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Financial Internet Quarterly 2025, vol. 21 / no. 4, p. 1-15

10.2478/fiqf-2025-0023

Financial Internet Quarterly

# UNCERTAINTY AS A DETERMINANT OF DIVIDEND DECISIONS OF PUBLIC COMPANIES DURING THE COVID-19 PANDEMIC. THE CASE OF COMPANIES LISTED ON THE WARSAW STOCK EXCHANGE

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**Abstract**

The aim of the article is to analyze the impact of an unpredictable individual event such as the COVID-19 pandemic on dividend decisions of companies listed on the Warsaw Stock Exchange. Due to the fact that the vast majority of companies do not provide detailed justification for dividend decisions, the analysis was based on a panel probit model with random effects of dividend propensity in the years 1998-2019, which was used to develop forecasts of dividend payments in 2020. The difference between the forecast and the actual dividend decision made by companies in 2020 could be attributed to the uncertainty caused by the pandemic.

The analysis covered 152 domestic companies listed on the Warsaw Stock Exchange that paid dividends in 2019 and/or in 2020. The calculations showed that, being uncertain about the future macroeconomic situation and, consequently, about their own, some companies stopped systematic annual dividend payments or significantly reduced their level. The companies made such decisions despite the fact that the forecasts developed on the basis of the probit model, proposed in the paper, indicated that they should pay dividends in 2020, as indicated by their good economic and financial situation.

**JEL classification**: G35, C23, C53

**Keywords**: Uncertainty, COVID-19, Panel Probit Model with Random Effects of Propensity to Pay Dividend, probability of dividend payment, Warsaw Stock Exchange

Received: 31.12.2024 Accepted: 28.04.2025

**Cite this:**

Kowerski, M. & Sioma, T. (2025). Uncertainty as a determinant of dividend decisions of public companies during the COVID-19 pandemic. The case of companies listed on the Warsaw Stock Exchange. Financial Internet Quarterly 21(4), pp. 1-15.



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## Introduction

Uncertainty and risk are two phenomena that have a significant impact on financial decisions. While risk is measurable, uncertainty is not (Knight, 1921). Uncertainty entails a lack of information about the future and inability to predict the consequences of choices and actions (Praktyczny Słownik, 2002). In other words, uncertainty refers to changes that are impossible to estimate; there is no way to determine the probability of their occurrence, as opposed to risk. Uncertainty is one of the biggest obstacles to effective business operations.

The source of uncertainty is the occurrence of individual events, previously unknown or poorly known. Undoubtedly, the COVID-19 pandemic was such a phenomenon. People, including owners and managers, faced the problem of the lack of reliable information regarding the extent and the duration of the pandemic, as well as its potential impact on the macroeconomic situation domestically and globally, and thus on the future of the companies they managed. This uncertainty was reinforced by various, often negative, administrative decisions (restrictions) that impacted management efficiency. These decisions also affected dividend policy, such as the recommendations issued by financial regulators and central banks worldwide regarding the non-payment of dividends by companies in the financial sector, especially commercial banks. Similar recommendations were made to refrain from share repurchases.

In March 2020, the European Central Bank banned dividend payments and share repurchases by euro area banks until October. At the end of July, it postponed this deadline to the end of January 2021. The Bank of England banned dividend payments until the end of 2020.

In May 2020, the Federal Reserve restricted shareholder payouts by the nation's largest banks, barring them from repurchasing their own stocks or increasing dividend payments in the third quarter.

In the UK, any company that received government assistance to stay afloat found it particularly difficult to justify maintaining dividend payments to shareholders (Bateman, 2020).

Most of the ex-dividend dates in Europe fell within the next three months.

The Indian government made the opposite decision, eliminating double taxation of dividends from 1 April 2020. As demonstrated by many countries that previously abolished double taxation of dividends, this increases the number of payers and the value of dividends paid (Agrawal, 2021).

We know very little about dividend behavior in extreme states of the world (Cejnek et al., 2021). This study examines how the uncertainty caused by an unpredictable individual event such as the COVID-19 pandemic affected the dividend decisions of companies listed on the Warsaw Stock Exchange (WSE). The easiest way to get an answer to this problem would be to get information directly from the companies. The problem, however, is that Polish law does not oblige companies to provide detailed reasons for their decision to pay or not to pay dividends. Thus in resolutions of the Annual General Meeting of Shareholders (AGM) concerning the distribution of profit the justification for the dividend decision is typically formal, only recalling the content of the Article 395 § 2 point 2) of the Polish Code of Commercial Companies. And only a few companies provided substantive justification for their decisions in 2020. Therefore, the analysis was based on a panel probit model with random effects of dividend propensity in the years 1998-2019, which was used to develop forecasts of dividend payments in 2020. Dividend payment forecasts for 2020 were then compared with the actual dividend decisions made by companies in this year. The forecasting model did not account for the pandemic; therefore, the difference between the forecast and the actual decision could be due to the uncertainty caused by the pandemic.

The analysis focuses on companies listed on the WSE and covers 152 domestic, non-financial companies that paid dividends in 2019 and/or in 2020.

The accuracy of the methodology used was also confirmed by the resolutions of these companies, which, however, decided to use broader justifications than the formal justifications.

To the best of our knowledge, the methodology presented in this article is the first of its kind to analyze the impact of COVID on companies' dividend decisions. It can also be used to analyze the impact of other unpredictable individual events on companies' financial decisions.

The structure of the paper is as follows. Section 2 presents the literature review. Section 3 describes the methodology used in the study, including analytical approach and sample characteristics. Section 4 presents dividend decisions made by companies listed on the WSE in 2020, contrasted with previous trends. Section 5 presents the results of the research and discussion. Section 6 presents conclusions and finally Section 7 contains limitations of the presented research and propositions for further research.

## Literature review

Despite nearly a century of research, dividend decisions and their impact on stock prices and therefore the value of companies remain a mystery (Frankfurter & Wood, 2002). The fact that there are three mutually

exclusive schools trying to explain the impact of dividend decisions on the value of the company (pro-dividend, neutral, anti-dividend) and a whole range of hypotheses and theories shows how ambiguous this issue is (Cwynar & Cwynar, 2007).

