GOSPODARKA NARODOWA

3(315)2023, 34–47
DOI: 10.33119/GN/169434
gnpje.sgh.waw.pl
SGH

The Polish Journal of Economics
Istnieje od / Published since 1931

Krzysztof Kompa
College of Business and Economics, University of Johannesburg, South Africa (*corresponding author*)

Dorota Witkowska
Department of Corporate Finance Management, University of Łódź, Poland

Lia (Magda) Hewitt
College of Business and Economics, University of Johannesburg, South Africa

Women's Representation on Boards and the Financial Performance of Polish Public Companies in the pre-COVID-19 Decade

Związek między reprezentacją kobiet w zarządach a wynikami finansowymi polskich spółek notowanych na giełdzie w dekadzie przed pandemią COVID-19

Abstract

Gender diversity in corporate boardrooms and its relation to the financial performance of public companies is the subject of a wide debate. Both positive and negative relationships have been identified between these two phenomena. This study attempts to determine if there is a relationship between the representation of women on boards and the financial performance of companies in Poland. The research sample comprised 90 companies that had complete records of necessary data and were continuously listed on the Warsaw Stock Exchange in Poland from 2010 to 2019 (in a period referred to as the pre-COVID-19 pandemic decade). The financial performance of companies is measured by (1) several single financial ratios and (2) synthetic (taxonomic) measures constructed using sets of various individual financial ratios. Investigations were conducted for all the selected companies collectively, and separately for banks, other financial firms and non-financial companies. The findings indicate that women's representation on boards had no connection to the financial performance of public companies in Poland, although a few examples of positive relation were noted, particularly in the case of banks.

Keywords:
firm performance, corporate governance, financial ratios, women on boards, taxonomic measures

JEL classification codes:
C38, J16, L25, M14, M41

Article history:
submitted: February 15, 2023
revised: June 29, 2023
accepted: July 10, 2023

Streszczenie

Różnorodność płci w zarządach i jej związek z wynikami finansowymi spółek notowanych na giełdzie jest przedmiotem szerokiej debaty. Dotychczas identyfikowano zarówno pozytywne, jak i negatywne relacje między tymi dwoma zjawiskami. W niniejszym badaniu podjęto próbę ustalenia, czy istnieje związek między reprezentacją kobiet w zarządach a wynikami finansowymi spółek w Polsce. Próba badawcza obejmowała 90 spółek, które posiadały pełną dokumentację niezbędnych danych i były nieprzerwanie notowane na Giełdzie Papierów Wartościowych w Warszawie w latach 2010–2019 (w okresie określanym jako dekada przed pandemią COVID- 19). Wyniki finansowe spółek mierzone są 1) kilkoma pojedynczymi wskaźnikami finansowymi oraz 2) miarami syntetycznymi (taksonomicznymi), skonstruowanymi z wykorzystaniem zbiorów różnych pojedynczych wskaźników finansowych. Badania przeprowadzono dla wszystkich wybranych spółek łącznie

Słowa kluczowe:
wyniki firm, ład korporacyjny, wskaźniki finansowe, kobiety w zarządach, miary taksonomiczne

Kody klasyfikacji JEL:
C38, J16, L25, M14, M41

Historia artykułu:
nadesłany: 15 lutego 2023 r.
poprawiony: 29 czerwca 2023 r.
zaakceptowany: 10 lipca 2023 r.

oraz oddzielnie dla banków, innych firm finansowych i spółek niefinansowych. Uzyskane rezultaty sugerują, że reprezentacja kobiet w zarządach nie była powiązana z wynikami finansowymi spółek notowanych na giełdzie w Polsce, choć odnotowano kilka przykładów korelacji dodatniej, szczególnie w przypadku banków.

Introduction

Recent decades have seen substantial changes in the position of women in the labour market and a steady increase in the role of women in the economy, with a growing level of their education. However, women still earn less than men and they are appointed less frequently than men to responsible positions in business, science, and politics.

Women's representation in the management of organisations has been one of the top challenges discussed by politicians, economists, and researchers, especially in the context of gender parity regulations in the European Union. "There is real debate between those who think we should be more diverse because it is the right thing to do and those who think we should be more diverse because it actually enhances share-holder value."[1] In its regulations, the European Union refers to equality reasons, resulting directly from EU treaties, European legal regulations and convictions, and to research outcomes confirming a positive relationship between gender diversity at the top management level and a company's financial performance and profitability.[2]

Meanwhile, the existing literature on gender parity in top management and its impact on the financial performance of companies shows both positive and negative relationships between the two. The findings differ among countries and economic branches as well as in the way these phenomena are measured. Such discussions are also taking place in Poland. However, they are most often framed within the space of political correctness rather than objective quantitative research into what kind of real impact the gender diversity of boards has on the financial achievements of companies.

Thus, the goal of this study is to assess if there is a relationship between women's representation on boards and the financial performance of public companies in Poland. It was assumed to consider only companies from the main stock indices of the Warsaw Stock Exchange in the pre-COVID-19 decade.[3] It was also decided that the measurements of women's representation on boards would be made at least six months prior to the measurement of the financial performance of companies, which is a new approach to research in this area. Also innovative is the use of synthetic measures of development (referred to as synthetic measures for short) to assess the economic and financial condition of public companies. These taxonomic measures were constructed using a variety of financial indicators derived from the annual reports of the evaluated companies, describing their situation at the end of the year.[4]

The paper is presented as follows: After a short introduction, the second section contains a literature review, whereas the third section describes the representation of women on the boards of public companies in EU member states. The fourth section is dedicated to methodology and data description, and the fifth section discusses the results of the empirical analysis. The last section concludes.

---

1 Statement presented by Karen J. Curtin [**Brancato, Patterson, 1999**].

2 Paragraphs 1–55 and 16 of the Preamble to *Directive (EU) 2022/2381 of the European Parliament and of the Council of 23 November 2022 on improving the gender balance among directors of listed companies and related measures* (online PE Document 32022L2381), Official Journal of the European Union, L 315/44, December 7, 2022.

