

Modelling of Dividend Payout Policy for Polish Public Companies

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ARTICLE INFO	ABSTRACT
Article History Received 5 July 2024 Accepted 25 July 2024 <i>JEL Classifications</i> G35, C23, D04 Keywords: Polish energy sector, Energy companies, Financial performance, Dividend policy, the Warsaw Stock Exchange	Purpose: The purpose of this research is to identify drivers of dividend payouts in energy companies listed on the Warsaw Stock Exchange (WSE) in the pre-COVID-19 pandemic decade, taking into account potential determinants such as general economic situation, company's financial efficiency, value of assets, lagged dividend payout, earnings, ownership of the company – main shareholders and structure of statutory bodies including women presence. Design/methodology/approach: Correlation analysis and pooled regression models to determine the potential determinants of payouts are used. Firms' financial performance is reflected by selected individual financial ratios and a specially constructed vector synthetic measure VSMD. Findings: Findings reveal that dividend payouts of energy companies in Poland are irregular. Dividend payments significantly depend on firms' financial efficiency, the size of their assets, lagged dividend payouts and ownership model, while the gender structure of statutory bodies has no impact on dividend payouts. The dividend payment decisions are implied by the current economic situation. Research limitations/implications: Limitations arise from the longitudinal sample design and data selection. Only Poland is considering with rather small WSE market, and the study concerns 9 companies described by 14 financial ratios (already selected) and set of variables for each year in 10 years timespan. Our VSMD measure needs pattern and anti-pattern which requires data from the entire market to be determined. Thus, the list of diagnostic variables cannot be simply copied for different "national" markets. Originality/value: This study contributes to research on the determinants of dividend policy. It introduces to the investigation the author's synthetic measure of firm financial efficiency. Explains dividend payments in Polish energy companies in the period 2010–2019 proposes a consistent baseline for research after the pandemic and after the war in Ukraine.

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1. Introduction

Dividend policy determines the structure of dividend distribution to its shareholders. It is a financial decision that involves deciding on the dividend payout ratio and the frequency of dividends payments. However, the basic question is if the dividend is to be paid at all or not. The crucial factor of dividend payout is earnings - profit made by the corporation. There are many factors influencing the dividend policy which provide to decide what part of the profit is paid its shareholders and which part is used for the capital-appreciating project of the corporation. Generally, the four most common types of dividend policy are distinguished (1) regular, (2) stable, (3) irregular and (4) no dividend policy. Our study concerns the Polish market, since Poland is the largest economically stable country in Central and Eastern Europe and an outstanding example of successful political and economic transformation. However, the Warsaw Stock Exchange (WSE), after transformation from centrally planned to market economy, has been operating for 30 years only and Polish public companies do not pay dividend often. In fact, only from 124 to 179 public companies paid dividend in the years 2013–2020 (Bogołębska, 2023), which made only from 28% to 36% of companies listed on WSE.

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There is also no regularity in dividend payment, and it seems that companies with the State Treasury as the major investor pay dividends more often than others, and energy companies belong to that group.

In our research we deal with the energy sector because this sector and its transformation are crucial to the widely understood world's development. This is since, from the very beginning, energy has critically implied economic and social development, technological and scientific progress as well as the well-being of the environment and societies. Making energy policy is one of the fundamental pillars of a state's functioning, and energy security – the cornerstone of this policy and even a strategic issue (Balcerzak & Pietrzak, 2017).

For years, the whole world, including EU countries, has been observing a dramatic increase in demand for energy (with a simultaneous lack of rationalization and economization of its use), causing the crucial dependence on energy imports and as well as insufficient diversification of directions, energy types, supplies, and sources. It is also experiencing the growing inequalities or even restrictions in access to energy, volatile and rising (often monopolistically or politically enforced) prices that threaten the security of countries and their socio-economic stability, dramatic climate change and increasing, uncontrolled environmental impacts, among others (European Parliament, 2023). These factors, their evolutionary trends and dynamics are, in the context of the role and importance of energetics, so alarming that they mobilize global bodies, regional alliances and individual states for urgent remedial policy responses, and science and economic practice for in-depth research and analysis.

The purpose of our investigation is to identify factors influencing dividend payouts observed in energy companies listed on the Warsaw Stock Exchange in the pre-COVID-19 pandemic decade, i.e., in years 2010-2019. Analysis of dividend policy will be provided taking into account general economic situation, financial efficiency of the company, value of assets, lagged dividend payouts, earnings, ownership of the company – main shareholders and structure of statutory bodies including women presence. Financial efficiency is considered in terms of selected single financial ratios and in terms of a purpose-built synthetic measure (Kompa & Witkowska, 2022). The last mentioned is the vector synthetic measure which is constructed applying the set of selected financial ratios.

We limit the timeframe of our research only to the period of economic stability before the pandemic, as we believe that the lockdown in 2020, together with the Russian attack on Ukraine in 2022, dramatically changed the situation for energy companies in Poland. Therefore, our research will provide a good baseline for future studies on the impact of the pandemic and war on the energy sector. The research is provided for 9 companies from generally defined energy sector, which have been continuously listed on the Warsaw Stock Exchange in years 2010-2019.

The paper is presented as follows. After a short introduction, the second section contains a literature review, whereas the third section is dedicated to the methodology and data description, and the fourth section discusses the results of the empirical analysis. Whereas the final section concludes.