The most important theories trying to explain the basics of dividend policy include:

- The anti-dividend theory of Litzenberg and Ramaswamy (1979) which assumes that dividend payment is unfavorable for both the company and the investor actually; in the first case limiting the company's capital and in the second limiting the flexibility of disposing of funds.
- The dividend irrelevance theory of Miller and Modigliani (1961), which states that the dividend policy does not introduce any changes in the value of the company.

Together with the set of pro-dividend theories:

- A Theory originating from Lintner (1956) and ironically called by Miller and Modigliani (1961) the bird in hand fallacy, according to it, investors value dividends more than capital gains and the dividends determine the value of the company. These preferences stem from the fact that, due to the risk, the dividend is more reliable than capital gains.
- Signaling theory (Myers & Majluf, 1984), according to this, a dividend can be a way to provide minority shareholders and potential investors with information about the actual situation of the company and its future profits so dividends reduce information asymmetry.
- Life cycle theory of dividends (Mueller, 1972), which says that a company begins to pay dividends when it moves from a high growth rate phase to a low-growth phase, that is, from a phase of immaturity to a maturity phase in the life cycle.
- Agency theory (Easterbrook, 1984; Jensen, 1986) according to this the increase in the value of dividends is a tool for reducing agency costs and conflicts that increase as companies grow.
- Catering theory of dividends (Baker & Wurgler, 2004) according to this, company boards adapt their dividend policy to changes in investors' attitudes to dividend payments. As a result, companies are more likely to pay dividends if the market rewards this decision by better valuing dividend-payers and not to pay if investors prefer non-paying companies. Thus, managers behave like caterers fulfilling clients (investors) preferences.

Since the last quarter of the 20th century, there has been an increase in the nominal and real values of dividends paid out globally, with particularly high dynamics recorded since the beginning of the second decade of the 21st century.

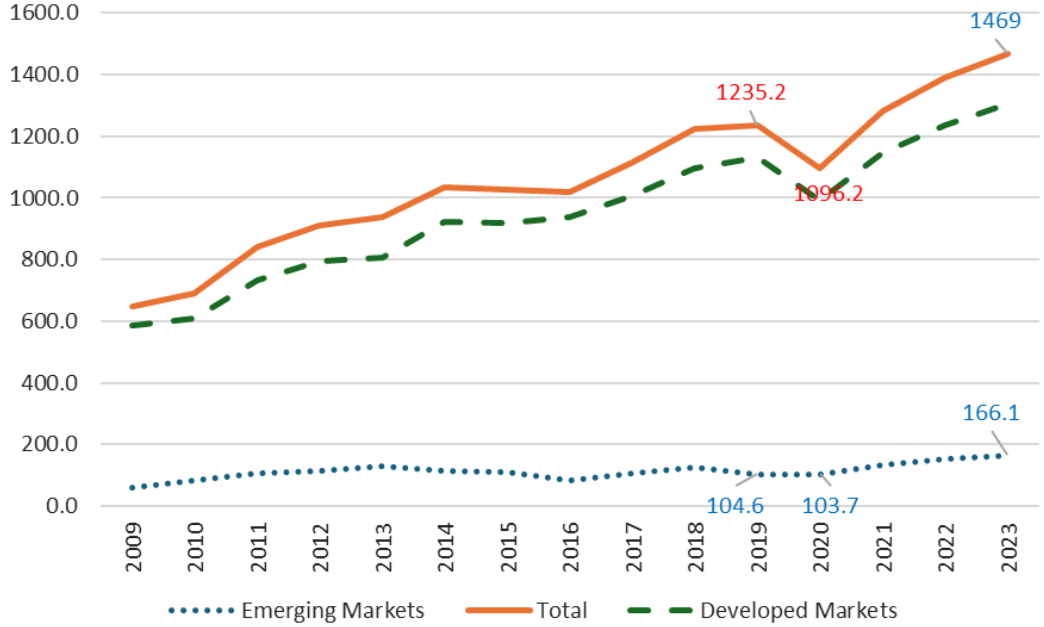
Data on dividend payers around the world collected by Damodaran (2025) indicate that in 2013, 40.9 thousand companies paid dividends worth $1,452.8 billion, and in 2019, 44.4 thousand companies paid dividends worth $2,034.1 billion, representing an average annual growth rate of 5.8%. In 2020, there was a slight decrease in payments compared to the previous year (by 1.9%). However, since 2021, the value of dividends paid has increased again at a faster rate than before the pandemic (by 7.7% annually average), reaching $2,490.5 billion in 2023[3].

Since 2009, Janus Henderson Investments (2024) has been collecting data on dividend payments by the 1,200 largest companies in the world. Their data (Figure 1) show that dividends paid by these companies also grew dynamically and amounted to $1,469.0 billion in 2023 (59% of Damodaran's estimated worldwide payouts). However, the decline in payments in 2020 compared to 2019 in this group of companies was much larger: from $1,235.2 billion in 2019 to $1,096.2 billion in 2020 (-11.3%). This may indicate that smaller companies were less prone to reducing dividend payments. As in the case of Damodaran's data, the largest companies in the next three years not only "recovered" from the decline that occurred in 2020 but also significantly increased the value of payments.

In the second decade of the 21st century, despite the decline in the value of payments in 2020, an average annual growth rate of 4.7% was recorded by the 1,200 largest companies in the world, exceeding the average annual Gross Domestic Product (GDP) growth rate.

[3] There are many more companies paying dividends in the world than those sending reports to the Damodaran database, but they are probably much smaller companies that pay incomparably smaller amounts. Hence, it can be predicted that in 2023 the value of dividends paid in the world was less than USD 2600 trillion.

**Figure 1: Changes in dividend payments by the 1,200 largest companies in the world in the years 2009-2023 (in billion $)**




*Source: Authors' own work based on Janus Henderson Investors.*

It is necessary to agree with Agrawal (2021) that "COVID-19 is a unique event experienced from a dividend perspective."