3 We use the phrase "the pre-COVID-19 decade" because it clearly defines the study period: 2010–2019. It also reflects the fact that the study was conducted for a period of economic stability, completely disrupted by the outbreak of the pandemic (and later also by the war in Ukraine).

4 Similar methodological assumptions and the same databases were used in **Kompa and Witkowska's** study [**2023**] employing innovative, vector-based synthetic measures of company performance.

Literature review

There is a significant body of literature on gender diversity within senior management. However, opinions vary about the role of women directors and on how greater gender diversity on corporate boards benefits company performance.

Erhardt, Werbel, and Shrader [2003], **Smith, Smith, and Verner [2006]**, **Campbell, and Minguez-Vera [2008; 2010]**, **Bear, Rahman, and Post [2010]**, **Bohdanowicz [2011]**, **Curtis, Schmid, and Struber [2012]**, **Lenard et al. [2014]**, **Hewitt [2019]** present several arguments for women serving on company boards. The most important among these is that companies with women in top managerial positions improve their performance faster, are more profitable and stable, as women are less prone to risk. In addition, employees are more satisfied with their jobs and more productive. The companies' stock prices also rise more rapidly. The positive impact of gender diversity on the condition of firms is also reported by **Terjesen, Couto and Francisco [2016]**, **Jyothi and Mangalagiri [2019]**, and **Khan and Subhan [2019]**. **Bennouri, Nagati and Nekhili [2018]** found a positive relationship between accounting performance (ROA and ROE) and female directorship, whereas a negative relationship was reported in some cases for Tobin's Q ratio.[5]

However, the positive effect of board gender diversity on firm performance increases when the share of women arrives at a "critical mass" level, i.e., at least 30% or three board seats of women on a corporate board [**Tochia, et al., 2010**; **Wiley, Monnor-Tormos, 2018**]. It is argued that reaching critical mass can change boardroom dynamics substantially, creating an environment in which innovative ideas can spring from gender diversity [**Hewitt, 2019**].

Some scholars do report the negative impact of women on enterprises' assessment, as noted by **Lee and James [2007]**, **Adams, Gupta, and Leeth [2009]**, **Adams and Ferreira [2009]**, **Dobbin and Jung [2011]**, **Ahern and Dittmar [2012]**, **Wellalage and Locke [2013]**, **Bertrand et al. [2014]** and **Eulerich et al. [2014]**, among others. There are also studies which show that there is no significant relationship between gender diversity and the economic performance of enterprises [**Farrel, Hersch, 2005**; **Rose, 2007**; **Wang, Clift, 2009**; **Carter at al. 2010**; **Bianco, Ciavarella, Signoretti, 2011**; **Marinova, Plantenga, Remery, 2016**; **Kompa, 2018**; **2019**; **Kompa, Witkowska, 2017**; **2018**; **2023**; **Shabbir, 2018**; **Ionacsu et al. 2018**; **Kwakye, Owiredu, 2019**; **Sekeroglu, Acar, 2019**; **Herrera-Cano, Gonzalez-Perez, 2019**; **Witkowska, 2020**].

There are several reasons for the inconsistency in these research results. The most important among these are factors connected with [**Witkowska, 2020**]:

- attributes of the enterprise or institution alone, such as: the region, industry, size of the firm, the general situation of the enterprise and the market or economy where it operates;
- the methodology used in research since there are many different methods used, for instance, correlation, especially the Pearson coefficient, pooled and panel regression, meta-analysis, and t-test for equality of two means;
- the measurement of firm performance, which is usually realised by single financial ratios such as return on equity (ROE), return on assets (ROA), return on sale (ROS) and Tobin's Q or stock prices;
- the measurement of women's representation in management which may be measured by the gender diversity index, or the number or share of females in supervisory or executive boards, or Chief Executive Officers (CEOs), or chairwomen of boards, etc.
- observations on women's representation in management create a time series of moments. Therefore the point (date) of the measurement is crucial when raw data are collected, but the researchers usually do not provide this kind of information.

A review of the literature indicates methodological inconsistencies and empirical gaps, and this applies to both research in general and studies focusing on Poland in particular.

[5] However, if they included several attributes of female directors all the relationships became positive.

Women on boards of listed companies across the European Union

Various European Union countries have made efforts for years to increase women's participation in decision-making positions. These efforts culminated with the final approval of a law that will implement quotas to keep gender balance on the boards of public companies. This law mandates 40% for non-executive seats and 33% for both non-executive and executive board positions for the "underrepresented sex" by 2026[6]. Therefore, it is worth exploring how women's representation on company boards has evolved over time.

The European Institute for Gender Equality (EIGE) reports that the share of women on the boards of blue-chip companies in the European Union (EU28**)** was 9% in 2004, 11.9% in 2010 and 30% in 2020. Table 1 contains detailed comparisons of data from the second half of 2010 and 2020 for board members and presidents,[7] together with CEOs.[8] It is visible that in 2020 the share of women on boards was less than 20% in 10 countries, with seven of those not having a female president. At the same time, Croatia and the Netherlands reported a lack of female presidents, while the share of women on boards in these two countries was 26.2% and 36.6% respectively.