2. Review of Literature

Dividend is a part of corporation's profit given to its shareholders. A company decides about the payment of dividends considering various factors. The decision about dividend payout generally depends on (Brigham, 1999, t. 2. p. 221) investment abilities of the firm, capital sources available for the corporation and shareholders' preferences concerning the relations between current and future earnings. In more detailed discussions (DeAngelo, 2006; Renneboog & Trojanowski, 2007; Denis & Osobov, 2008; von Eije & Megginson, 2008; Farre-Mensa, et al., 2014; Kaźmierska-Jóźwiak, 2015; Bogołębska, 2019; Kowerski, 2022) one may find such determinants as: the economic cycles since it is necessary to create a reserve for facing a crisis, government policy including existing taxation system, life cycle of the sector (industry) where the corporation operates (especially the age of the corporation) and the trends of profits, together with the corporation's need for additional capital and cash balance.

Dividend policy has been investigated by financial economics since 50-ties of previous century what caused the development of several theories which explain different dividend policies created by firms' managers and the responses – behaviour of investors. Among them theories that are mentioned in literature the most often are: dividend irrelevance theory, dividend bird in hand theory, tax preference theory, dividend signalling theory, and dividend clientele hypothesis. In fact, majority of these theories have their background in early research conducted by Miller and Modigliani.

Miller & Modigliani (1961) formulated dividend irrelevance theory, according to which dividend policy is insufficient and it affects neither the stock value nor the cost of capital. In other words, investors are interested in total return from investment, and they do not pay attention whether they receive dividends or capital gains. Gordon (1963) and Lintner (1962) argued that the value of the corporation increases with the increase of the payout ratio. It is, so called, dividend bird in hand theory. The tax preference theory of dividends developed by Litzenberger and Ramaswamy (1979; 1983), states that some shareholders prefer long-term capital gains to current dividend yield. Such investors willing to pay more for the stock of a corporation which uses its earnings for the further development instead of paying dividends.

Another theory is the dividend signalling according to which managers inform about present financial situation and about future perspectives by the dividend payouts. Therefore, they may change investors' expectations concerning profits in following periods. In other words, an announcement of a dividend increase suggests positive future prospects and a corporate's dividend payout rise may predict favourable performance of the company's stock in the future. The first research concerning the signalling effect, assuming asymmetry of information, were conducted by Bhattacharya (1979) and Miller & Rock (1985). Research conducted for companies listed on the Warsaw Stock Exchange shows that signaling theory in dividend policy is not applicable. Kaźmierska-Jóźwiak (2017) and Bogołębska (2022) state no relationships between the dividend paid and the companies' earnings in following year, also Żyła (2018) claims that there is no relationship between dividend payout and share prices.

Miller and Modigliani also suggested the existence of so-called clientele effect. Due to this theory, changes in a dividend policy cause a loss of some clientele who will sell their stock and attract new clientele who will buy stock based on dividend preferences. Elton and Gruber (1970) tested clientele effect in the U.S. market as the first. Procianny & Verdi (2009) tested clientele effect in the Brazilian market, and they conclude that their “*findings are inconsistent with the clientele hypothesis but provide support for the signalling hypothesis*”. Kawano (2014) explains that companies with high (low) dividend-payout ratios attract investors with low (high) marginal tax rates and presents empirical research which strongly support the dividend clientele hypothesis.

There are numerous studies which search the dividend determinants (Alli et al., 1993; Ho, 2003; DeAngelo, DeAngelo & Stulz, 2006; Renneboog, & Trojanowski, 2007; Denis & Osobov, 2008; Von Eije & Megginson, 2008; Al-Najjar & Hussainey, 2009; Chay & Suh, 2009; Gill et al., 2010; Farre-Mensa, Michaely & Schmalz, 2014; Alstadsaeter et al., 2017; Raaballe & Hedensted, 2023) among others. Kaźmierska-Jóźwiak (2015) and Franc-Dąbrowska et al. (2020), discussing the literature concerning examples of research, distinguish several factors influencing dividend policy: current and future earnings, profitability, free cash flow, growth opportunities, size of firm, level of financial leverage and liquidity, institutional ownership, business risk and asset structure. From the other hand, researchers recognize the conflict between managers and shareholders therefore for dividend description they use such data as the Governance Index, variables describing ownership and the structure of managerial bodies (Jiraporn & Ning, 2006; Kowalewski et al., 2007; Ngo et al., 2020; Jabbouri, 2016; Pucheta-Martínez & Bel-Oms, 2016; Gyapong et al., 2021). Others connect dividend policy with political uncertainty (Farooq & Neveen, 2019; Tran, 2020).

To sum up one should notice that investigations concerning dividend determinants have been provided applying different methods including econometric models (e.g., logit models, panel or pooled regression) employing a variety of explanatory or control variables such as:

- natural logarithm of total assets, natural logarithm of capitalization to measure a size of a company,
- the return on assets (ROA) and return on equity (ROE) ratios, maturity measured by the ratio of retained earnings to total assets and equity to assess profitability,
- standard deviation of the equity returns in the years preceding the decision to pay out as a risk measure,
- Tobin's q ratio to measure investment opportunities,
- GDP growth rate, stock market capitalization as macroeconomic determinants
- variables representing ownership and the structure of managerial bodies.

Presented literature review shows the research gap concerning dividend policy provided by Polish energy companies in the longer period. Especially, taking into account that energy sector is crucial and strategic for the whole economy, it is necessary to identify the relationship between dividend payouts and companies' efficiency considered in multidimensional space.

3. Methodology

Presented study is based on the following concept.