Increasing dividend payments make them more and more important for investors. Hence, their drastic decline during the COVID-19 pandemic caused great concern among financial analysts and investors and, of course, became an inspiration for in-depth research into the causes and possibilities of explaining this phenomenon, which resulted in numerous articles.

Changes in dividend payments around the world in the first year of the pandemic were not uniform across all countries and were subject to geographical, economic, and legal regionalization. Research conducted on changes in payments by the 1,200 largest companies in the years 2009–2021 shows the following (Kowerski, 2022a):

1) Dividend payments in Australia and Asia grew the fastest, and COVID significantly reduced dividend payments in 2020 in Australia and Europe.
2) Dividend payments in emerging market countries grew faster than in developed markets countries, and COVID did not significantly reduce payouts in emerging markets. However, developed markets still provide the vast majority of dividends and have an almost fourfold higher Dividends-to-GDP ratio than emerging markets.
3) The common law system is more favorable to dividend payments. The dividends-to-GDP ratio in common law countries was more than twice as high as in civil law countries.

The observed trends lead to the conclusion that it was the outbreak of the COVID-19 epidemic that influenced changes in the decisions and dividend policies of companies around the world, primarily in 2020. This is why most of the research on the impact of COVID-19 on dividend decisions relates to 2020. These tendencies have been confirmed by detailed research of subregions and groups of countries.

AlGhazali and Yilmaz (2023) analyzed 5,869 firms from 29 emerging countries during the 2015-2020 period. Polish companies accounted for 1.5% of the sample. The total number of firms paying dividends decreased from 5,059 in 2019 to 4,849 in 2020 (-4,15%). Their analysis also showed that "during the pandemic a majority of the firms either increased or decreased their dividends. Additionally, there was a significant rise in the number of firms that have opted to omit dividends, surpassing those that have maintained their dividend payments during the pandemic" (AlGhazali & Yilmaz, 2023).

Agrawal's (2021) analysis of the 509 largest non-financial Indian companies paying dividends in 2015-2019 and listed on the Bombay Stock Exchange showed (contrary to the expectations of enhanced dividends associated with the dividend double tax elimination) a considerable spike (from 46% to 56%) in the dividend cuts in 2020. This finding indicates that the uncertainty caused by COVID-19 had a stronger (negative) impact on the dividend decisions of Indian companies than the benefits associated with the abolition of double taxation.

Ntantamis and Zhou (2022) analyzed 6,173 companies listed on the main stock exchanges of the G-7 countries (Canada, France, Germany, Italy, Japan, United Kingdom, and the United States) that paid at least one dividend or made at least one share repurchase in 2015-2020. The 2020 fiscal year was classified as the COVID-year for the analysis. According to their research, dividends were paid by 71.6% of companies in 2019 and by 66.1% in 2020. The fraction of share repurchases fell from 53.0% to 50.7%. The value of dividends paid fell from $757.6 billion to $672.5 billion (by 11.2%), while share repurchases fell from $725.363 billion to $526.1 billion (by 27.5%). Firms in France, Germany, Italy, and the United Kingdom experienced widespread cuts in dividends, while firms in the United States and Canada cut cash payout more through share repurchases, with Japanese firms falling in between. The authors concluded that corporate cash holdings helped mitigate the negative impact of COVID-19 on payout adjustments.

Ali (2022), utilizing a sample of 8,889 firms listed in the G12 countries (Australia, Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland[4], United Kingdom, United States) showed that although the proportion of dividend cuts and omissions was significantly higher during the pandemic, the majority of firms either maintained or increased dividends. He considered all types of dividend changes in the analysis, which provides a more complete picture and thus a better understanding of corporate dividend policy decisions during the pandemic. To get more insights into corporate dividend policy over time, he selected the sample period from 2015 to 2020. The notable variation in firms' dividends changes in 2020 indicates the negative impact of the COVID-19 pandemic on corporate dividend policy. For example, in 2020 715 firms in the sample (8%) omit dividends while 2,174 firms (approximately 25%) cut dividends. This compares with only 448 (977) firms that on average omit (decrease) dividends during "normal times" (2015-2019) which means increase by 59.3% and 122.5% respectively. The author also estimated logit models of all types of dividend changes for 2020. The explanatory variables he selected - return on assets, change in earnings, forecasted earnings per share growth rate, asset turnover, leverage, firm size, liquidity market-to-book ratio – are significant factors influencing dividend decisions. However, because the models were estimated on data from 2020, they only revealed specified variables influenced dividend decisions during the pandemic. To understand whether and how the impact of these variables changed compared to the pre-pandemic period, it would be necessary to estimate the same models on the data from previous years (2015-2019) and compare the estimated parameters.

[4] Note that the G12 group consists of thirteen countries. When Switzerland joined the G12 in 1984, the name of the group was not changed.

Krieger et al. (2021), using data from 1,400 dividend-paying publicly traded firms in the U.S. from Q1 2015 through Q2 2020, calculated that in Q2 2020, 213 firms cut dividends and 93 omitted dividends. This proportion of cuts and omissions was three to five times higher than any other quarter since 2015. These authors also estimated linear probability models using ordinary least squares (OLS) method of cuts and omissions of dividends (the dependent variable is a dummy variable equal to one if the firm cut or omitted dividend in a given quarter and zero otherwise) from Q1 2015 through Q1 2020 and in Q2 2020 and compared the estimated parameter values in both periods. The parameters for the NetIncome and Debt variables proved to be significant at the level of 0.05. In the case of NetIncome, the lower its value, the greater the probability of cut or omission, but in Q2 2020 the impact was much stronger. In the case of Debt, parameters were also significant, but the sign of the parameter in the probability of cuts model changed from negative from Q1 2015 through Q1 2020 to positive in Q2 2020. Before the pandemic, higher debt was conducive to a decrease in cuts, while in the initial period of the pandemic, it was conducive to an increase in the value of dividend cuts. These results are biased by the fact that, in the case of dichotomous dependent variables, estimating the linear probability model using the OLS is inappropriate – some fitted values of probabilities may be less than zero or greater than one. Heteroscedasticity of random disturbances can also occur (Kowerski, 2022b). However, the authors' conclusion is worth emphasizing: "in the COVID-19 period of 2020, publicly traded entities witnessed much higher rates of dividend cuts, and industrial firms had much greater rates of dividend omissions than in the 2008 financial crisis. Thus, viewed solely from the perspective of dividend policy, the COVID-19 pandemic is a unique event and clearly worthy of additional analysis and study" (Krieger et al., 2021).

