{aligned} \text{NWC}_{it} = & 23.285 - 10.425\text{FLV}_{it} + 0.101\text{AGE}_{it} \\ & + 0.302\text{ROA}_{it} + 4.603\text{OCF}_{it} \\ & - 3.395(\text{FS}_{it}) + 8.743\text{SLG}_{it} \\ & + \eta_i + \varepsilon_{it} \end{aligned}$$

In the same way, we can estimate Model 2 (GWC) for the certified firms in the following ways:

$$\begin{aligned} \text{GWC}_{it} = & (\alpha + \beta_8) + (\beta_2 + \beta_9)(\text{FLV}_{it}) \\ & + (\beta_3 + \beta_{10})(\text{AGE}_{it}) + (\beta_4 + \beta_{11})(\text{ROA}_{it}) \\ & + (\beta_5 + \beta_{12})(\text{OCF}_{it}) + (\beta_6 + \beta_{13})(\text{FS}_{it}) \\ & + (\beta_7 + \beta_{14})(\text{SLG}_{it}) + \eta_i + \varepsilon_{it} \end{aligned}$$

$$\begin{aligned} \text{GWC}_{it} = & 16.348 - 2.978\text{FLV}_{it} - 0.367\text{AGE}_{it} \\ & + 0.133\text{ROA}_{it} + 6.837\text{OCF}_{it} \\ & - 2.286(\text{FS}_{it}) + 4.546\text{SLG}_{it} \\ & + \eta_i + \varepsilon_{it} \end{aligned}$$

We obtained the same results when the codes for the dummy variables were switched for both types of firms. Table 5 shows that the coefficients of lag of both dependent variables of the noncertified firms are statistically significant at the 0.01 (Model 1, NWC) and 0.10 (Model 2, GWC) level of significance. The signs of both lagged working capital coefficients are positive, which means that there is a positive relationship between lagged working capital and current working capital. The findings of the positive relationship are in line with Sardo and Serrasqueiro (2022);

Sharma, Bakshi, and Chhabra (2020); and Nyeadi, Sare, and Aawaar (2018), as the scholars also reported the same relationship between the variables.

The coefficient of FLV (Model 1) of the noncertified firms is statistically insignificant as the p -value is higher than the significance level. The coefficient of FLV is statistically significant in Model 2 at the 0.01 significance level. The negative sign of FLV revealed a negative relationship between FLV and GWC. For the certified firms, the relationship between FLV and both types of WRC is significant and negative. This negative relationship between FLV and WRC for quality-certified and noncertified firms revealed that high-levered firms need less investment in WRC. A firm with a higher FLV has to acquire external financing at a higher cost due to a higher risk premium. This negative relationship is possible because high debt for a firm is unconventional for managing WRC. Due to this negative relationship, firms save large stock inventories as assets and use their credit more carefully. The negative relationship between FLV and WRC is consistent with the earlier studies, such as Sharma, Bakshi, and Chhabra (2020); Abbadi and Abbadi (2012); Rehman, Wang, and Kabiraj (2017); and Seth et al. (2020). However, the relationship between the variables is significantly larger for noncertified firms than the relationship between FLV and WRC for certified firms ($-0.250 > -2.978$).

Both coefficients of ROA of the noncertified firms are significant at the 0.01 level of significance. The negative signs of the coefficients of ROA revealed a negative relationship between firm profitability and WRC. The findings of ROA and WRC are consistent with prior studies (Seth et al. 2020; Soukhakian and Khodakarami 2019). The relationship between the WRC and ROA of the certified firms is positive and significant at a 0.10 level of significance. This positive relationship between the variables revealed that higher profitable quality-certified firms have a higher WCR. The relationship shows that the quality certified firms with higher profitability rates would have satisfactory cash holdings for their investment activities. Moreover, quality-certified firms would be less concerned with efficient WRCM, resulting in higher levels of WRC. However, the relationship between ROA and both types of WRC is significantly larger for certified firms than the relationship between ROA and WRC for noncertified firms ($0.302 > -0.008$ in Model 1 and $0.133 > -0.007$ in Model 2). The positive relationship between ROA and WRC is reported by some authors, such as Rehman, Wang, and Kabiraj (2017); Singh and Kumar (2017); and Pham, Nguyen, and Nguyen (2020). These findings are interesting, as the

relationship is opposite for certified firms and noncertified firms. However, the magnitude of ROA for noncertified firms is very small.