- Let be given a set of energy companies listed on the Warsaw Stock Exchange continuously during the pre-COVID-19 pandemic decade.
- Let each company be described yearly by a set of financial ratios traditionally used for corporate financial analysis, as well as by additional arbitrarily selected explanatory variables, which will be treated as determinants of dividend payouts.
- The study consists of econometric modelling of the relationship of dividend payouts to different sets of determinants of dividend payment policy.

3.1 The Data

The empirical research concerns 9 companies (Table 1) which are classified to the generally defined energy sector. These companies on December 30, 2019, belonged to the main stock index portfolios¹: WIG20, WIG30, mWIG40 or sWIG80 and were continuously listed on the Warsaw Stock Exchange throughout the years 2010-2019. An additional condition to select the companies to the sample was availability of necessary information. According to the classification of companies made by the Warsaw Stock Exchange these companies represent different sizes and sub-sectors that is represented by the belongingness to the certain WSE indexes.

In addition, Table 1 contains numbers of shares and share prices at the end of 2019 together with the increase rates calculated in comparison to the first year of analysis. One may notice that during the decade under investigation, three companies essentially changed number of shares – Grupa Lotos and Polenergia increased number of shares by 42% and 131% respectively whereas Tauron's number of shares decreased by 44%. Share prices in 2019 essentially increased for all oil & gas companies from 21% to 129%, whereas they decreased for all other companies from 20% to 75% in comparison to the prices observed in the first year of study. One may also notice that in analyzed companies both number of shares and share prices are diversified. The values of the latter give some idea about dividend payouts expected by investors. It is also worth mentioning that all considered companies (except Polenergia) are either State Treasury companies i.e., State treasury is the biggest investor or are subsidiaries from State Treasury companies (such as Enea and PGE in Table 1).

¹ These stock indexes characterize the different sizes and liquidity of stocks listed on the Warsaw Stock Exchange - index WIG20 is created by 20 major and most liquid companies, portfolio of WIG30 contains all companies belonging to WIG 20 and 10 additional companies, mWIG40 contains 40 medium size companies, and sWIG80 – 80 smaller companies.

Table 1. Basic characteristics of analysed energy companies and changes at the end of 2019 in comparison to 2010.

Companies	WIG	No. of shares		Price [PLN]		Sector	1 st shareholder	
							State	other than State
Bogdanka	mWIG40	34 014	(0.0)	34.85	(-68.3)	mining		Enea 64.9%
Enea	WIG30	441 443	(0.0)	7.92	(-66.6)	energy	51.50%	
Grupa Lotos	WIG20	184 873	(42.3)	83.58	(129.0)	oil & gas	53.19%	
Kogeneracja	sWIG80	14 900	(0.0)	34.40	(-68.7)	energy		PGE 58.1%
Orlen	WIG20	427 709	(0.0)	85.82	(87.4)	oil & gas	27.52%	
PGE	WIG20	1 869 761	(2.5)	7.96	(-65.7)	energy	59.39%	
PGNiG	WIG20	5 778 315	(-2.1)	4.33	(21.3)	oil & gas	71.88%	
Polenergia	sWIG80	45 444	(131.4)	26.90	(-19.7)	energy		Kulczyk 42.8%
Tauron	WIG20	1 752 549	(-44.4)	1.64	(-75.0)	energy	36.06%	

Note: To recognize all companies shorten names are used. Numbers in parenthesis denote percentage change in 2019 in comparison to 2010. All presented data concerns the end of 2019. State means State Treasury; WIG means WIG index; PLN – see footnote 3.

Source: own elaboration

Due to information presented in Table 2, all selected energy companies paid dividends in the years 2010-2020, however only PGE and PGNiG² paid them regularly every year. Whereas Grupa Lotos and Polenergia did not pay dividends in 6 years and Tauron in 5 years (among 10 years of analysis). Dividend was paid by all, but one companies in years 2012 and 2013, whereas 5 (among 9) companies did not pay dividend in 2020. One may also notice that dividend payouts (especially in 2020) were rather symbolic, because in 65 cases (among 90) the value of dividend per share was smaller than 1 PLN³, and the biggest one was 6.62 PLN.

Table 2. Value of dividend payouts by share for selected companies [PLN]

Company	Dividend payouts per share [PLN] in years:									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bogdanka	1.40	4.00	5.06	5.81	3.50	0.00	1.01	0.00	0.75	0.00
Enea	0.44	0.48	0.36	0.57	0.47	0.00	0.28	0.00	0.02	0.00
Grupa Lotos	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	3.00	1.00
Kogeneracja	3.56	4.47	0.06	0.19	0.11	6.34	6.62	2.73	0.00	0.00
Orlen	0.00	0.04	1.50	1.44	1.65	2.13	3.24	3.00	3.50	1.00
PGE	0.77	1.92	0.88	1.13	0.80	0.26	0.00	0.02	0.00	0.00
PGNiG	0.11	0.00	0.13	0.15	0.20	0.18	0.20	0.07	0.11	0.09
Polenergia	0.01	0.01	0.01	0.00	0.00	0.50	0.00	0.00	0.00	0.00
Tauron	0.08	0.31	0.20	0.19	0.15	0.00	0.00	0.00	0.00	0.00
Average	0.71	1.25	0.91	1.05	0.76	1.05	1.37	0.76	0.82	0.23

Note: in 2012, PGNiG paid dividend in amount 1000 PLN total what gives 0.0006 PLN per share. PLN – see footnote 3.

Source: Own elaboration on the basis of EMIS data

3.2 The Methodology

Here a question arises what the determinants of the dividend payment are. Therefore, we study the relationships between dividend payout values and a list of potential determinants such as: the financial efficiency, total assets, the ownership of the companies by the State Treasury, presence of women in statutory bodies, differences among companies in terms of sub-sectors defined by stock indexes, and general economic situation.

