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Abdalmuttaleb M. A. Musleh Al-Sartawi
Abdulnaser Ibrahim Nour *Editors*

Artificial Intelligence and Economic Sustainability in the Era of Industrial Revolution 5.0

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Artificial Intelligence and Economic Sustainability in the Era of Industrial Revolution 5.0

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Preface

Countries seek to achieve sustainable development, particularly economic sustainability through practices that enable long-term economic growth and extend the positive effects of this growth to the environmental, social, and cultural aspects of society. Economic sustainability emphasizes achieving economic growth in terms of volume and quality while also maintaining the health and stability of societal growth and the human ecosystem. Economic sustainability aims to preserve capital and labor, to improve the standard of living, the effective use of assets, along with maximization of profits. The principles of economic sustainability can hence be considered in line with the elements of Industry 5.0. Both seek to and include the welfare and well-being of workers, individuals, and the society. This publication accordingly focuses on topics related to the role of technology and AI in advancing the welfare and well-being of the society.

The publication *Artificial Intelligence and Economic Sustainability in the Era of Industrial Revolution 5.0* has provided a platform for interdisciplinary research from multiple perspectives, disciplines, and researchers. The publication covers topics in the fields of technology, economics, accounting, finance, and knowledge management especially from the perspective of the more human-centric society—Society 5.0.

This publication consists of 99 chapters. The call for papers sought submissions in full research papers and hence attracted many submissions which were reviewed in a double-blind process by academics in the relevant fields.

This book provides insight on important areas related to artificial intelligence, sustainable development, and Society 5.0. The papers present a wide range of topics including block cipher, entrepreneurship and AI, AI and stock trading decisions, digital transformation, knowledge management, chatbot engineering, cybersecurity, and smart metering system.

As editors, we would like to take this opportunity to thank our reviewers for refereeing the chapters as well and their contributions toward the improvement of quality and content of the chapters. Particular thanks go to our authors and reviewers for the quality of the papers. We are grateful for receiving papers and submissions from two conferences, (1) The Fifth Scientific Conference of the College of Economics and Social Sciences 2023 (CESS) and (2) The International Conference on Global Economic Revolutions 2022. Finally, we would like to thank the executive editor of CESS 2023, **Dr. Islam Abdeljawad**, for his hard work and support in organizing the conference, leading the editorial team, and reviewing the final accepted papers for publication.

Manama, Bahrain
Nablus, Palestine, State of
October 2023

Abdalmuttaleb M. A. Musleh Al-Sartawi
Abdulnaser Ibrahim Nour

Introduction

The Fifth Industrial Revolution or ‘Industry 5.0’ has been dubbed as the digital revolution with a *soul*. In this senses, Industry 5.0 addresses the technocentric limitations of Industry 4.0. Sustainable technologies, human-centric artificial intelligence, and manufacturing simulation are essential for implementing the key elements of Industry 5.0 which include **human-centricity, sustainability, and resilience**. Countries seek to achieve sustainable development, particularly economic sustainability through practices that enable long-term economic growth and extend the positive effects of this growth to the environmental, social, and cultural aspects of society. Economic sustainability emphasizes achieving economic growth in terms of volume and quality while also maintaining the health and stability of societal growth and the human ecosystem. Economic sustainability aims to preserve capital and labor, to improve the standard of living, the effective use of assets, along with maximization of profits [1]. The principles of economic sustainability can hence be considered in line with the elements of Industry 5.0. Both seek to and include the welfare and well-being of workers, individuals, and the society.

Industry 5.0 is an effort to address the human impacts of the Fourth Industrial Revolution. In light of the rapid developments of the Industrial Revolution 5.0, the importance of this conference to achieve a sustainable economy is embodied in several aspects. As the limited natural resources threaten the sustainability of the economy, the development of new operations and investment in various resources is a necessity for the long-term sustainability of any business activity [2].