The coefficients of OCF of the noncertified firms are statistically significant and positive, which shows a positive relationship between OCF and both types of WRC. Considering the certified firms, the relationship between OCF and WRC is statistically significant and positive. A higher value of OCF allows firms to invest internal funds in WRC. The findings show that certified and noncertified Czech firms have sufficient cash from their operations activities to finance WRC. However, this relationship for the certified firms is significantly larger than the relationship between OCF and WRC for noncertified firms ($4.603 > 0.782$ in Model 1, $6.837 > 0.019$ in Model 2). The positive and significant relationship between OCF and WRC is consistent with the earlier studies (Sardo and Serrasqueiro 2022; Singh and Kumar 2017; Abbadi and Abbadi 2012).

The coefficients of FS of the noncertified firms are statistically significant at the 0.05 (Model 1) and 0.01 (Model 2) levels of significance. Both signs of the coefficients are positive, which means that FS has a positive impact on WRC. This positive relationship shows that large firms have higher negotiating power with financial institutions and suppliers; thus, they can have a high level of current liabilities. Large noncertified firms can make more WRC investments due to a wide range of financing options. This positive relationship is in line with the findings of Salawu and Alao (2014); Nyeadi, Sare, and Aawaar (2018); and Sharma, Bakshi, and Chhabra (2020). On the other hand, the relationship between the FS and WRC of the certified firms is statistically significant and negative. This negative relationship between the variables exposed that small quality-certified firms tend to have limited financing options to meet their WRC. Therefore, the small quality-certified firms will pay more attention to WRC. Small firms require higher WRC as they are more vulnerable to risk. Yousaf (2023) also mentioned this fact that small Czech firms have a higher risk of bankruptcy. However, the relationship between FS and both types of WRC is significantly larger for noncertified firms than the relationship between FS and WRC for certified firms ($0.088 > -3.395$ in Model 1 and $0.244 > -2.286$ in Model 2).

Both coefficients of the dummy variable (EFQM) are statistically significant at the 0.10 level of significance. The signs of the coefficients of EFQM are positive in both types of WRC, which implies that the quality certificate from the European Foundation has a

Table 6. Acceptance/rejection of the hypotheses.

S. no	Hypotheses	NWC	GWC
H _{1a}	FLV is negatively associated with both types of working capital for noncertified firms.	Rejected	Accepted
H _{1b}	FLV is negatively associated with both types of working capital for the certified firms from the EFQM Model.	Accepted	Accepted
H _{2a}	There is a significant relationship between AGE and both types of WRC for noncertified firms.	Rejected	Rejected
H _{2b}	AGE is significantly associated with both types of WRC for the certified firms.	Rejected	Rejected
H _{3a}	There is a significant relationship between ROA and both types of WRC for non-certified firms.	Accepted	Accepted
H _{3b}	ROA is significantly associated with both types of WRC for the certified firms.	Accepted	Accepted
H _{4a}	There is a significant relationship between OCF and both types of WRC for non-certified firms.	Accepted	Accepted
H _{4b}	There is a significant relationship between OCF and both types of WRC for the certified firms.	Accepted	Accepted
H _{5a}	There is a significant impact of FS on both types of WRC for noncertified firms.	Accepted	Accepted
H _{5b}	There is a significant impact of FS on both types of WRC for the certified firms.	Accepted	Accepted
H _{6a}	There is a significant relationship between SLG and both types of WRC for noncertified firms.	Rejected	Rejected
H _{6b}	There is a significant relationship between SLG and both types of WRC for the certified firms.	Rejected	Rejected
H ₇	The quality certificates from the EFQM model have a significant impact on both types of WRC.	Accepted	Accepted

positive impact on the WRC. The quality-certified firms have a higher WRC on average, which indicates that the firms keep a higher amount of capital than noncertified firms. Hence, the firms with quality certificates not only perform better and earn more profits but also have a higher amount of capital compared to noncertified firms. Zimon and Dellana (2019) argued that there are also various nonfinancial benefits of quality certificates, such as customer satisfaction, higher product quality, improved labor productivity, on-time delivery, etc. Therefore, we recommend to the firm's management that they should implement the TQM process within their firms to obtain financial and non-financial benefits.