3.2.1 Vector Synthetic Measure of Firms' Efficiency

Firm efficiency is a complex issue which may be measured using different ratios or indicators. However, it is usually represented by a single financial ratio e.g., ROE, ROA or by a descriptive assessment. In this research we measure firm efficiency by specially constructed⁴ financial efficiency measure VSMD, which is a vector synthetic measure of development, and represents the complex assessment of the financial standing of the companies (Kompa & Witkowska, 2022). This measure was calculated on the basis of data from companies continuously quoted on the

² Value of dividend per share calculated for PGNiG in 2012 equals 0.0006.

³ PLN is a symbol of Polish currency. For general orientation, 1 PLN is about 0.21-0.22 Euro.

⁴ The detailed description of the measure construction is discussed in (Kompa & Witkowska, 2022) see also (Nermend, 2009).

Warsaw Stock Exchange in the years 2010-2019, applying 14 financial ratios which have been often used to assess the financial situation of firms. The following ratios were employed for the measure construction: current and quick ratios, returns on assets (ROA), equity (ROE) and sales (ROS), operating profit margin, asset turnover ratio, earnings yield (P/E), book to market ratio (P/BV) and EBITDA per assets which have positive impact on the financial standing of the company together with debt ratio, days inventory, sales and payable outstanding which have negative impact. The financial efficiency of firm $VSMD_{it}$ was calculated for each company ($i=1, 2, \dots, 9$) and every year of investigation ($t=2010, 2011, \dots, 2019$).

Table 3. Pearson linear correlation coefficients evaluated for financial dividend payouts in relation to other characteristics of companies

Companies	VSMD		EBIDTA		Dividend	
	to dividend payout				to cash flow per share	to earning per share
	total	per share	total	per share		
Bogdanka	0.0735	0.0735	0.1072	0.1072	-0.1199	0.1882
Enea	0.9028	0.9028	0.6011	0.6043	-0.3285	0.1120
Grupa Lotos	0.8138	0.8138	0.6113	0.4730	0.3163	0.5095
Kogeneracja	0.3559	0.3559	0.3069	0.5188	0.4751	0.5424
Orlen	0.4704	0.4704	0.4054	0.3510	-0.1322	0.4543
PGE	0.8965	0.8965	-0.3559	-0.3334	0.3431	0.4958
PGNiG	-0.2973	-0.2897	0.2852	0.2808	0.3093	0.0657
Polenergia	0.0598	0.0615	-0.1162	-0.1104	-0.4762	-0.0937
Tauron	0.8194	0.7148	0.2225	0.2602	-0.0841	0.6602

Note: Bold numbers denote that hypothesis about insignificant correlation may be rejected for the significance level 0.05.

Source: Own calculation

As it was mentioned above, there are some factors influencing dividend policy such as earnings and cash flow or financial standing. Therefore, it is interesting if there is any relationship between these indicators and dividend payouts. Values of Pearson correlation coefficients presenting in Table 3 show that there are not many significant relationships for dividend payouts and EBIDTA, VSMD and other selected characteristics of the considered companies' financial standing. Similar situation appears when instead of dividend's total values, these values divided by assets is taken into account. In fact, significant correlation is observed between dividend and VSMD the most often, then for EBIDTA and dividend. Dividend is not correlated with selected indicators for majority of companies.

Table 4. Pearson linear correlation coefficients evaluated for financial efficiency measure VSMD in relation to other characteristics of companies

Companies	VSMD to:								
	EBIDTA		CFPS	EPS	ROA	Debt Ratio	P/E	ROE	Current Ratio
	total	per share							
Bogdanka	0.8160	0.8875	-0.2071	0.9049	0.9094	-0.6802	0.2058	0.8899	-0.1394
Enea	0.5760	0.7174	-0.3801	0.1343	0.3645	-0.9854	0.6919	0.2129	0.4138
Grupa Lotos	0.8382	0.8173	0.3878	0.8056	0.8737	-0.8599	0.3306	0.7950	0.4660
Kogeneracja	0.5392	0.7430	0.3612	0.2885	0.0538	-0.9265	-0.4277	-0.0905	0.7884
Orlen	0.9258	0.8567	-0.0544	0.9833	0.9589	-0.8338	0.1240	0.9396	0.3388
PGE	-0.2640	0.1733	0.3240	0.6661	0.7496	-0.9582	0.5964	0.7119	0.5784
PGNiG	0.0743	0.2431	-0.0373	0.5886	0.6855	-0.9307	-0.4646	0.4982	0.1580
Polenergia	0.4679	0.5221	0.3362	0.0320	0.1669	-0.6655	-0.6655	0.1369	0.1669
Tauron	0.1552	0.2129	-0.2152	0.6112	0.6479	-0.9600	0.6977	0.6422	0.6694

Note: Bold denote that hypothesis about insignificant correlation may be rejected for $\alpha=0.05$; CFPS means cash flow per share, EPS means earning per share,

Source: Own calculation

To show how and to what extent synthetic measure transforms information from single ratios used for its construction and how it relates to some other characteristics of companies Pearson correlation coefficients were calculated (Table 4). Cash flow is not significantly correlated with dividend and VSMD for all companies. Whereas debt ratio shows significantly negative correlation with VSMD for all companies. Also, ROA and ROE significantly and positively influence the value of VSMD for the majority of companies while P/E and current ratio – only for two of them.