Cejnek et al. (2021) analyzing dividend derivatives of equity indices of the Euro Stoxx 50, the FTSE100, the Nikkei 225, and the S&P 500 concluded that "in the wake of COVID-19, near-term dividend expectations declined dramatically and only recovered partially by the end of 2020. As a result, the fraction of the overall equity market value due to near-term dividends dropped substantially."

Gemra et al. (2022) examined how investors perceived the reduction or complete resignation of dividend payments during the initial stage of the COVID-19 pandemic (1.02.2020 to 5.06.2020). Using data from 56 companies listed on the WSE that published information about management boards' dividend recommendations for 2020 and using the methodology of event studies, they verified the hypothesis that investors would react negatively to dividend reduction or

price. In turn, announcements of higher dividend payments did not have a statistically significant effect on share prices on any of the examined days. Moreover, the study did not demonstrate a statistically significant increase in investor interest in acquiring shares when companies announced that the dividend would be maintained at the same or a higher level. Investors perceived this signal from the company's management board as neutral (Gemra et al., 2022).

Mazur et al. (2023) analyzing companies listed on S&P1500 concluded that in 2020 the level of dividend payout was negatively related to both the expected and realized future earnings, indicating that companies are highly likely to be forced to cut dividends in the near future and therefore the current level of dividends appears not sustainable.

## Methodology

### Research hypothesis

The drastic decrease in dividend payments, as well as information from some companies, lead to the formulation of the following research hypothesis:

The uncertainty caused by COVID-19 regarding the economic situation in the world and in Poland resulted in that in 2020 some companies listed on the Warsaw Stock Exchange, despite achieving good financial results enabling dividend payments, did not pay them out or reduced the level of payments.

### Analytical approach

The analyses presented in the previous section show that a decrease in both the propensity to pay dividends and the value of paid dividends throughout the world took place primarily in 2020. One reason for this may not have been the deterioration of companies' financial situation as much as the uncertainty regarding the functioning of companies and the overall economy in the near future due to the COVID-19 pandemic. In 2021, the propensity and level of payments returned to the average level of previous years.

The aim of the article is to analyze the impact of an unpredictable event, such as the COVID-19 pandemic, on the dividend decisions of companies listed on the Warsaw Stock Exchange.

The easiest way to get an answer to this question would be to get information directly from companies. The problem, however, is that Polish law does not oblige companies to provide detailed reasons for their decision to pay or not to pay dividends. In most cases, when companies intend to pay dividends, their management boards publish resolutions recommending the payment. Conversely, management boards of companies rarely publish resolutions when they do not intend to pay dividends. However, all companies on the main market must announce dividend decisions in resolutions of the AGMs concerning the distribution of profit. But, in both cases, the justification for the dividend decision is typically formal, only recalling the content of the Article 395 § 2 point 2) of the Polish Code of Commercial Companies, which states that the agenda of the annual general meeting of shareholders must include the adoption of a resolution on the distribution of profits or the financing of losses (Act of 15.09.2000, Code of Commercial Companies, Journal of Laws 2000 No. 94 item 1037).

Therefore, the analysis was based on a panel probit model with random effects of dividend propensity in the years 1998-2019 estimated by one of the authors of this article (Kowerski, 2024), which was used to develop forecasts of dividend payments in 2020 (for 2019). Dividend payment forecasts for 2020 were then compared with the actual dividend decisions made by companies this year. The applied model did not account for the pandemic; therefore, the difference between the forecast and the actual decision could be due to the uncertainty caused by the pandemic. Of course, there may also be other reasons for the differences between the forecast and actual results (including forecast error, which is an immanent feature of every forecast). The quality of the forecasts obtained is determined by the quality of the model adopted for forecasting. The better the model is fitted to historical data, the higher the quality of forecasts can be expected. The model was estimated on data from an unbalanced panel of 112 non-financial companies (1,509 observations) that, at the end of 2019, were included in the WIG20, mWIG40 and sWIG80 indices and had been listed for at least 3 years (i.e., they entered the WSE no later than 31.12.2016). Among the 1,509 observations, 824 were related to companies paying dividends, indicating the dividend payment propensity of 54.6%.

The forecasting model adopted in the paper has the following form:

$$Probit Y_{i,t} = \beta_0 + \beta_1 X_{1i,t-1(t)} + \beta_2 X_{2i,t-1(t)} + ... + \beta_k X_{ki,t-1(t)} + \mu_{1i,t} \quad (1)$$

$$Y_{i,t} = \begin{cases} 1, \, i-th \; company \; decided \; to \; pay \; dividend \; in \; year \; t \\ 0, \, i-th \; company \; decided \; not \; to \; pay \; dividend \; in \; year \; t \end{cases}$$

Where:

Probit $Y_{i,t}$ - the value of the probit of dependent variable for i-th company in t year. The probit is the inverse of the cumulative standard normal distribution function,

$X_{j\,i,\,t\text{-}t(1)}$ - the value of j-th explanatory variable for i-th company in year t - 1 or in year t, depending on the nature of the variable,

$\mu_{1i,\,t}$ - random disturbance, which is the sum of the random specific effects,

White noise:

$$\mu_{1i,t} = \alpha_{i1} + \varepsilon_{1t}$$

The explanatory variables for the model were selected in a three-step statistical procedure, taking into account the panel nature of the data (Kowerski, 2024). This selection procedure allowed for the identification of the best set of 8 explanatory variables from among 32 potential, substantively related to the propensity to pay dividends, explanatory variables describing both the economic and financial situation of the analyzed companies and the macroeconomic situation of Poland.