Table 1. Percentage of women on boards of large listed companies in EU

	Member		CEO		President	
	2010	2020	2012	2020	2010	2020
EU 27	11.8	29.5	2.2	7.5	3.7	7.1
EU 28	11.9	30.0	2.5	7.4	3.4	7.2
Austria	10.5	31.5	0.0	5.0	0.0	20.0
Belgium	11.2	38.4	0.0	5.9	13.3	5.9
Bulgaria	12.2	12.9	0.0	13.3	9.1	0.0
Croatia	17.7	26.2	0.0	10.5	0.0	0.0
Cyprus	12.6	11.5	0.0	11.1	3.3	0.0
Czech Republic	7.0	17.2	0.0	9.1	7.1	0.0
Denmark	8.4	33.6	0.0	12.5	5.3	8.3
Estonia	6.2	8.8	0.0	5.9	0.0	0.0
Finland	9.5	35.1	2.9	4.2	2.9	4.2
France	12.3	45.1	0.0	2.7	2.8	2.7
Germany	15.6	36.3	4.3	0.0	4.5	6.9
Greece	4.5	13.0	0.0	4.5	2.6	4.5
Hungary	4.0	9.9	5.3	7.1	5.3	7.1
Ireland	23.5	28.8	3.2	15.8	9.1	5.3
Italy	13.1	38.4	4.0	0.0	3.4	17.6
Latvia	3.5	25.6	0.0	0.0	0.0	13.3
Lithuania	13.6	14.3	0.0	16.7	7.7	0.0
Luxembourg	2.4	18.2	5.0	0.0	5.6	0.0
Malta	14.9	9.9	10.0	12.0	0.0	0.0
Netherlands	8.7	36.6	0.0	10.0	0.0	0.0
Poland	11.6	22.8	5.3	10.5	5.3	36.8
Portugal	5.4	26.6	0.0	5.9	0.0	5.9
Romania	21.3	12.8	10.0	14.3	0.0	6.7
Slovakia	9.8	31.4	0.0	20.0	5.9	10.0

6 The regulation was passed on November 23, 2022 (PE document 32022L2381)

7 According to the EIGE definition, the president is the chairperson of the highest decision-making body in each company. The highest decision-making body is usually termed the supervisory board (in a two-tier governance system) or the board of directors (in a unitary system).

8 Data on CEOs (Chief Executive Officer or equivalent position) have been recorded by EIGE since 2012. Thus, comparisons are made for 2012 and 2020.

	Member		CEO		President	
	2010	2020	2012	2020	2010	2020
Slovenia	21.6	22.9	10.0	10.0	10.0	5.0
Spain	25.9	29.3	0.0	3.0	4.2	6.1
Sweden	26.4	38.0	3.8	11.5	0.0	15.4
United Kingdom	13.3	34.7	6.4	6.1	0.0	8.0

Source: Authors' own elaboration based on Gender Statistics Database https://eige.europa.eu/gender-statistics/dgs/indicator/wmidm_bus_bus__wmid_comp_compbm/metadata (accessed on 28.02.2021).

In the remaining EU states, the situation has essentially improved during the last 10 years. However, only six countries have more than 10% of women presidents. In 2020, the biggest percentage of women on boards was observed in France, at 45.1%, followed by Italy and Belgium, each with 38.4%, and Sweden, with 38%. At the opposite end of the spectrum were Estonia, with 8.8%, and Malta and Hungary, each with 9.9%.

Table 2. Percentage of women on executive and supervisory boards of companies listed on Warsaw Stock Exchange's main market at the end of 2020

Board	Total	President	Vice-president	Member
executive	12.1	5.8	14.6	14.6
supervisory	16.0	10.0	8.9	18.2

Source: Authors' own elaboration based on [**Rogalska, Wiśniewski, 2021**].

According to the EIGE data, the largest percentage of women presidents is reported in Poland, at 36.8% in 2020, but this figure seems to be overestimated. A local data source, Notoria Service database,[9] reports that, as of the end of 2020, there were four women presidents of executive boards and six chairwomen of supervisory boards in companies included in the WIG20 blue-chip index. This represented 20% and 30% of the total number of presidents for executive and supervisory boards respectively, and 25% when both boards were considered jointly (Tables 1 and 2).

Table 3. Percentage of women on boards of all WSE-listed companies, including both the main market and NewConnect

Years	Executive board		Supervisory board	
	Member	President	Member	Chairwomen
2010	10.8	7.1	10.7	11.7
2011	10.6	7.9	10.6	10.2
2012	12.0	7.3	11.2	12.8
2013	11.5	7.9	11.4	12.5
2014	12.0	7.2	13.3	12.8
2015	11.6	7.4	14.2	13.3
2016	11.1	7.0	15.1	11.7
2017	11.2	6.1	15.1	11.8
2018	11.5	6.7	15.2	11.8
2019	12.5	7.2	15.9	12.1

Source: Authors' own elaboration based on [**Witkowska, Kompa, Wiśniewski, 2017**; **2018**; **2019**] and [**Kolanko, Wiśniewski, 2020**].

[9] Notoria Serwis is an authorised provider of data on companies listed on the WSE.

Table 3 contains data on women's representation on the boards of companies listed on the WSE's main and NewConnect[10] markets from 2010 to 2019. The proportion of women on the supervisory boards was slightly higher than on the executive boards. If the whole capital market is considered, the percentage of women members of supervisory boards in 2019 was 48.6 points higher than in 2010, while for executive boards the increase was 15.74 p.p. However, if only women in top managerial positions are considered, there were no notable changes over the decade. Companies listed on the WSE's NewConnect alternative market are small and young, and some of them are family businesses. Thus, there are more women in the statutory bodies of these companies than in companies listed on the exchange's main market.

Methods and data description

The research covered all the companies included in the Warsaw Stock Exchange's main stock indices, WIG20, mWIG40 and sWIG80,[11] as of December 30, 2019. Only companies that were continuously listed in the pre-COVID-19 decade were considered. In addition, companies selected for the analysis had to have a complete record of the required data[12] for the whole research period. Finally, 90 companies met the set criteria and qualified, of which 17 were from the financial sector, and 73 from the non-financial sector.