On the other hand, preserving human life is important, as climate change causes damages that impede the human ability to continue living, so reducing energy consumption and adjusting the food production approach provides an opportunity for the growth and stability of future generations. Also on this list are discovery and innovation [3]. When the environment gets worse, it becomes harder to come up with new ideas and find new parts that can be used to make products and services that help the economy.

In Society 5.0, organizations need to seize both national and international market opportunities through reliable employees who can effectively and efficiently utilize digital technology [4]. It is the role of organizations, through strategies, policies, and training, to increase employee engagement and voice.

Abdalmuttaleb M. A. Musleh Al-Sartawi
2023

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Al-Sartawi received his **Ph.D.** in Accounting from the University of Banking and Financial Science (UBFS). He has presented and published many papers in regional and international conferences and journals. In addition, Al-Sartawi is **Chair and Editor of two international conferences**: the European, Asian, Middle Eastern, North African Conference on Management and Information Systems (EAMMIS) and the International Conference on Global Economic Revolutions (ICGER). He is Member of various **editorial boards and technical committees** in international refereed journals and conferences.

Al-Sartawi is **Member of several international organizations and associations** such as the European Accountants Association (EAA), Bahrain Economists Society, the Middle East Economic Association (MEEA), the International Islamic Marketing Association (IIMA), the Arab Academy for Banking and Financial Sciences, and the Palestinian Accounting Association.

Besides his experience in **teaching**, he is vastly experienced in local and **international quality standards and accreditation** requirements. He is responsible for developing and implementing the Bahrain Quality Assurance (**BQA**) and the National Qualifications Framework (**NQF**) systems at his department. In terms of international accreditation, he has experience in preparing reports as per **AACSB** standards, related to Assurance of Learning and intellectual contribution standards.

Al-Sartawi has worked closely with a number of international professional bodies in mapping his department's programs with professional certifications, resulting in several exemptions and accreditations such as **ACCA, CFA, and CIMA**. URL: https://www.scopus.com/authid/detail.uri?authorId=57191107039

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Do Board Characteristics Affect the Financial Performance of the Companies Listed on the PEX?

Muath Asmar, Muiz Abu Alia, and Fawzi Hussein Ali

Abstract Board characteristics are among the important aspects of corporate governance mechanisms which contributes significantly in the reducing agency costs and enhancing firm's financial success. The relationship between board characteristics and firm performance is widely considered by the previous studies. However, mixed results are obtained. Therefore, this study examines the impact of board size, board ownership, board compensations, CEO duality and number of board meetings on financial performance for the companies listed on the Palestine Exchange. A random effect regression is used to analyze the panel data covering the period from 2005 to 2016. The results show that CEO duality and board compensations characteristics negatively affect the performance of the Palestinian companies when measured by the return on assets. On the other hand, the results indicate that return on equity is negatively impacted by the CEO duality. The study provides useful recommendations to enhance the governance practices in Palestine and other countries that have similar settings.

Keywords Board characteristics · Firm performance · Palestine exchange · Corporate governance

1 Introduction

During the past decades, a serious debate has emerged about corporate governance (CG) due to the agency problem that has arisen as a result of the division of ownership, management, and control. Shareholders seek to optimize yield and riches while managers need power required for running corporations [1]. According to [2], an unequal knowledge and flawed contractual ties exist between stockholders (principals) and managers (agents). Managers may spend more on vanity projects than value-maximizing projects and use suboptimal financial and business strategies. Agency

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costs, the costs of organizing, funding, and monitoring the principal-agent contract often result from these variations. CG defines the firm's direction and control as it includes processes, culture, policies, laws, and structures that influence company management [3]. It involves responsible, transparent long-term management and oversight in a way that mitigates the shareholders and managers clash.

Many studies showed that agency disputes between principals and agents impact firm performance and financial choices [4, 5]. According to [6], managers favor low debt, high cash, and low rewards when owners and directors' interests are not divided due to weak CG. Agency conflict can be alleviated by complying with CG requirements including those board- related practices. These practices prompt managers to act and control the firm activities in a way that leads to maximizing its financial performance [7] and reduce cost of capital [8].