3.2.2 Pooled Regression Analysis

Identification of factors influencing value of dividend payouts is provided using pooled regression models:

$$y_{it+1} = \alpha_0 + \sum_{k=1}^K \alpha_k x_{it}^k \quad (1)$$

where for $i=1,2,\dots,9$; $t=2010,\dots,2019$, dependent variable y_{it+1} is represented by the value of total dividend denoted as DT , the share of dividend in total assets - DA or dividend per share - DS , paid in the year $(t+1)$. In other words, we consider dependent variable (represented by variously measured dividend paid) in a year after the measurements of explanatory variables, i.e., dividend is paid in years 2011-2020 from earnings obtained from previous year(s). The set of $k=1, 2, \dots, K$ explanatory and control variables x_{it}^k , which appear in different variants of the model, includes:

- $Ln(assets)$ – natural logarithm of total assets,
- $Year2020$ – the binary variable equals 1 for 2020, to check if uncertainty in 2020 influence decisions about dividend payouts,
- $GDP(t)$ and $GDP(t+1)$ – GDP growth rate which describe the general economic situation and may influence a decision about dividend payout,
- PIS the binary variable equals 1 for years 2016-2019 when economic policy was changed in comparison to the previous years after the party PiS came to power,
- $Dividend(t-1)$ – value of dividend payout in the previous year,
- $Treasury$ and $Treasury^*$ – variables describing the ownership of the company; $Treasury$ – a binary variable equals 1 for companies owned by State Treasury and equals 0 otherwise (i.e., for Bogdanka, Polenergia and Kogeneracja), and $Treasury^*$ equals 1 for State Treasury companies, equals 0.5 for Bogdanka and Kogeneracja, which capital partly belongs to the State Treasury companies, and 0 for Polenergia,
- $Sector F$ and $Sector E$ variables describing the belongingness to the subsectors oil and gas and energy, respectively,
- $Share E$ – share of women in the executive board,
- $Share S$ – share of women in the supervisory board
- $Size E$ – number of members of the executive board,
- $Size S$ – number of members of the supervisory board,
- $Chair S$ – binary variable equals one for chairwomen in the supervisory board,
- $Share E+S$ – share of women in both statutory bodies,
- $Size E+S$ – number of members in both statutory bodies,
- $Chair S$ – binary variable equals one for chairwomen one of both statutory bodies,
- $ROA, ROE, Debt$ – values of financial ratios: ROA, ROE and debt ratio,
- $VSMMD$ – the vector financial measure of company's efficiency.

4. Empirical results

Numerous pooled regression models⁵ describing dividends were estimated applying OLS method. Tables 5-11 contain representative results in the form of parameter estimates, t-Student statistics and adjusted determination coefficients R^2 . Information about the dependent variable is presented in the heads of tables. Symbols ***, ** and * denotes significance of the variable at significance level $\alpha=0.01, 0.05$ and 0.01 , respectively. Adjusted R^2 let us evaluate the accuracy of the model regardless number of explanatory variables, i.e., degrees of freedom. Values of constant coefficient are omitted in majority of models, because it has no economic interpretation, and its values were extremely high for total dividend paid.

⁵ As it is visible in in Tables 2-3 dividend payouts equal zero in many cases, therefore we cannot consider logarithm of dividends.

Table 5. Models' DT1–DT4 parameter estimates: total dividend

Variables	Models							
	DT1		DT2		DT3		DT4	
	α_k	t-stat	α_k	t-stat	α_k	t-stat	α_k	t-stat
$GDP(t+1)$							7933.34	0.39
$GDP(t)$							-10566.33	-0.32
<i>Chair S</i>			142410.69	0.85			241052.41	1.56 *
<i>Share S</i>			-254766.89	-0.79	-136881.91	-0.47	-84378.81	-0.26
<i>Size S</i>			18429.82	0.56	16040.20	0.49	40294.72	1.30 *
<i>Share E</i>	450018.11	1.07					370029.76	0.82
<i>Size E</i>	-84173.16	-1.30					-83766.23	-1.31 *
<i>VSMD</i>	395836.18	3.24 ***	227786.74	1.64 *	296669.30	2.62 ***	495906.92	6.28 ***
$Ln(assets)$	564098.99	2.42 ***	447554.48	1.77 **	493141.38	2.00 **	297258.39	2.57 ***
<i>Sector F</i>	261275.64	1.25	159594.13	0.64	241082.56	1.06	368577.13	2.90 ***
<i>Sector E</i>	-489033.81	-1.32	-102038.15	-0.24	-281210.24	-0.74		
<i>Treasury</i>	459203.83	5.76 ***	467520.25	5.83 ***	457047.48	5.77 ***	-207735.34	-0.68
<i>PLS</i>							-257480.39	-2.31 **
<i>const.</i>	Yes	-3.55 ***	Yes	-1.99 **	Yes	-3.07 ***	Yes	-2.94 ***
Adjusted R ²	0.4206		0.4037		0.4057		0.4510	

Note: Symbols ***, ** and * denotes significance of the variable at significance level $\alpha=0.01$, 0.05 and 0.01, respectively.
Source: Own calculation

Tables 5–9 contains results obtained for total dividend payouts. It is visible that significantly positive impact on total dividend is observed for dividend lagged by a year, synthetic efficiency measure VSMD and value of assets in all models where they appear except VSMD in the model DT2 (among models DT1–DT15 presented in Tables 5–8), and logarithm of assets in the models DT8, DT13 and DT16. It means that the value of dividend payments essentially depends on these three factors.