The concept of our study assumes that if a change in women's representation on boards affects the financial performance of companies, a statistically significant correlation should be observed between this change and forward-looking changes in the values of the financial ratios. The same relationship should occur if multivariate synthetic measures (built on sets of various financial ratios) are applied while measuring the financial condition of companies. It was further assumed that board member actions affect company performance after at least six months. The application of linear correlation coefficients allows us to identify the direction of the correlation, i.e. to state if the representation of women on boards had a positive or negative impact on these companies' financial performance. Thus, the research was conducted in the following stages:

1. selection of companies which were listed on the Warsaw Stock Exchange continuously during the pre-COVID-19 decade;
2. identification of the gender structure of statutory boards in all the considered companies as of June 30 of each year[13];
3. selection of key financial ratios describing the companies' performance, measured at the end of each fiscal year;
4. construction of synthetic measures of firm performance for all the investigated companies and separately for individual economic sectors (i.e., nonfinancial, banks and "other financial");
5. calculation of Pearson coefficients, measuring the linear correlation between the share of women on a company's board and the financial performance of that company, as measured by individual financial ratios (3) and constructed synthetic measures (4) for each studied company and in each year of the research;
6. verification of the statistical significance of Pearson coefficients; and
7. drawing inferences about the analyses and postulated implications.

The gender diversity of boards is measured by the percentage of women on executive and supervisory boards separately and in total, as evaluated for each company every year.

Table 4 contains the list of 22 financial ratios which were selected for the analysis of the companies' financial performance. All these ratios are classified as stimulants (denoted by S) or de-stimulants (D). The former

10 NewConnect is an organised stock market operated by the Warsaw Stock Exchange outside the regulated market in the form of an alternative trading system.

11 The WIG20 index is based on the value of a portfolio with shares in 20 major and most liquid companies in the WSE Main List. The mWIG40 index comprises 40 medium-sized WSE Main List companies, while the sWIG80 index comprises 80 smaller companies (https://gpwbenchmark.pl/en-home).

12 The primary database for this study was created based on the Notoria Serwis database by **Blaszczyk [2020]**, and was also applied in other studies by the authors of this paper (cf. footnote 4).

13 Since the employment time series is a series of moments, the measurement dates must be fixed and the same for each year of the analysis.

are variables whose rise in quantity indicates a better financial performance of the company. The latter have the opposite influence.

Table 4. Individual financial ratios used in this investigation

	Ratios	Banks	Not banks	Type
1	Asset turnover ratio		X	S
2	Book-to-market ratio P/BV	X	X	S
3	Capital adequacy ratio CAR	X		S
4	Current ratio		X	S
5	Days inventory outstanding		X	D
6	Days payable outstanding		X	D
7	Days sales outstanding		X	D
8	Debt ratio		X	D
9	Earnings yield P/E	X	X	S
10	EBITDA/assets		X	S
11	Equity ratio in financing fixed assets	X		S
12	Income assets ratio	X		S
13	Liquidity ratio IMF	X		S
14	Operating costs / assets	X		D
15	Operating costs / core business income	X		D
16	Operating costs / results on banking activities	X		D
17	Operating profit margin OPM	X	X	S
18	Productivity of fixed assets	X		S
19	Quick ratio		X	S
20	Return on sales ROS	X	X	S
21	Return on assets ROA	X	X	S
22	Return on equity ROE	X	X	S

Ratios applicable for all companies are shadowed.
Source: Authors' own elaboration.

In this study, single and multidimensional approaches are employed to measure the financial situation of companies. The first approach is based on using single financial ratios, i.e., operating profit margin (OPM), return on assets (ROA), return on equity (ROE), return on sales (ROS), price-to-book value (P/BV), and price-to-earnings (P/E). The second approach is to apply the taxonomic distance of companies from the defined pattern in the multidimensional space of variables describing companies. Euclidean distance is defined for each year as following [**Nermend, 2009**: 36–45]:

$$q_{it} = \sqrt{\frac{1}{k}\sum_{j=1}^{k}(z_{jt}^{i} - z_{jt}^{0})^2} \tag{1}$$

where for each year t=1, 2, ..., T, z_{jt}^{0}, z_{jt}^{i} – standardised variables describing the pattern and the i-th investigated company respectively:

$$z_{jt}^{i} = \frac{x_{jt}^{i} - \overline{x}_{jt}}{S_{jt}^{x}} \tag{2}$$

$$z_{jt}^{0} = \begin{cases} \min\limits_{i=1,2,\ldots n}\left\{z_{jt}^{i}\right\} \text{ for } x_{jt}^{i} \in D \\ \max\limits_{i=1,2,\ldots n}\left\{z_{jt}^{i}\right\} \text{ for } x_{jt}^{i} \in S \end{cases} \tag{3}$$

where, x_{jt}^{i} – observations of the *j*-th financial ratio in the *i*-th company, $\overline{x}_{jt}$, S_{jt}^{x} – average and standard deviation of the *j*-th ratio respectively, *k* – count of variables employed for measure construction, *D*, *S* – sets of de-stimulants and stimulants respectively.

To construct synthetic measures, the ratios of liquidity, debt, efficiency, profitability, and market value were applied. These variables are presented in Table 4 and categorised into three groups according to the business type defined as banks (the "banks" column), non-banks (the "not banks" column) and all studied companies together (shadowed boxes). In other words, Euclidean distances (1) are derived: (a) for all companies using six common indicators, (b) for banks using 14 indicators (six common indicators and an additional eight applicable only to banks) and (c) for non-banks using 14 indicators (six common and an additional eight applicable only to non-banks). While using indicators specific to companies in group (c), synthetic measures (1) are calculated separately for financial and non-financial companies, because usually women in management are more likely to be in financial companies than in others (see Table 5).

Pearson's linear correlation coefficients between the share of women on boards and firms' financial performance are calculated for each year and for the entire research period. At that, measurements are made for both these phenomena in the same year (*t*) and for the fraction of women from the previous year (*t*-1). The statistical significance of correlation is tested for a significance level of 0.05, using a test statistic:

$$t = \frac{r \cdot \sqrt{N-2}}{\sqrt{1-r^2}} \tag{4}$$

where *r* – Pearson coefficient, *N* – count of observations, *t* – t-Student statistics with (*N*-2) degrees of freedom.

Empirical findings

The representation of women on the statutory boards of the studied companies is analysed in terms of the percentage share of women on boards, the number of women top managers on both executive and supervisory boards, and the dynamics of changes (CH) given in percentage points (p.p.). Notably, women are more often in the management of financial companies than non-financial companies (Table 5).