Although the relationship between board characteristics and firm performance is widely considered, mixed results are obtained. Accordingly, this study examines how board characteristics, as corporate governance mechanisms, impact the financial success of the companies listed on the Palestine Exchange (PEX). This study contributes to the extant literature by providing evidence from new different setting. The Palestinian economy is unique as it has specific conditions and exclusive challenges due to political circumstances [9]. Palestine is a developing country with political instability and weak rule of law [10–12].

2 Literature, Theories and Hypotheses Development

Agency theory clarifies the relationship between the agent (managers) and the principal (shareholders). While both parties are expected to maximize their utility, managers may behave opportunistically at the expense of the shareholders interest. Agency relationship creates monitoring costs, bonding costs and the residual loss to the principals [13]. Therefore, CG was created to align the interest of both parties, and thus minimize agency costs. Key governance mechanisms such as board characteristics and ownership structure are essential in protecting and maximizing shareholder wealth [14, 15].

While agency theory assumes that principals and agents have conflict of interest, stewardship theory takes an opposite view. According to the stewardship theory, managers are basically trusted and good stewards for the firm resources and are likely to maximize the shareholders' wealth [16, 17]. They run the firm in a way that maximizes its performance as managers who achieve high returns create a good reputation that enable them to turn back into the markets for future needs of the firm [18].

The companies' ultimate goal is to maximize the owners' wealth by increasing the firm stock prices [19]. In an efficient market, nobody affects the prices, so each investor has the incentive to cut costs in order to raise wealth, thereby providing for the efficient use of allocated resources [20].

Many empirical studies investigated the relationship between corporate governance and company's financial performance [21, 22]. These studies used different CG mechanisms and several performance measures. Results of these studies are extremely mixed [23–26].

Firms with good governance tend to have good financial performance as CG enhances disclosure quality [26] which, in turn, increases the firm profitability [27]. This argument was confirmed by [28] who attributed the differences in the EU firms' results to the variation in the level of CG.

Board size

There is an extensive debate on the effect of board size on the firm performance [29, 30]. Many studies such as [31] showed that the firm performance, measured by Tobin's Q and ROA, is affected by board size. According to [32], small board size is more efficient when managing directors given the high consistency between the members. Empirically, [33–35] confirmed that smaller board size correlated positively with firms' value. Akbar et al. [36] found that board size had a negative significant influence on firms' performance (ROA and Tobin's Q). Consistently, [37] showed that board size had a negative impact on ROA while the relationship was not significant for ROE. Also, [38] found that board size had a negative impact on banks performance. Likewise, [1] indicated that the relation between board size and Tobin's Q is negatively significant.

On the other hand, [39] showed that board size had a positive significant impact on Australian bank's performance. Larger boards improve the governance and reduce the agency costs resulting in a positive association with firm value [40]. In addition, [23] found that board size and firm performance (ROA, ROE, and profit before tax) are positively associated. Similarly, [41–43] suggested a positive influence of board size on firm performance.

However, [44, 45] found no significant impact of board size on firm performance. Furthermore, [46] revealed that board size does not improve the financial performance (Tobin's Q and ROA) of the companies listed on Dubai Financial Market.

As a result, the first hypothesis is:

H1: There is a significant negative relationship between board size and firm performance.

The Frequency of board meetings

There are two perspectives on the effect of the board meetings frequency on the firm performance. According to [47], board meetings can be used to enhance the firm performance. This view subjects to the commitment of the board with firm's strategies and not distracted by other issues. Salim, Arjomandi and Seufert [39] found that the Australian bank's performance is positively affected by the number of board meetings. In the same line, [23, 36] suggested that board meetings and firm performance (ROA, ROE, and profit before tax) are positively associated.

Oppositely, other studies have reached different results supposing that board meetings are not useful and do not support the firm performance, as the meetings' agenda is set by executive directors while non-executive directors are sidelined. For example, [34, 48] suggested a negative relationship between the number of board meetings and firm performance. Similarly, [43] confirmed that board meetings hurt financial success of the Islamic banks in Pakistan.