Table 6. Models' DT5–DT8 parameter estimates: total dividend

Variables	Models							
	DT5		DT6		DT7		DT8	
	α_k	t-stat	α_k	t-stat	α_k	t-stat	α_k	t-stat
$GDP(t+1)$	5604.09	0.28			-57175.51	-1.81 **	10348.49	0.58
$GDP(t)$	-9747.12	-0.29			-27752.71	-0.90	-23183.86	-0.88
<i>Chair S</i>	272355.98	1.86 **			216002.36	1.41 *	34803.72	0.26
<i>Share S</i>	-152792.00	-0.51			-189878.54	-0.37	-143784.70	-0.52
<i>Size S</i>	37706.84	1.23			12230.83	0.45	22088.13	0.81
<i>Share E</i>	294122.01	0.67					27130.53	0.07
<i>Size E</i>	-70315.20	-1.16					-37686.18	-0.67
<i>VSMD</i>	504645.47	6.50 ***	473533.58	6.28 ***	482041.75	6.22 ***	240258.51	2.97 ***
$Ln(assets)$	225674.81	4.56 ***	277958.43	3.16 ***	190315.96	1.84 **	115439.20	1.09
<i>Sector F</i>	361891.21	2.87 ***	253500.19	2.21 **	282816.96	2.35 **	213395.11	1.87 **
<i>Year2020</i>					-598951.46	-2.44 **		
<i>Treasury</i>			-160303.10	-0.61	56.26	0.00	-17804.81	-0.07
<i>PLS</i>	-252071.25	-2.27 **	-259116.67	-2.76 ***				
<i>Dividend(t-1)</i>							0.53	5.60 ***
<i>const.</i>	Yes	-4.97 ***	Yes	-3.60 ***	Yes	-2.13 **	Yes	-1.28
Adjusted R ²	0.4547		0.4535		0.4362		0.5971	

Note: Symbols ***, ** and * denotes significance of the variable at significance level $\alpha=0.01$, 0.05 and 0.01, respectively.
Source: Own calculation

Table 7. Models' DT9–DT12 parameter estimates: total dividend

Variables	Models											
	DT9			DT10			DT11			DT12		
	α_h	t-stat		α_h	t-stat		α_h	t-stat		α_h	t-stat	
<i>GDP(t+1)</i>	10156.78	0.58		-46936.79	-1.46	*	-48506.82	-1.52	*	-57175.32	-1.82	**
<i>GDP(t)</i>	-23027.17	-0.89		-26991.31	-0.88		-25512.70	-0.84		-27753.23	-0.91	
<i>Chair S</i>	37402.67	0.29										
<i>Chair E+S</i>				198350.66	1.30	*	228495.85	1.60	*	215992.43	1.50	*
<i>Share S</i>	-149485.04	-0.57										
<i>Size S</i>	21846.44	0.81										
<i>Share E+S</i>				-217011.08	-0.41		-304280.71	-0.60		-189847.89	-0.39	
<i>Size E+S</i>				40454.16	1.29	*	38318.52	1.24		12230.51	0.45	
<i>Share E</i>	19839.86	0.05		437103.60	0.94		397569.52	0.86				
<i>Size E</i>	-36438.18	-0.69		-121596.46	-1.69	**	-107848.45	-1.59	*			
<i>VSMD</i>	240758.85	3.01	***	485731.86	6.15	***	494026.07	6.38	***	482038.57	6.40	***
<i>Ln(assets)</i>	109131.96	2.25	**	292279.62	2.48	***	229529.98	4.57	***	190334.06	4.27	***
<i>Sector F</i>	212635.65	1.88	**	349999.49	2.79	***	342731.97	2.76	***	282816.87	2.37	***
<i>Year2020</i>				-540419.17	-2.19	**	-536987.97	-2.19	**	-598954.75	-2.47	***
<i>Treasury</i>				-179812.24	-0.59							
<i>Dividend(t-1)</i>	0.53	5.67	***									
<i>const.</i>	Yes	-2.42	***	Yes	-2.73	***	Yes	-4.66	***	Yes	-4.34	***
Adjusted R ²	0.6023			0.4446			0.4492			0.4433		

Note: Symbols ***, ** and * denotes significance of the variable at significance level $\alpha=0.01$, 0.05 and 0.01, respectively.
Source: Own calculation

Another variable which is positively significant is *Sector F*, which informs that oil & gas companies pay higher dividends than other companies (models DT4–DT15, DT19 and DT20). Variable *Treasury* informs about state control of the company and this variable is insignificant in majority of models, but it is significantly positive in the models DT1–DT3. Variable *PIS* appears in the models DT4–DT6, and it shows that total dividend payouts were significantly smaller in years 2017–2020 i.e., after the managements of State Treasury companies were changed by PiS when it became a governing party.

Table 8. Models' DT13–DT16 parameter estimates: total dividend

Variables	Models											
	DT13			DT14			DT15			DT16		
	α	t-stat		α	t-stat		α	t-stat		α	t-stat	
<i>GDP(t+1)</i>	-24524.97	-0.95		-380282.59	-1.98	**				10667.79	0.65	
<i>GDP(t)</i>	-11045.42	-0.43										
<i>VSMD</i>	235416.44	3.18	***	235094.60	3.24	***	222906.72	3.01	***			
<i>Ln(assets)</i>	111619.30	1.43	*	96626.58	2.58	***	74737.09	0.98		78323.62	2.13	**
<i>Sector F</i>	173280.57	1.77	**	171772.83	1.78	**	172202.35	1.75	**	165606.33	1.51	*
<i>Year2020</i>	-364323.76	-1.80	**	-26340.461	-1.06							
<i>Treasury</i>	-44068.12	-0.20					36894.52	0.17				
<i>Dividend(t-1)</i>	0.53	6.09	***	0.53	6.26	***	0.56	6.53	***	0.56	6.60	***
<i>ROE</i>				Yes	-2.58	***	Yes	-1.24		904358.96	2.11	**
<i>ROA</i>				0.6196			0.6177					
<i>Debt</i>										-777516.74	-2.24	**
<i>const.</i>	Yes	-1.58	*							Yes	-1.85	**
Adjusted R ²	0.6112									0.6052		