Table 5. Proportion of women on boardrooms of studied companies

Years	Executive board		Supervisory board		Both boards
	Number of presidents	Share	Number of presidents	Share	Share
All companies					
2010	4	9.47%	7	11.73%	10.86%
2019	1	10.64%	7	15.41%	13.56%
2010–2019	38	9.82%	77	13.60%	12.20%
CH (p.p.)	–75	12.38	0%	31.32	24.84
Non-financial					
2010	2	8.68%	6	11.71%	10.55%
2019	0	9.06%	7	15.29%	12.90%
2010–2019	27	8.42%	70	13.35%	11.55%
CH (p.p.)	–100	4.38	16.67	30.57	22.27
Financial					
2010	2	12.68%	1	11.82%	12.15%
2019	1	15.79%	0	15.83%	15.81%
2010–2019	11	14.99%	7	14.67%	14.80%
CH (p.p.)	–50	24.53	–100	33.93	24.28

Source: Authors' own evaluation.

For the period under investigation, a share of women below 10% was observed in ¼ of the financial companies and nearly ½ of the non-financial companies. Meanwhile, in ¼ of the financial companies and about $^1/_6$ of the non-financial companies the proportion of women managers was up to 20%. Additionally, seven of the investigated companies had no women on their boards over the entire decade. One of these companies was in the financial sector.

Table 6 contains the values of Pearson linear correlation coefficients calculated for all the companies and the whole timespan, as well as information about the years when statistically significant relationships were observed. There are no significant relationships between the share of women on boards and firms' financial performance if the financial condition of companies is reflected by OPM, ROA, ROE, ROS, P/E or P/BV, for the whole period of investigation and in most years regardless of the length of the time gap (six or 18 months) between the share of women on boards (current and lagged) and the ratios' values.

A significantly positive relationship between financial ratios and having women directors was found in only 11 cases (2.8%), while a significant negative relationship was observed in just three cases (0.8%). The positive impact of women on executive boards is most frequently seen with the price-to-earnings ratio (P/E). Conversely, a negative influence is seen in the case of profitability ratios (ROE and ROA).

Table 6. Pearson correlation coefficients between single ratios and share of women on boards evaluated for all companies, 2010–2019

Ratio	Supervisory board		Executive board		Both boards	
	t	t – 1	t	t – 1	t	t – 1
OPM	–0.0303	–0.0342	–0.0201	–0.0231	–0.0378	–0.0422
ROA	0.0094	0.0162	–0.0491	–0.0445	0.0046	–0.0004
		2014(+)	**2017(–)**	**2017(–)**		**2014(+)**
ROE	–0.0231	0.0428	–0.0200	0.0025	–0.0291	0.0366
		2014(+)	**2014(–)**			**2014(+)**
P/BV	0.0147	0.0054	–0.0192	–0.0342	0.0013	0.0160
			2013(+)			
P/E	–0.0147	0.0092	0.0192	–0.0018	–0.0013	0.0044
	2017(+)	**2017(+)**	**2013(+)**	**2012(+)**	**2017(+)**	**2017(+)**
ROS	–0.0083	0.0040	–0.0055	–0.0050	–0.0096	–0.0010

Note: Bold numbers denote years when statistically significant correlations are observed, (+) – positive and (–) negative relation

Source: Authors' own evaluation.

Table 7. Pearson correlation coefficients between synthetic measures and share of women on boards evaluated for all companies

Years	Supervisory board		Executive board		Both boards	
	t	t – 1	t	t – 1	t	t – 1
2010	0.0655		–0.1066		0.0142	
2011	–0.0677	–0.1273	–0.0598	–0.0547	–0.1138	–0.1430
2012	–0.1194	–0.1194	–0.1349	–0.1553	**–0.1781**	–0.1128
2013	**–0.1873**	–0.0842	0.0004	–0.0321	**–0.2139**	–0.1365
2014	–0.0916	–0.1797	0.1436	0.0313	–0.0385	–0.1712
2015	–0.0005	0.0077	–0.0776	–0.0216	–0.0439	–0.0164
2016	–0.0341	–0.0402	–0.0038	0.0178	–0.0276	–0.0336
2017	0.0359	0.0196	0.1379	0.1140	0.0837	0.0540
2018	0.0222	0.0943	0.0125	0.0109	0.0291	0.0962
2019	0.0266	0.0161	0.0725	0.0637	0.0389	0.0495
2010–2019	0.0294	0.0292	0.0095	0.0217	0.0124	0.0308

Bold numbers denote statistically significant correlations.

Source: Authors' own evaluation.

Table 8. Pearson correlation coefficients between synthetic measures and share of women on boards evaluated for other financial companies (not banks)

Years	Supervisory board		Executive board		Both boards	
	t	t – 1	t	t – 1	t	t – 1
2010	–0.2490		–0.0597		–0.2409	
2011	0.0747	–0.1572	–0.3415	–0.2472	–0.0434	–0.2755
2012	0.0993	0.0993	–0.3571	–0.3121	–0.0814	–0.0389
2013	0.5379	0.2530	0.0126	–0.3721	0.3476	0.0610
2014	–0.0352	0.2957	–0.2674	–0.3058	–0.1449	0.0465
2015	–0.1810	–0.2095	–0.2667	–0.4186	–0.2177	–0.3158
2016	–0.0204	0.0598	–0.2393	–0.0990	–0.1028	0.0032
2017	0.4140	0.3335	0.2647	0.1642	0.3728	0.2830
2018	0.0672	–0.0378	–0.0181	–0.0181	0.0289	–0.0474
2019	0.6241	0.5672	0.1597	0.0821	0.5030	0.4643
2010–2019	0.1710	0.1434	–0.0843	–0.1409	0.0623	0.0417

Source: Authors' own evaluation.