Thus, the second hypothesis is:

H2: There is a significant positive relationship between the frequency of board meetings and firm performance.

CEO duality

Another side of CG practices that may influence the firm performance is the role duality of board chairman and CEO. There is a believe that a separation between chairman and CEO has a positive impact on stock return [31, 33, 49]. According to [50], merging both positions of CEO and board chair had negative effect on corporate performance. Consistently, [1] found that non-executive directors and Tobin's Q are negatively associated. In addition, [41, 51, 52] found that CEO duality had a negative impact on the financial performance of firms.

On the other hand, a second view on the CEO duality relies on an idea that managers are good stewards of the firm recourses. Chen and Cheung [53] found a positive effect of CEO duality on firm value. From the stewardship view, insider managers are desirable given their deep knowledge, easy access to information and technical expertise. Therefore, CEO duality is deemed to lead to better firm performance [17]. This view was confirmed by [24] who asserted that CEO duality in Saudi Arabia had positive impact on firm performance. Likewise, [23] found that role duality and firm performance (ROA, ROE, and profit before tax) are positively associated.

However, [54] found no significant relation between CEO duality and firm performance. As well, [55] confirmed that CEO duality isn't associated with firm performance.

Accordingly, our third hypothesis is as follows:

H3: There is a significant negative relationship between CEO duality and firm performance.

Board ownership

When ownership is scattered, individual shareholders don't have incentives to monitor the manager's behavior, while the situation of concentration of ownership among large shareholders creates incentive for the monitor and control process than small one [56]. Existing of large shareholders can lead to incentives and power for monitoring and control the firm resources [57]. Previous studies found a positive impact of large shareholders on firm performance [31, 58, 59]. Ducassy and Guyo [3] reported a positive significant relationship between the concentration of capital in few shareholders and the firm success. This allows for more concourse of interests with the similar goals of maximizing the firm's value. In addition, [60] concluded that low ownership concentration has a negative relation with Korean firms' profitability.

Notwithstanding, [61, 62] found a negative significant relationship between large shareholders and firm performance. Also [39] found that concentrated shareholdings negatively impact banks' performance. Foroughi and Fooladi [63] also found that ownership concentration had negative impact on firm performance. In Palestine, [64] suggested that equity returns are negatively affected by the ownership of board members.

Thus, our fourth hypothesis states that:

H4: There is a significant positive relationship between board ownership and firm performance.

Board compensations

Board compensation is one of the most important mechanisms of corporate governance. Compensation is used to encourage managers and board of directors to run the firm in a manner that serves the shareholders interest and reduces the conflict of interest between agents and the principals [44]. Mixed results on the impact of board compensations on firm performance were observed by several empirical studies. While [44], for example, found that board compensations have a positive impact on firm performance, [65] had opposite results. In turn, [66] failed to find a relationship between board compensation and firm performance. The final hypothesis is:

H6: There is a significant positive relationship between board compensation and firm performance.

3 Research Methodology

3.1 Data

This study examines the effect of board characteristics on the firm success (performance) in the Palestinian context. The study includes all A panel data covers the period from 2005 to 2016 belongs to the 49 companies listed on the PEX was obtained from the annual reports of companies. These reports are available at the websites of the companies and the PEX.

3.2 Variables

Dependent variables

The dependent variable of this study is the firm performance represented by two measures, return on assets and return on equity. Return on assets (ROA) is the net income of the firm to its total assets [37, 50, 67]. Return on equity (ROE) is calculated as the net income divided by equity, as discussed by [37, 55, 68].

Independent variables

As established earlier, five characteristics of board of directors are considered in this study. The first is Board size (BOS) which is measured as the number of board of directors following [31, 69]. Board ownership (BO), the second characteristic, is measured by the percentage of shares owned by the board of directors as established by [51, 69]. The third characteristic is board compensations (BC) which is represented by the amount of money granted to board members for their service [44, 70, 71]. Role duality (RD), the fourth characteristic, is measured as a dummy variable. If the chairman and the CEO is the same person it takes "0", otherwise it takes "1" [41–43]. Finally, number of meetings (NOM) of the board is measured by the number of board of directors' meetings during the financial year [39, 50].