Note: Symbols ***, ** and * denotes significance of the variable at significance level $\alpha=0.01$, 0.05 and 0.01, respectively.
Source: Own calculation

Table 9. Models' DT17–DT20 parameter estimates: total dividend

Variables	Models							
	DT17		DT18		DT19		DT20	
	α_k	t-stat	α_k	t-stat	α_k	t-stat	α_k	t-stat
<i>GDP(t+1)</i>	13512.19	0.82	14559.31	0.88				
<i>Ln(assets)</i>	97596.29	2.75 ***	80535.28	2.53 ***	413061.80	3.35 ***	400327.85	3.13 ***
<i>Dividend(t-1)</i>	0.57	6.72 ***	0.60	7.73 ***				
<i>ROE</i>	-1837905.93	-1.04	-2487395.93	-1.49 *	1419776.03	2.70 ***		
<i>ROA</i>	4564091.16	1.65 *	5540466.55	2.11 **				
<i>Share E</i>					358594.81	0.84	487302.32	1.11
<i>Size E</i>					-79145.88	-1.21	-59552.92	-0.88
<i>Sector F</i>					463109.13	1.98 **	490046.10	2.02 **
<i>Sector E</i>					103014.17	0.47	55353.96	0.24
<i>Debt</i>	-341774.01	-1.09			-1842267.69	-4.67 ***	-1958286.66	-4.81 ***
<i>Treasury</i>					-588207.40	-1.58 *	-609073.68	-1.58 *
<i>const.</i>	Yes	-2.74 ***	Yes	-2.54 ***	-5361268.54	-3.00 ***	-5090878.78	-2.75 ***
Adjusted R ²	0.6073		0.6064		0.4106		0.3653	

Note: Symbols ***, ** and * denotes significance of the variable at significance level $\alpha=0.01$, 0.05 and 0.01, respectively.
Source: Own calculation

Variables *GDP(t)*, *GDP(t+1)* and *Year2020* were introduced onto the model to check if decisions about the value of dividend payout depend on the general economic situation. *GDP(t)* is not significant in any of discussed models, whereas *GDP(t+1)* is significantly negative in the models DT7, DT12 and DT14 (among 13 models where it is present). Also, variable *Year2020* shows that situation observed in 2020 prompted managers to decide against dividend payment in this particular year (this variable is significant in 4 models among 5 in which it exists).

All variables describing size and structure of statutory bodies are insignificant in all models with exception of the model DT5 which shows that if there is a chairwoman in the supervisory board of the company the dividend is higher than if the chair is man and the model DT10, which states that increase of number executory board members decreases the value of the dividend payout.

Table 10. Models' DS1–DS6 parameter estimates: dividend per share

Variables	Models											
	DS1		DS2		DS3		DS4		DS5		DS6	
	α_k	t-stat	α_k	t-stat	α_k	t-stat	α_k	t-stat	α_k	t-stat	α_k	t-stat
<i>GDP(t+1)</i>	0.018	0.27					0.054	0.79				
<i>GDP(t)</i>	-0.028	-0.29					-0.082	-0.81 ***				
<i>Chair S</i>	1.531	2.86					0.190	0.36				
<i>Share S</i>	-1.212	-1.16					0.316	0.29				
<i>Size E+S</i>	0.154	1.43 *			0.188	2.20 **	0.078	0.73				
<i>Share E</i>	0.813	0.53					-0.903	-0.58 *				
<i>Size E</i>	0.212	1.02					0.274	1.25 ***				
<i>VSMMD</i>	0.523	2.05 **	0.487	1.91 **	0.311	1.24	0.133	0.42	0.643	2.56 ***	0.153	0.53
<i>Ln(assets)</i>	-1.329	-3.57 ***	-0.629	-2.13 **			0.308	0.75	0.327	1.75 **	0.613	2.05 **
<i>Sector F</i>	-0.691	-1.13	-0.759	-1.25	0.559	1.46 *	0.362	0.82	0.256	0.39	0.513	1.33 *
<i>Sector E</i>	-1.632	-2.91 ***	-1.367	-2.68 ***	-0.841	-1.68 **			-0.608	-1.15		
<i>Treasury</i>					-1.299	-3.35 ***	-2.548	-2.48 **			-2.970	-3.44 ***
<i>Treasury*</i>	4.076	2.89 ***	2.207	1.84 **					-0.034	-3.33 ***		
<i>Dividend(t-1)</i>							0.000	1.01			0.000	0.99
<i>const.</i>	17.698	3.56 ***	9.886	2.50 **	-0.919	-0.89	-4.504	-0.77	-3.679	-1.23	-7.501	-1.72 **
Adj. R ²	0.189		0.117		0.146		0.153		0.189		0.175	

Note: Symbols ***, ** and * denotes significance of the variable at significance level $\alpha=0.01$, 0.05 and 0.01, respectively.
Source: Own calculation

In the models DT16–DT20 (Tables 8, 9), financial efficiency of companies is measured by single ratios ROA, ROE and debt ratio. Models DT16, DT18–DT20 shows that these variables are significant with the right sign of the parameters whereas in DT17 all these variables are insignificant.