Synthetic measures (1) are calculated for each year using four sets of combinations of ratios and companies. According to definition (1), the performance of the company is better when the distance from the pattern is smaller. Therefore, the positive impact of women managers on companies' performance is detected for negative values of correlation coefficients (which are presented in Tables 7–10). Statistically significant and negative correlations for annual data are only observed in seven cases (5.8%) for current relations and for one case (0.9%) when lagged relationships are considered. There are two cases (among 12 relations) of significantly negative correlations calculated for both lagged and current relations in the whole period of investigation for banks, and one case where correlations are significant and positive for executive boards in non-financial companies in 2014. In other words, women's representation on boards most significantly improves the financial performance of banks (seven of 63 cases), compared with the group including all companies (three of 63 cases) and non-financial firms (one of 63 cases).

Table 9. Pearson correlation coefficients between synthetic measures and share of women on boards evaluated for banks

Years	Supervisory board		Executive board		Both boards	
	t	t – 1	t	t – 1	t	t – 1
2010	–0.0896		–0.3976		–0.3795	
2011	0.5040	0.1421	0.1651	0.3558	0.4229	0.3973
2012	–0.2949	–0.2949	0.1962	0.1074	0.0451	–0.2391
2013	–0.2468	–0.4867	–0.1062	–0.0333	–0.1931	–0.2473
2014	–0.5646	–0.3710	–0.0998	–0.1254	**–0.7501**	–0.2852
2015	–0.5001	–0.4930	–0.1388	–0.0422	**–0.7402**	–0.6179
2016	–0.5106	–0.4951	0.3315	–0.1574	–0.4551	**–0.7599**
2017	–0.1959	–0.3536	0.3480	0.1686	–0.0342	–0.4040
2018	0.1292	–0.3636	–0.0972	0.5361	0.0930	–0.0138
2019	0.3061	0.1859	–0.1338	–0.2503	0.2715	–0.0998
2010–2019	**–0.2923**	**–0.3243**	–0.0103	0.0294	**–0.2583**	**–0.2681**

Bold numbers denote statistically significant correlations.

Source: Authors' own evaluation.

Table 10. Pearson correlation coefficients between synthetic measures and share of women on boards evaluated for non-financial companies

Years	Supervisory board		Executive board		Both boards	
	t	t – 1	t	t – 1	t	t – 1
2010	0.1180		–0.1034		0.0642	
2011	–0.0786	–0.0870	–0.0556	–0.0457	–0.0625	–0.1099
2012	–0.0238	–0.0238	–0.1810	–0.1754	–0.1121	0.0184
2013	–0.1986	–0.0520	–0.0178	–0.0391	**–0.2831**	–0.1224
2014	–0.0716	–0.1258	**0.2536**	0.0959	0.0188	–0.1245
2015	0.0213	0.0401	0.0655	0.0879	0.0372	0.0750
2016	0.0161	–0.0036	0.0864	0.1053	0.0532	0.0326
2017	0.0355	0.0183	0.1653	0.1548	0.0903	0.0610
2018	0.0684	0.1388	0.0957	0.0587	0.1118	0.1678
2019	–0.0527	0.0192	0.0005	0.0509	–0.0683	0.0405
2010–19	0.0494	0.0366	0.0010	–0.0018	0.0231	0.0273

Bold numbers denote statistically significant correlations.

Source: Authors' own evaluation.

Conclusions

There are scholars who find advantages from the increasing number of women in management, especially indicating the positive effects on a firm's financial performance. However, some researchers show that there is no significant relationship in this area or indicate that this relationship is negative. This study aimed to answer the question if there is a relationship between the representation of women on boards and the financial performance of companies. The investigation covered companies from the portfolios of the Warsaw Stock Exchange's WIG20, mWIG40 and sWIG80 indices.

The financial performance of public companies was measured by either individual financial ratios, observed at the end of each year, or specially constructed synthetic indicators that were multi-dimensional measures. Meanwhile, the gender structure of the supervisory and management boards of the public companies was always observed at June 30 of each year of the study, as it was assumed that the period between measurements of boardrooms structures and financial ratios should be at least six months. Accordingly, the correlation between women's share in management and the financial performance of public companies was calculated for current and one-year lagged observations.

The presented results show that in general the impact of women's representation in management on the financial performance of public companies in Poland is insignificant. This is concluded based on 459 Pearson correlation coefficients estimated for all the companies and single ratios (OPM, ROA, ROE, ROS, P/E and P/BV), as well as for synthetic measures (1) based on these variables. Only 14 coefficients (i.e., 3%) reveal that women managers' representation on boards has a positive and significant impact on firm performance. Also, Euclidean distances constructed for three selected groups of companies (banks, not-banks, and all together) using individual financial ratios relevant for these groups are only weakly correlated with the representation of women on boards. Only eight of the 189 estimated Pearson coefficients for these three groups (i.e., 4.2%) indicated an improvement in the firm's financial position because of women's representation in management. Seven of these eight companies were banks.

However, it was shown that women's representation on the statutory bodies of companies listed on the Warsaw Stock Exchange's main market ranged from 11% to 18% in the 2010–2020 period. This share was much smaller than the "critical mass" level, which might affect our investigation. This assumption seems to be confirmed by the studied banks, where the highest percentage of women in management was observed and their positive impact on the financial results was most often stated.

We carried out our research inspired by the works of the European Parliament on equality regulations for public companies governing the composition of their statutory bodies. The research was a pilot study limited in scope to Polish companies. However, we will conduct similar research in the future to cover public companies in other European Union member states. This will create a knowledge base on the relationship between women's participation in management and standing of companies, the baseline for comparing changes that will occur in effectiveness of firms obliged to ensure gender parity from 2026.

References

Adams R. B., Ferreira D. [2009], Women in the boardroom and their impact on governance and performance, *Journal of Financial Economics*, 94 (2): 291–309, https://doi.org/10.1016/j.jfineco.2008.10.007.

Adams S. M., Gupta A., Leeth J. D. [2009], Are Female Executives Over-Represented in Precarious Leadership Positions?, *British Journal of Management*, 20 (1): 1–12, https://doi.org/10.1111/j.1467-8551.2007.00549.x.