Control variables

Company size (SZ) and company type (CT) are used as control variables. While SZ is measured by log of total assets, company type (CT) is measured as a dummy variable (Financial = 1, non-financial = 0).

3.3 Research Model

Considering that performance is measured in this study by two measures (ROA and ROE), we developed two models to investigate the effect of board of members characteristics on firm performance.

$$\mathrm{ROAit} = \alpha + \beta\mathrm{BOSit} + \beta\mathrm{BOit} + \beta\mathrm{BCit} + \beta\mathrm{RDit} + \beta\mathrm{NOMit} + \mathrm{SZit} + \mathrm{CTit} + \mathrm{et} \tag{1}$$

$$\mathrm{ROEti} = \alpha + \beta\mathrm{BOSit} + \beta\mathrm{BOit} + \beta\mathrm{BCit} + \beta\mathrm{RDit} + \beta\mathrm{NOMit} + \mathrm{SZit} + \mathrm{CTit} + \mathrm{et} \tag{2}$$

where ROA represents the return on assets for companies listed on the Palestine Exchange. ROE is the return on equity. BOS is the board size, BO is the board ownership, BC is the board compensations, RD is the CEO duality wither the CEO and the chairman is the same person. NOM is the number of board meetings during the financial year. Firm size (SZ) and company type (CT) are both control variables. e is error term.

4 Results and Discussion

4.1 Descriptive Statistics

Table 1 displays the descriptive statistical indicators for the dependent and independent variables including mean, median, maximum, minimum, standard deviation, and number of observations. For more detail concerning the statistical expressions, refer to [72–74]. During the period of the study, ROA has a mean of 0.029707 and varies from − 0.62 to a 0.29. During the period of the study, ROE has a mean of 0.059084 and varies from − 0.89 to 0.89 at its lowest and highest points.

The Correlation Matrix

Table 2 explains the correlation matrix between the dependent and independent variables. The highest correlation is 72.9% between ROA and ROE; an expected result as both of them measure the profitability. The correlation between the independent variables varies from 24.4 to 59.5% indicating no problem of multicollinearity.

Regression

The Hausman test is used in panel data analysis to determine whether to adopt a fixed effects model or a random effects model. The Hausman test showed that the chi squared values for both models were not statistically significant at 5%, suggesting the random effect model is better for panel data estimation. Thus, the random effect models were estimated in this study to determine the effect of board characteristics on the firm performance. Table 3 summarizes the random regression for the two models.

The results show that role duality has a negative significant impact on ROA and ROE. These results are consistent with [41, 50–52]. Role duality may produce

Table 1 Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. Dev	Observations
ROA	0.029707	0.022	0.29	− 0.62	0.071034	357
ROE	0.059084	0.06	0.89	− 0.89	0.144842	357
RD	0.607843	1	1	0	0.488917	357
SZ	17.52367	17.36089	22.13879	13.71149	1.801332	357
NM	6.084034	6	13	1	1.587768	357
BS	9.305322	9	123	5	6.392965	357
BO	0.56861	0.556	0.972	0.0537	0.203481	357
BC	122,785.4	54,075	1,167,800	0	195,419.2	357
CT	0.361345	0	1	0	0.481064	357

Table 2 Correlation matrix

	ROA	ROE	RD	SZ	NM	BS	BO	BC	CT
ROA	1								
ROE	0.72895	1							
RD	− 0.1580	− 0.1671	1						
SZ	0.12887	0.17950	− 0.1479	1					
NM	− 0.0537	− 0.0197	0.1728	0.00422	1				
BS	0.0123	0.00864	0.0141	0.14434	− 0.0047	1			
BO	0.0304	− 0.0048	0.2224	− 0.0451	− 0.2066	− 0.1247	1		
BC	0.0308	0.19168	− 0.1766	0.59581	0.22201	0.08188	− 0.2438	1	
CT	− 0.0971	0.15208	0.03091	0.27155	− 0.0288	0.09646	− 0.1534	0.3578	1