Concerning the post-estimation results, Wald test statistics gave chi-square values as significant in both dependent variables, which means that both models (Model 1 and Model 2) have predictive power. Many scholars argued that the AR (1) statistic should be significant and the AR (2) statistic should be insignificant (Roodman 2009; Yousaf and Bris 2021). The *p*-values of AR (1) and AR (2) are according to the suggestions of the scholars. The *p*-values of the AR (2) statistic in Table 5 confirm the absence of second-order serial correlation in the residuals. Additionally, the validity of the instruments in the models is checked by using the Hansen test (Hansen 1982). The Hansen statistic is used to diagnose over-identifying restrictions in both models, where the test's *p*-values reject the assumption of overidentifying restrictions in both models. Roodman (2009) suggested that the *p*-value of the Hansen Test should be between 0.10 and 0.25. The Hansen Test's *p*-value reported in Model 1 is within

the suggested range. However, the *p*-value reported in Model 2 is slightly larger than the suggested range. If the value is greater than 0.25, it means too many instrumental variables are used in the model. However, various authors reported a *p*-value of the test that was much greater than the suggested range (Yousaf 2022a; Wintoki, Linck, and Netter 2012). Therefore, the results reported in Model 1 and Model 2 are valid.

Table 6 shows the acceptance or rejection of the hypotheses for all variables that affect the net and gross working capital.

5. Conclusions, practical implications, and limitations

WRC is one of the most significant decisions for all firms. The current study aims to analyze the main determinants that affect the WRC of certified and noncertified firms. The findings of the present study show that financial leverage, profitability, operating cash flow, and firm size are the key factors that affect WRC. The findings indicate that financial leverage and profitability have a negative impact on WRC for noncertified firms. On the contrary, operating cash flow and firm size have a positive impact on WRC for noncertified firms. The dummy variable positively impacts both types of WRC, which concludes that the EFQM certified firms have higher WRC on average compared to the noncertified firms. However, financial leverage and firms have a negative relationship with the WRC for quality-certified firms. Conversely, operating cash flow and profitability positively impact the WRC of the certified firms.

5.1. Practical implications

The results of the present research offer practical and theoretical implications. Theoretically, the research contributes by extending the literature in both types of WRC that mainly emphasize profitability and does not discuss other factors that impact WRC, such as firm size, sales growth, and cash flow. Moreover, the current research contributes to the literature on how quality awards and certificates impact WRC. Practically, the research outcome will be fruitful for firms' managers, directors, and leaders to sustain the optimum level of WRC and estimate future WRC requirements. The management of the firms should pay close attention to determinants that affect WRC (positively or negatively). Most of the prior literature shows that quality awards and certificates have a positive impact on firm profitability or performance. The findings of the current study show that the quality certificates have a positive impact on WRC. Hence, the study's findings will motivate the management of the firms to implement the EFQM model in their firms. Furthermore, the study's findings suggest to managers and directors of the firms that they should give importance to WRCM to improve profitability and sustainable growth.

5.2. Further studies

Most of the findings of the determinants are partly consistent with previous studies: Sardo and Serrasqueiro (2022); Sharma, Bakshi, and Chhabra (2020); Nyeadi, Sare, and Aawaar (2018); Rehman, Wang, and Kabiraj (2017); Singh and Kumar (2017); and Wasiuzzaman and Arumugam (2013). However, some of the results of the determinants are inconsistent with the findings of past studies. Moreover, some results are in opposite directions for noncertified and certified firms. These conflicting results offer scope for further research. Due to data availability, we employed only Czech firms' data for noncertified and quality-certified firms and then compared the findings of the two types of firms. However, if other countries and regions are included for comparison in future studies, it will be more interesting. Much could be done about WRC in the future. Further research could be conducted by including different quality certificates or awards, extending time periods, and including more firm-level, micro-level, and macro-level determinants as independent variables. We recommend to researchers and academics that they should include the consequences of COVID-19 in their research for a comprehensive analysis.

5.3. Limitations

The current study has a number of limitations that should be taken into account. (i) The analysis only included the years 2017 through 2021 because secondary data from the Albertina database was readily available. (ii) The consequences of COVID-19 were not considered in the study. (iii) Many variables impact WRCM; however, we included only a few independent variables based on the available data and prior studies. (iv) Various firms received different quality certificates at different times from the European Foundation. However, we ignored the certificates' category and certification time.

Disclosure statement

No potential conflict of interest was reported by the author(s).

About the author

Muhammad Yousaf received his MSc. degree in economics from the University of Copenhagen, Denmark, and a PhD degree from Tomas Bata University in Zlin, Czech Republic. He has passed the course Applied Econometrics for Researchers from Copenhagen Business School (CBS), Denmark. His research interests are in quality management, financial economics, microeconomics, macroeconomics, and econometrics. He has published many research articles in various journals.

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Data availability statement

The data of this study is available at Albertina database homepage, <https://www.bisnode.cz/produkty/albertina/>.

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