Ahern K. R., Dittmar A. K. [2012], The Changing of the Boards: The Impact on Firm Valuation of Mandated Female Board Representation, *The Quarterly Journal of Economics*, 127 (1): 137–197, https://doi.org/10.1093/qje/qjr049.

Bear S., Rahman N., Post C. [2010], The Impact of Board Diversity and Gender Composition on Corporate Social Responsibility and Firm Reputation, *Journal of Business Ethics*, 97 (2): 207–221, https://doi.org/10.1007/s10551-010-0505-2.

Bennouri M., Chtioui T., Nagati H., Nekhili M. [2018], Female board directorship and firm performance: What really matters? *Journal of Banking & Finance*, 88: 267–291, https://doi.org/10.1016/j.jbankfin.2017.12.010.

Bertrand M., Black S. E., Jensen S., Lleras-Muney A. [2018], Breaking the Glass Ceiling? The Effect of Board Quotas on Female Labour Market Outcomes in Norway, *The Review of Economic Studies*, https://doi.org/10.1093/restud/rdy032.

Bianco M., Ciavarella A., Signoretti R. [2011], Women on Boards in Italy, *SSRN Electronic Journal*, https://doi.org/10.2139/ssrn.1945855.

Błaszczyk A. [2020], *Obecność kobiet w organach statutowych spółek publicznych w Polsce*, paper presented at the Current Economic & Social Topics 2020 Jubilee International Members' Colloquium, Łódź, Poland.

Bohdanowicz L. [2011], Zróżnicowanie organów statutowych pod względem płci a wyniki finansowe polskich spółek publicznych, *Acta Universitatis Nicolai Copernici Ekonomia*, 42 (1): 105, https://doi.org/10.12775/aunc_econ.2011.008.

Brancato C. K., Patterson D. J. [1999], *Board diversity in U.S. corporations: Best practices for broadening the profile of corporate boards*, Conference Board, New York.

Campbell K., Mínguez-Vera A. [2007], Gender Diversity in the Boardroom and Firm Financial Performance, *Journal of Business Ethics*, 83 (3): 435–451, https://doi.org/10.1007/s10551-007-9630-y.

Campbell K., Minguez-Vera A. [2009], Female board appointments and firm valuation: short and long-term effects, *Journal of Management & Governance*, 14 (1): 37–59, https://doi.org/10.1007/s10997-009-9092-y.

Carter D. A., D'Souza F., Simkins B. J., Simpson W. G. [2010], The Gender and Ethnic Diversity of US Boards and Board Committees and Firm Financial Performance, *Corporate Governance: An International Review*, 18 (5): 396–414, https://doi.org/10.1111/j.1467-8683.2010.00809.x.

Curtis M., Schmid C., Struber M. [2012], *Gender diversity and corporate performance*, Credit Suisse Research Institute, https://wappp.hks.harvard.edu/files/wappp/files/gender_diversity.pdf.

Dobbin F., Jung J. [2011], Corporate Board Gender Diversity and Stock Performance: The competence gap or institutional investor bias? *North Carolina Law Review*, 89 (3): 809–838, https://scholar.harvard.edu/files/dobbin/files/2011_nclr_dobbin_jung.pdf.

Erhardt N. L., Werbel J. D., Shrader C. B. [2003], Board of Director Diversity and Firm Financial Performance, *Corporate Governance*, 11 (2): 102–111, https://doi.org/10.1111/1467-8683.00011.

Eulerich M., Velte P., Uum C. van [2014], The impact of management board diversity on corporate performance – an empirical analysis for the German two-tier system, *Problems and Perspectives in Management*, 12 (1).

Farrell K. A., Hersch P. L. [2005], Additions to corporate boards: the effect of gender, *Journal of Corporate Finance*, 11 (1–2): 85–106, https://doi.org/10.1016/j.jcorpfin.2003.12.001.

Herrera-Cano C., Gonzalez-Perez M. A. [2019], Representation of Women on Corporate Boards of Directors and Firm Financial Performance, *Advanced Series in Management*, 37–60, https://doi.org/10.1108/s1877-636120190000022003.

Hewitt L. M. M. [2019], Women and Peacebuilding, in: Zyl E. van, Campbell A. (eds.), *Leadership Self-Transformation to Peace*, KR Publishing.

Ionascu M., Ionascu I., Sacarin M., Minu M. [2018], Women on Boards and Financial Performance: Evidence from a European Emerging Market, *Sustainability*, 10 (5): 1644, https://doi.org/10.3390/su10051644.

Jyothi P., Mangalagiri J. [2019], Would Firm Performance Be Better with Women Directors? Evidence from India, *Vision: The Journal of Business Perspective*, 23 (2): 180–188, https://doi.org/10.1177/0972262919840217.

Khan A.W., Abdul Subhan Q. [2019], Impact of board diversity and audit on firm performance, *Cogent Business & Management*, 6 (1): 1611719, https://doi.org/10.1080/23311975.2019.1611719.

Kolano Ł., Wiśniewski T. [2020], *Coraz więcej kobiet we władzach spółek z warszawskiej giełdy*, https://www.parkiet.com/Firmy/303089999-Coraz-wiecej-kobiet-we-wladzach-spolek-z-warszawskiej-gieldy.html (accessed on 13.06.2021).

Kompa K. [2018], Parytet płci w kierownictwie spółek giełdowych a zmiany w sytuacji finansowej firm w latach 2010–2013, *Przedsiębiorczość i Zarządzanie*, 19 (3/II): 135–150.

Kompa K. [2019], Zmiany w kierownictwie spółek giełdowych a zmiany ich sytuacji finansowej, in: Śliwiński A. (ed.), *Zarządzanie w warunkach ryzyka*: 187–206, Oficyna Wydawnicza SGH, Warszawa.