Since Fama and French (2001) proposed the use of the logit (or probit) model to study propensity to pay dividends, the explanatory variables selected for the panel probit model proposed in this study, are among the most commonly used to assess the dividend policy of companies listed on various markets: profitability, company size, investment opportunities (Fama & French, 2001), leverage (von Eije & Magginson, 2008), risk (Li & Zhao, 2008), stickness of dividends (deAngelo et al., 2006). These variables best described the propensity to pay dividends by companies listed on the WSE also in previous years (Kowerski, 2003; Kowerski & Kaźmierska-Jóźwiak, 2022) The propensity to pay dividends is low both when the company has very small and very large investment opportunities, which is why Kowerski (2013) proposed an inverted U-shaped relationship.

**Table 1: Results of estimation of a panel probit model with random effects of propensity to pay dividends in 1998-2019**

| Variables, coefficients | | Parameters | p-value |
|---|---|---|---|
| Const | | -0.7938 | 0.034 |
| SIZE | Logarithm of assets, at 2019 prices, for the company *i* at the end of year t – measure of company size | 0.1687 | 0.001 |
| ROA (%) | Net profit, at 2019 prices, divided by the average of assets of the company *i* at the end of years t and t - 1 – measure of company profitability | 0.0327 | <0.001 |
| CE | Capitalization to book value of equity ratio for company *i* at the end of year t – measure of company investment opportunities | 0.0975 | 0.011 |
| CE2 | CE square | -0.0033 | 0.048 |
| PROP_1 (%) | Propensity to pay dividends for company *i at the year t* - 1: fraction of dividends paid out to all possible payments from the year following the year of the company's listing on the WSE until 2019 - measure of the stickiness of dividends (However, if the company paid a dividend in the year of its IPO, that year was also included in the number of possible payments (Kowerski, 2011)). | 0.0129 | <0.001 |
| DR (%) | Debt ratio of the company *i* in at the year t (total debt/total assets) – measure of company leverage | -0.0137 | <0.001 |
| RISK1 (%) | First volatility coefficient of the company's *i* at the end of year t – calculated as the quotient of the difference between the maximum and minimum share price divided by the maximum price at the year t – measure of company risk | -1.2017 | <0.001 |
| RISK2 (%) | Second volatility coefficient of the company's *i* – calculated as the quotient of the difference between the maximum share price and its price at the end of year t divided by the maximum price in year t – measure of company risk | -1.1142 | <0.001 |
| ρ | | 0.3299 | |
| LR test: ρ = 0 | | 55.9900 | <0.001 |
| Wald test | | 228.1000 | <0.001 |
| Count $R^2$ (%) | | 73.8900 | |

*Source: Kowerski, M. (2024). Nonpayers also matter. On Lintner's dividend partial adjustment model estimation. Argumenta Oeconomica, 2(53), 32-51.*

Results of estimation are presented in Table 1. The estimated model has a high level of fit to the empirical data. The significance of the intraclass correlation coefficient ρ, means that individual companies have their own specific characteristics. The estimated parameters are statistically significant, which confirms the correct selection of explanatory variables.

This model is a good forecasting tool not only because of its formal properties, but also because it describes the influence of explanatory factors (variables) on the propensity to pay dividends over a long period of time (1998–2019). If in 2020 it gives a forecast that is inconsistent with the actual dividend decision made by the company, it must have been influenced by other factors that have not occurred so far. In 2020, it could have been COVID-19, as indicated by a great deal of external information in the form of an economic downturn, and above all, a significant decrease in this year in the number of companies paying dividends and the value of payments.

Substituting the values of the explanatory variables at the end of 2019 into the estimated panel probit model with random effects of the propensity to pay dividends in the years 1998–2019 (The source of data for calculating the values of individual variables was the www.bankier.pl database and yearbooks of the Warsaw Stock Exchange (https://www.gpw.pl/statystyki-gpw)), the forecasted values of probits in 2020 for each company were obtained:

$$\begin{aligned} Probit Y^*_{i2020} &= -0.7938 + 0.1687 SIZE_{i2019} + 0.0327 ROA_{i2019} \\ &+0.0975 CE_{i2019} - 0.0033 CE2_{i2019} + 0.0129 PROP1_{i2019} \\ &-0.0137 DR_{i2019} - 1.2017 RISK1_{i2019} - 1.1142 RISK2_{i2019} \end{aligned} \quad (2)$$

Where:

Probit*$_{i2020}$ - Forecasted value of probit for company i in 2020.

Using the fitted values of probits and standard normal distribution, the probabilities of dividend payments by individual companies in 2020 were calculated.

The probabilities calculated for each company are a measure of the accuracy of the forecast.

Most often the forecast of dividend payment or non-payment are prepared using two rules:

1) Standard rule:

$$Y^*_{i2020} = 1, if \;\; p > 0.5 \quad (3)$$

Where:

Y*$_{i2020}$ = 1 means that the company will pay a dividend,

p - probability of dividend payment calculated on the basis of the probit model.

2) Optimal rule:

$$Y^*_{i2020} = 1, if \;\; p > 0.546 \quad (4)$$

0.546 is the propensity to pay dividends among the companies in the sample used to estimate the probit model.

These forecasts were then compared with actual decisions on dividend payments in 2020.

If the probability of dividend payment was higher than 0.546 (optimal rule), then the company's financial situation in 2019, as described using the explanatory variables in the model, was strong enough to pay dividends in 2020 (for 2019). If such a company did not pay a dividend, it suggests that its dividend decision was influenced by other, non-financial factors, including uncertainty related to the COVID-19 pandemic (If the standard rule is adopted, the threshold probability is 0.5).