Table 3 Regression results

Model 1 DV = ROA		Model 2 DV = ROE	
Variable	Coefficient	Variable	Coefficient
C	− 0.18538	C	− 0.193188
NM	− 0.0022	NM	0.000556
BS	0.000416	BS	0.000241
BO	0.018396	BO	0.058027
BC	− 5.95E−08***	BC	− 2.69E−08
RD	− 0.0321*	RD	− 0.058574*
SZ	0.013424*	SZ	0.012801
CT	− 0.00342	CT	0.055927***

Note * 0.01, ** 0.05, *** 0.10

conflicts of interest and poor monitoring. It may lead to a lack of independent oversight and accountability, which can result in poor decision-making and poor governance. Additionally, the CEO may also favor short-term profitability above long-term growth and sustainability. This may lower profits and shareholders value over time. Separate CEO and chairman of the board roles have been proved to improve financial performance. Thus, dividing the positions may reduce these negative effects and enhance company governance, boosting profitability and long-term performance.

In addition, the results indicate that board compensation have a negative significant impact on ROA. These results are in consistence with previous studies [65]. Compensation of board of directors negatively impacts firm profitability if it is not structured properly. This is because excessive or inappropriate compensation can create conflicts of interest and affect the decision-making process of the board. If board members are compensated to emphasize short-term financial benefits above long-term strategic planning, it may impair the company's long-term prospects. High remuneration packages might also make board members feel entitled, leading to complacency and poor decision-making. Studies suggest that excessive board remuneration lowers business performance and shareholder value. Thus, organizations must ensure that board remuneration aligns with their long-term strategic objectives. This may improve governance and profitability.

However, no significant effect of the other characteristics on the measures of the profitability is observed. Such results confirm the findings of prior studies such as [44–46]. The results also show that ROA is affected positively by the firm size while ROE is higher in non-financial firms.

These findings may highlight the importance of ensuring that efficient governance practices are adopted by the Palestinian companies. Beside it is required by official directives, CG is a culture. We believe that the prevailing circumstances have an influence on both the CG practicing and the financial reporting of the Palestinian companies [75–77]. Prevailing factors should be considered when addressing such issues. As we earlier established, Palestine has a unique setting that differentiate it from other countries [69, 78–80].

5 Conclusion

Corporate governance mechanisms are supposed to mitigate the agency conflict and reduce its costs. Part of the governance mechanisms and practices is related to the board of directors' characteristics. As established by many studies, effective corporate governance has an effect on the firm performance and value. Many studies have considered the relationship between the corporate governance mechanisms efficiency and the firm performance. However mixed results were gotten, and therefore, this issue is addressed in this study by targeting a unique setting. Precisely, the study examines the effect of board director characteristics on the performance of the companies listed on the Palestine Exchange. Palestine is a developing country that suffer political instability.

The study used panel data belongs to 49 companies listed on the Palestine Exchange during the period from 2005 to 2016. A total of 375-year observations are included in the regression analysis. Five practices are considered in the study to represent board characteristics including board size, board meetings frequency, CEO duality, board ownership and board compensation. On the other hand, return on assets (ROA) and return on equity (ROE) are used to measure the financial performance.

Results show that ROA is negatively affected by the CEO duality and board compensations. On the other hand, the results indicate that CEO duality negatively affect the second measure of performance (ROE).

Our study is important as it highlights an important issue in a unique environment. The results imply the need to adequately consider the corporate governance practices by the Palestinian companies. Regulators need to create efficient requirements to ensure the compliance of these companies with corporate governance rules. Moreover, other countries that have features similar to those prevailed in Palestine may benefit from the study results especially the Arab countries and the countries that suffer political instability.

For future research, we recommend to include more board characteristics such as gender diversity and board independence using recent data [70, 71]. Furthermore, it is preferable to conduct such a study in different countries to consider the effect of the differences in the prevailing circumstances in these countries on the corporate governance and firm performance relationship. Thus, the limitations of this study are overcome.

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