Kompa K., Witkowska D. [2017], Czy obecność kobiet w kierownictwie wpływa na rentowność kapitału własnego spółek notowanych na GPW? *Zarządzanie i Finanse/ Journal of Management and Finance*, 15 (3): 5–20, https://wzr.ug.edu.pl/.zif/5_1.pdf.

Kompa K., Witkowska D. [2018], Gender Diversity in the Boardrooms of Public Companies in Poland: Changes and Implications, *Montenegrin Journal of Economics*, 14 (1): 79–92, https://doi.org/10.14254/1800-5845/2018.14-1.6.

Kompa K., Witkowska D. [2023], Impact of women's representation in top management on performance of WSE-listed companies, in: Dietl M., Zarzecki D. (eds.), *Understanding the Polish capital market: from emerging to developed*: 280–298, Routlege, https://doi.org/10.4324/9781003298069.

Kwakye M., Owiredu A. [2019], The effect of board gender diversity on the financial performance of banks in Ghana, *IMPACT: International Journal of Research in Business Management*, 7 (9): 1–10, http://www.impactjournals.us/download/archives/03–10–2019–1570082031-6-IMPACT%20:%20IJRBM-1.%20IJRBM-%20The%20Effect%20of%20Board%20Gender%20Diversity%20on%20the%20Financial%20Performance%20of%20Banks%20in%20Ghana.pdf.

Lee P.M., James E.H. [2007], She'-e-os: gender effects and investor reactions to the announcements of top executive appointments, *Strategic Management Journal*, 28 (3): 227–241, https://doi.org/10.1002/smj.575.

Lenard M J., Yu B., York E.A., Wu S. [2014], Impact of board gender diversity on firm risk, *Managerial Finance*, 40 (8): 787– 803, https://doi.org/10.1108/mf-06-2013-0164.

Łuniewska M., Tarczyński W. [2006], *Metody wielowymiarowej analizy porównawczej na rynku kapitałowym*, Wydawnictwo Naukowe PWN, Warszawa.

Marinova J., Plantenga J., Remery C. [2015], Gender diversity and firm performance: Evidence from Dutch and Danish boardrooms, *The International Journal of Human Resource Management*, 27 (15): 1777–1790, https://doi.org/10.1080/09585192.2015.1079229.

Nermend K. [2009], *Vector calculus in regional development analysis: Comparative regional analysis using the example of Poland (Contributions to Economics)* (2009th ed.), Physica-Verlag a Springer Company.

Rogalska T., Wiśniewski T. [2021], Udział kobiet we władzach spółek giełdowych na stabilnym poziomie, *Parkiet*, https://www.parkiet.com/Ludzie-rynku/303079994-Udzial-kobiet-we-wladzach-spolek-gieldowych-na-stabilnym-poziomie.html (accessed on 13.06.2021).

Rose C. [2007], Does female board representation influence firm performance? The Danish evidence, *Corporate Governance: An International Review*, 15 (2): 404–413, https://doi.org/10.1111/j.1467-8683.2007.00570.x.

Sekeroglu G., Acar M. [2019], The effect of female board members on firm performance: The case of Turkey, in: Zortuk M., Bayrak Gezdim S., Burhan H.A. (eds.), *4th International Conference on Economics Business Management and Social Sciences. Book of conference proceedings and abstracts*: 22–31, Academia Press Center.

Shabbir M.S. [2018], Women on Corporate Boards and Firm Performance, Preliminary Results from Italian Listed Companies after the Introduction of Gender Quota Law 120/2011, *Journal of Business & Financial Affairs*, 7 (01), https://doi.org/10.4172/2167-0234.1000316.

Smith N., Smith V., Verner M. [2006], Do women in top management affect firm performance? A panel study of 2,500 Danish firms, *International Journal of Productivity and Performance Management*, 55 (7): 569–593, https://doi.org/10.1108/17410400610702160.

Terjesen S., Couto E.B., Francisco P.M. [2015], Does the presence of independent and female directors impact firm performance? A multi-country study of board diversity, *Journal of Management & Governance*, 20 (3): 447–483, https://doi.org/10.1007/s10997-014-9307-8.

Torchia M., Calabrò A., Huse M., Brogi M. [2010], Critical mass theory and women directors' contribution to board strategic tasks, *Corporate Board Role Duties and Composition*, 6 (3): 42–51, https://doi.org/10.22495/cbv6i3art4.

Wang Y., Clift B. [2009], Is there a "business case" for board diversity?, *Pacific Accounting Review*, 21 (2): 88–103, https://doi.org/10.1108/01140580911002044.

Wellalage N.H., Locke S. [2012], Women on board, firm financial performance and agency costs, *Asian Journal of Business Ethics*, 2 (2): 113–127, https://doi.org/10.1007/s13520-012-0020-x.

Wiley C., Monllor-Tormos M. [2018], Board Gender Diversity in the STEM&F Sectors: The Critical Mass Required to Drive Firm Performance, *Journal of Leadership & Organizational Studies*, 25 (3): 290–308, https://doi.org/10.1177/1548051817750535.

Witkowska D. [2020], Does gender diversity within corporate management improve financial performance of companies listed on Warsaw Stock Exchange, in: Misiak-Kwit S., Kiausiene I. (eds.), *Sustaiability-Equality-Women*: 73–98, Volumina.

Witkowska D., Kompa K., Wiśniewski T. [2017], Kobiety na rynku kapitałowym, *Parkiet*, https://www.parkiet.com (accessed on 13.06.2021).

Witkowska D., Kompa K., Wiśniewski T. [2018], Kobiety w spółkach giełdowych, *Parkiet*, https://www.parkiet.com/Analizy/303089942-Kobiety-w-spolkach-gieldowych.html (accessed on 13.06.2021).

Witkowska D., Kompa K., Wiśniewski T. [2019], Różnorodność władz spółek giełdowych, *Parkiet*, https://www.parkiet.com/Ludzie-rynku/303089984-Roznorodnosc-wladz-spolek-gieldowych.html (accessed on 13.06.2021).