For the purposes of this article, the resolutions of the management boards and draft resolutions adopted by AGMs for all studied companies were analyzed. In 2020, 29% of management boards provided more than just formally detailed justifications for their dividend recommendations and the resolutions of AGMs on the profit distribution contained more comprehensive explanations for these decisions. They frequently mentioned the pandemic as the main factor influencing their decisions.

The analysis of these documents provided additional arguments for the assessment of the prognostic values of the adopted model and the correctness of the methodology used.

## Sample

Due to the drastic decrease of propensity to pay and the value of dividends paid in 2020, as well as other studies (e.g. Krieger, Mauck &Pruitt, 2021; Mazur, Dang & Vo, 2023) this analysis focuses on dividend decisions made by domestic companies listed on the WSE in 2019–2020. The decisions made by these companies in both years were compared to identify the changes that took place in 2020 compared to 2019. Dividend payment forecasts for 2020 were also generated. As in other studies (e.g. Ntantamis & Zhou, 2022) companies that paid dividends in 2019 and/or in 2020 were accepted for analysis.

In 2019, there were 149 such companies, while in 2020 there were 111 (a decrease of 25.5%).

**Table 2: Division of studied companies**

| Group | Specification | Companies paying in 2019 | Companies paying in 2020 | Companies covered by the forecast |
|---|---|---|---|---|
| A | Companies that paid dividends systematically for at least 2 years until 2019, but did not pay dividends in 2020 | 12 | 0 | 10 |
| B | Companies that did not systematically pay dividends, but paid dividends in 2019, but did not pay in 2020 | 48 | 0 | 41 |
| C | Companies that paid dividends systematically for at least 2 years until 2019 and also paid dividends in 2020 | 24 | 24 | 23 |
| D | Companies that did not systematically pay dividends, but paid dividends in 2019 and 2020 | 65 | 65 | 61 |
| E | Companies that did not pay a dividend in 2019 but did so in 2020 | 0 | 21 | 17 |
| Total | | 149 | 111 | 152 |

*Source: Authors' own work.*

18 companies were excluded from the sample for the following reasons:

1) Eleven companies whose fiscal year did not align with the calendar year. Most often, it was the period from 1.06.2019 to 30.06.2020, resulting in AGMs held at the turn of 2020 and 2021, with payments occurring in 2021.
2) Five banks, because the probit model was estimated using data from non-financial companies. Additionally, the Polish Financial Supervision Authority (UKNF) recommended that banks not pay dividends due to the uncertainty caused by COVID-19.
3) Two companies that were delisted from the WSE before 30.06.2020.

For the selected 152 companies, we analysed their dividend payment history since their listing on the WSE, which allowed us to divide the analysed companies into five groups (A to E) as presented in Table 2.

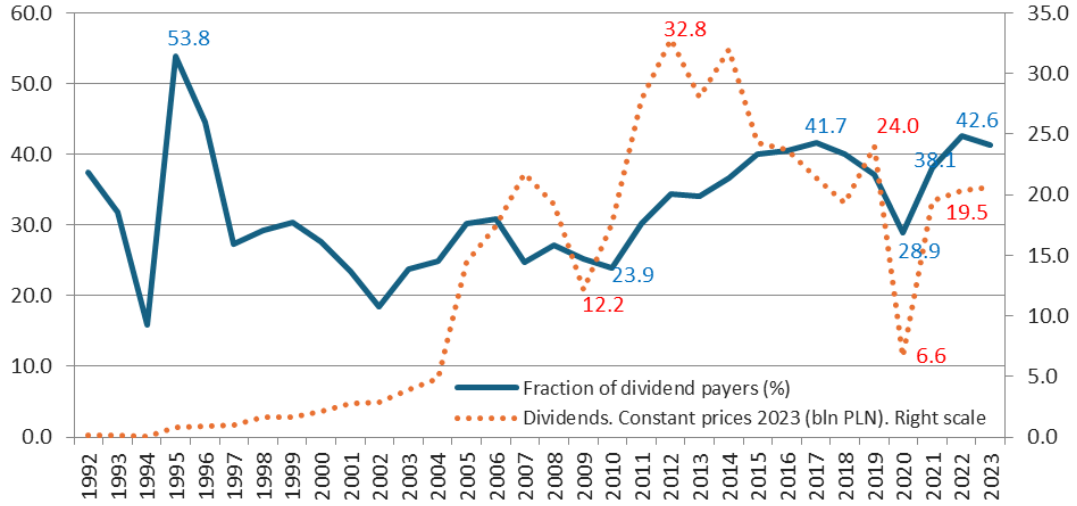
As a result, forecasts using the probit model were generated for 152 companies.

## Dividend decisions undertaken by companies listed on the WSE in 2020 against the previous trends

Starting from 1997 to 2019 (In previous years, due to the small number of listed companies, it is difficult to identify any trend), the fraction of dividend-paying companies slowly increased, with the significant slope of linear trend of 0.71 p.p. and peaking in 2017 (41.7%). In 2020, the fraction of dividend payers dropped to 28.9% (It was lower (23.9%) only in 2010, which was a consequence of the global crisis) as presented in Figure 2. The decrease in dividend propensity was much greater than in other emerging markets (AlGhazali & Yilmaz, 2023; Kowerski, 2022a). Calculated, on the estimated trend 1992–2019, the fraction of dividend payers in 2020 should reach 39.1%. However, in 2021, the fraction of payers already increased to 38.1% and from the next year it exceeds 41%, with this being 1.4 p.p. higher than the value estimated on the trend for 2022. This result may indicate that such a significant decrease in the share of paying companies was a one-off result from the impact of a one-off factor, which could have been the pandemic. In 2022, this decline was compensated for by above-average growth.

This phenomenon is even more pronounced when considering the value of dividends paid. Between 1997 and 2019, the value of dividends paid, adjusted to 2023 constant prices increased annually by PLN 1.23 billion (significant slope of linear trend). In 2019, dividend payments by domestic companies amounted to PLN 24.0 billion. In 2020, this value decreased by more than three and a half times to PLN 6.6 billion. Compared to the peak in 2012 (PLN 32.8 billion), the 2020 value represents a fivefold decrease. Notably, 50% of the decline was determined by the administration ban on dividend payments by banks. As with the fraction of dividend payers, there was an increase in payouts in the next three years, but they remained lower than in 2019. Preliminary estimates indicate that dividend payments will reach in 2024 a value significantly exceeding the previous maximum (over PLN 44 billion).