Checking the level of the model accuracy measured by adjusted R^2 , it is noticeable that the highest level of determination coefficient ($R^2 \geq 0.6$) is obtained by the models with lagged dividend payout as explanatory variable (models DT8-DT9, DT13-DT18). It is also worth mentioning that synthetic measure of firm financial efficiency, as explanatory variable, is more appropriate than the single financial ratio because models with *VSM*D generate higher R^2 (model DT1 and DT20) than models with *ROA*, *ROE* and *Debt*.

Tables 10-11 contain model estimates when dependent variable is either dividend per share or dividend on assets. It is worth noticing that Pearson correlation coefficient between total dividend payouts and dividend per share is only 0.1772, whereas between total dividend payouts and dividend divided by assets is 0.7395 and between total dividend divided by assets and dividend per share is 0.6837. Therefore, not all previously discussed dependencies can be confirmed. The first observation points to lower accuracy level of the models estimated for dependent variables *DS* and *DA* than for *DT*. - Dividend per share is described only in 12-19% whereas dividend to assets in 29 to 39%. Most explanatory variables visible in the models estimated for *DS* are statistically insignificant. Although, *VSM*D and logarithm of assets significantly increase the value of dividend per share in 3 and 4 models describing *DS*, respectively. Whereas variable *Sector E* shows that dividends paid by companies belonging to WIG-energy are lower than in case of companies from other sectors what is in line with results obtained in models estimated for total dividend.

Variables describing State Treasury ownership of the company are significant in all models DS1-DS6 but in the models DS1 and DS2 parameters standing by *Treasury** are positive whereas in the rest of the models *Treasury* and *Treasury** are negative what makes interpretation impossible. Also, negative and significant is the parameter standing by the variable *GDP(t)* what is difficult for interpretation together with significantly positive impact of variable *Size E* (in the model DS4) because the same variable had the opposite sign in the model DT10.

Relationships presented by the models DA1-DA3 (Table 11) are more similar to the ones identified for total dividend payouts than in case of the models DS1-DS6. Also, interpretation of parameter estimates for models describing dividend payouts to assets is similar.

Table 11. Models' DA1-DA3 parameter estimates: total dividend to assets

Variables	Models							
	DA1		DA2				DA3	
	α_k	t-stat	α_l	t-stat			α_k	t-stat
<i>GDP(t+1)</i>	-0.0030	-2.40 ***	0.0004	0.60			-0.0263	-3.14 ***
<i>GDP(t)</i>	-0.0014	-1.16	-0.0018	-1.59 *				
<i>Chair S</i>	0.0036	0.67						
<i>Share S</i>	-0.0022	-0.19						
<i>Size E+S</i>	0.0008	0.65						
<i>Share E</i>	-0.0228	-1.36 *						
<i>Size E</i>	0.0023	0.95						
<i>VSM</i> D	0.0164	5.42 ***	0.0102	3.11 ***			0.0108	3.42 ***
<i>Ln(assets)</i>			0.0042	1.25			0.0055	1.66 **
<i>Sector F</i>	0.0038	0.78	0.0028	0.65			0.0029	0.70
<i>Year2020</i>	-0.0303	-3.19 ***					-0.0022	-2.02 **
<i>Treasury</i>	0.0030	0.60	-0.0121	-1.24			-0.0147	-1.56 *
<i>Dividend(t-1)</i>			0.0000	3.19 ***			0.0000	3.01 ***
<i>const.</i>	-0.0053	-0.37	-0.0557	-1.13			-0.0697	-1.47 ***
Adjusted R^2	0.2892		0.3336				0.3867	

Note: Symbols ***, ** and * denotes significance of the variable at significance level $\alpha=0.01$, 0.05 and 0.01, respectively.

Source: Own calculation

5. Conclusions

Energy sector has been crucial for each national and global economy because of the scale of interaction with the outside world, the profound impact on the economy, the living conditions of societies and the well-being of the environment, as well as on the stability of development of countries and their security. Therefore, the financial standing and management of the energy companies seems to be an important issue. Our study concerns dividend policy in Polish public energy companies since Poland is an outstanding example of successful political and economic transformation and the biggest capital market in post-communist countries. Our empirical study may be summarized as following.

In the pre-COVID decade, energy companies quoted on WSE paid dividends irregularly and dividend payouts in 2020 were much smaller than in previous years what is caused by pandemic and uncertainty of companies' management concerning firms' functioning. Also, GDP growth rate observed in the year when dividend is paid has a

negative impact on the total dividend value as well as on dividend value to assets. Higher dividends are paid in gas and oil sector than in mining and energy sectors. It was also observed that share prices of gas and oil companies essentially increased during analyzed decade whereas share prices of other considered companies decreased in that time span.

Logarithm of assets and financial efficiency are two main factors increasing level of dividend payout what is in line with another research. However, vectorial synthetic measure of financial effectiveness, described by Kompa and Witkowska (2022), represents companies' financial standing better than single financial ratios what is visibly in values of adjusted determination coefficient. Another significant factor increasing the dividend payouts is lagged dividend. The State Treasury ownership is a significant factor which cannot be clearly interpreted because this variable has both negative and positive signs. Structure and size of statutory bodies do not influence dividend payouts measured as total dividend, dividend per share and dividend to assets. Although there were three cases (among 29) when parameter standing by one of variables describing this phenomenon significantly differs from zero.

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