**Figure 2: Fraction of dividend payers (%) and value of paid dividend by domestic companies listed on the WSE in constant prices of 2023 (PLN billion) in 1992 - 2023**




*Source: Authors' own work.*

## Results and discussion

The authors collected the values of explanatory variables for 152 companies at the end of 2019 and, after submitted them into the model, calculated values of probits and then the probability (propensity) to pay dividends in 2020 by these companies. The basic results of calculations are presented in Table 2 and Figure 3.

Of the 33 companies that had been paying dividends consistently until 2019 for at least two years, 10 (Group A) did not pay dividends in 2020, thus breaking the chain of uninterrupted payments. Calculated on the probit model probabilities of dividend payments in 2020 for ten (all) companies in group A were higher than 0.5, which, according to the standard rule, means they all should have paid dividends. According to the optimal rule, 9 companies should have paid dividends. The average probability of dividend payment for this group of companies was 0.78, and the median was 0.76. Until 2019, half of these companies had been paying dividends systematically for at least 8 years, and EUROCASH for the longest time (for 14 years).

**Table 3: Probability of dividend payments in 2020 and justification of dividend decisions of companies by specified groups**

| Specified groups of companies: | | A | B | C | D | E | Total |
|---|---|---|---|---|---|---|---|
| Average full years on the WSE to 2020 | | 8.4000 | 13.1000 | 9.8000 | 15.3000 | 12.4000 | 13.1000 |
| Probability of dividend payment in 2020 | Minimum | 0.5107 | 0.0903 | 0.3208 | 0.0893 | 0.1368 | 0.0893 |
| | Average | 0.7817 | 0.4303 | 0.7491 | 0.5967 | 0.4349 | 0.5689 |
| | Median | 0.7619 | 0.3872 | 0.7801 | 0.5868 | 0.3439 | 0.5714 |
| | Maximum | 0.9546 | 0.8663 | 0.9931 | 0.9999 | 0.9546 | 0.9999 |
| Forecast accuracy according to the rule (%) | Standard | 0.0000 | 65.9000 | 95.7000 | 65.6000 | 23.5000 | 61.2000 |
| | Optimal | 10.0000 | 70.7000 | 91.3000 | 55.7000 | 23.5000 | 58.6000 |
| Change in the value of payments 2020 to 2019 (%) | | X | X | -21.8000 | -39.3000 | X | -63.3000 |
| Fraction of companies justifying dividend decisions with the negative impact of the pandemic on their current situation (%) | | 30.0000 | 2.4000 | 13.0000 | 4.9000 | 0.0000 | 6.6000 |
| Fraction of companies justifying dividend decisions with impact of the uncertainty caused by the pandemic on the economic situation domestically and abroad (%) | | 50.0000 | 43.9000 | 13.0000 | 11.5000 | 5.9000 | 22.4000 |

*Source: Authors' own work.*

80% of Group A companies provided the COVID-19 epidemic as the factor determining the lack of payment, with 30% citing the impact of the pandemic on the company's current situation and 50% linking dividend decisions with the uncertainty caused by the COVID-19 pandemic on the economic situation domestically and abroad. In justifying their decision, the companies indicated the possible negative impact of the pandemic on the economic situation domestically and across Europe, which in turn might affect their business environment. In the case of some companies, uncertainty led AGMs to adopt resolutions not to pay dividends, despite the positive recommendation from their management boards. Thus, it was the companies systematically paying dividends until 2019, which in 2020 interrupted the stream of payments, that "felt the need to explain themselves" for this decision. Of course, they cited COVID-19 as the reason. Such a result confirms the correctness of the adopted concept of the research: the probability of dividend payment calculated on the basis of the model indicates that the company should have paid dividends, but did not.

The results obtained for this group of companies confirm the correctness of the adopted research hypothesis (Appendix 1).

In the case of companies that did not systematically pay dividends but paid dividends in 2019 and did not pay in 2020 (Group B), the average probability of dividend payment was significantly lower than in Group A and amounted to 0.43. The probability of dividend payments for as many as 63.4% of companies in this group was lower than 0.5. Thus, only 36.6% of companies in this group confirm the correctness of the adopted research hypothesis. This may indicate that companies' decisions not to pay dividends were primarily due to the economic and financial situation, which did not allow for payments, and the uncertainty caused by the pandemic could possibly only be an additional factor in this decision. 43.9% of the companies in this group justified the decision not to pay dividends by the uncertainty caused by COVID-19. The average probability of dividend payment in the group of companies that justified the lack of payment due to COVID-19 was 0.53, i.e. it was 52% higher than that of companies that did not provide a reason for non-payment in the justification. So, as in the case of group A companies, they should have paid dividends, but they did not do so due to COVID-19.

The other analyzed companies (groups C, D, E) paid dividends. Among these companies, 23 formed Group C (companies that had consistently paid dividends for at least two years until up to 2019 and also paid dividends in 2020). The average probability of dividend payment in this group was 0.75, and the median was 0.78. The probability of paying dividends for only one company was less than 0.5 (0.3208); according to the standard rule, this company should not have paid a dividend. Additionally, the probability of paying dividends for one more company was less than 0.546 (0.5329) and this company should not have paid dividends according to the optimal rule. Probability calculations indicate that the economic and financial situation of 91.3% of companies was very good, and they did not have to fear the negative effects of the pandemic. Probably Lintner's (1956) thesis indicating that companies that have started paying dividends are very reluctant to stop paying dividends because it can be an unfavorable signal for the market was also utilized here. However, another observed phenomenon is worth noting. Namely, the C group companies reduced the value of the dividend paid in 2020 compared to 2019 by 21.8%. This reduction affected 69.6% of the companies in this group, with 34.8% paying dividends decreased by more than half comparing to 2019. Some of these companies justified the reduction in payments with the uncertainty related to the pandemic. This result confirms the part of the research hypothesis that COVID-19 was the cause of the reduction in the level of payments.

The average probability of dividend payment in Group D – companies that did not systematically pay dividends but paid dividends in 2019 and in 2020 was 0.60 (median 0.59). The calculated probabilities show that, according to the standard rule, 65.6% of all companies in this group should have paid dividends. In other words, forecasts indicated that more than a third of the companies in this group should not have paid dividends, but they did. The value of dividends paid in 2020 by the companies of this group decreased even more than in the case of the companies in Group C (by 39.3%) which is consistent with the part of the research hypothesis that COVID-19 was the cause of the reduction in the level of payments. As in the case of Group C, the vast majority of Group D companies justified dividend decisions only with the statutory requirement to distribute profit. Only 11.5% of the companies justified the limitation of payments by the uncertainty caused by the pandemic.

The most challenging aspect is explaining the decisions of Group E companies (i.e., those that did not pay dividends in 2019 but did so in 2020). The average probability of dividend payment by these companies was 0.43 and the median was only 0.34. According to the standard and optimal rules, only 23.5% of companies should have paid a dividend. This group includes companies that benefited from the pandemic. For example, one such company is a manufacturer of medical gloves and a distributor of disposable medical materials, whose net financial result increased from PLN -1.9 million (net loss) in 2019 to PLN 312.0 million (net

profit) in 2020. Another example includes producers and distributors of video games, the largest of which increased its net profit from PLN 172.8 million in 2019 to PLN 1,128.1 million in 2020.

## Conclusions

In 2020, most markets around the world, including the Warsaw Stock Exchange, saw a significant decrease in the number of companies paying dividends and the value of payments. As shown by the results of the presented analyses, the main reason for the decrease in the number of dividend-paying companies on the WSE in 2020 compared to 2019 (by 25.5%) and the value of payments by as much as 72.4% was the uncertainty related to the negative impact of the pandemic on the current situation of companies and their business environment. This means that COVID-19 has had a much more negative impact on the dividend decisions of companies listed on the WSE than on other emerging markets (AlGhazali & Yilmaz's, 2023). COVID-19 caused the discontinuation of payments by companies that had been systematically paying dividends for many years, and those that decided to pay dividends transferred much smaller amounts to shareholders. As it turned out, COVID-19 was an unpredictable individual event that surprised both company owners and state institutions. Already in 2021, there was a renewed increase in payments, with some companies paying out much larger dividends than in pre-COVID times, in order to compensate their shareholders for the losses incurred. On the other hand, there were companies that unexpectedly earned significant additional funds, i.e. beneficiaries of COVID-19. Despite the fact that the forecasts developed on the basis of a model, assuming the previous relationship between the propensity to pay and the factors determining it, indicated that a dividend would be paid in 2020, however the companies did not pay dividends. A large number of them justified such a decision in the documents submitted to the AGMS by the uncertainty brought by COVID-19 and this confirms the research hypothesis put forward in the article.

So what conclusions can be drawn from this relatively short but turbulent period for the finances of companies and investors? The uncertainty caused by unpredictable individual events will always have a very negative impact on economic decisions, including financial ones, of economic entities and state institutions. “COVID-19 is a unique event experienced from a dividend perspective” (Agrawal, 2021). And here there is a very unfavorable conclusion for those investors who invest in the so-called dividend companies, which declare systematic payments in their policies. In times of high uncertainty, omitting or limiting dividend payments is one of the easiest and simplest, but also rational from the company's point of view, decision - keeping funds in a situation where the future is uncertain. These decisions unexpectedly deprive shareholders of income. Of course, such decisions can and often do have a negative impact on the company's value in the long term – but in such situations, most often management does not think about the distant future. On the other hand, the uncertainty brought by unpredictable individual events is an opportunity for speculators to make a quick profit also on dividends paid by unexpected beneficiaries of events such as COVID-19. In other words, COVID-19 has only moved us further away from the solution of the dividend puzzle: “why do companies pay dividends at all?” (Black, 1976).

The experience of COVID-19 has brought another question mark in the discussion that has been going on for almost 70 years, mainly, which of the many dividend theories and hypotheses best explains the dividend decisions of companies?

In 2020, the anti-dividend theory of Litzenberg and Ramaswamy (1979) which assumes that dividend payment is unfavorable for both the company and the investor only came true; in the first case limiting the company's capital and in the second limiting the flexibility of disposing of funds.

In the authors’ opinion, the methodology proposed in this paper, based on the probit (or logit) forecasting model, can be used in the future for analyses and forecasts of financial decisions (including dividend decisions) in the event of other unforeseen circumstances. Significant differences between the received forecasts and the actual results of the company should be a signal for detailed analysis using company reports and other sources.

## Limitations and further research

The study's findings can be valuable for investors, financial analysts and company management boards. However, it's important to acknowledge the research limitations.

The proposed method requires an up-to-date forecasting model estimated on the basis of panel data covering a long period of time. Therefore, in the future, they should be reestimated as new data emerge, perhaps by changing the explanatory variables as well. Information from the justification of decisions by company management boards is very useful in verifying the quality of the forecasting model. On the other hand, Polish law does not oblige companies to provide detailed reasons for their decision to pay or not to pay dividends. This, in turn, requires the search for additional exogenous information on whether we are really dealing with the uncertainty brought by events similar to the COVID pandemic.

At this point, it is worth recalling the words of Cejnek et al. (2021) that "we know very little about

dividend behavior in extreme states of the world". Hence, one should fully agree with Krieger et al. (2021) that "from the perspective of dividend policy, the COVID pandemic is a unique event and clearly worthy of additional analysis and study".

Undoubtedly, COVID-19 in 2020 was a one-off event for the dividend policy, but it will have an impact on the verification of many dividend theories in the future, e.g. by reducing the quality of the estimated models (e.g. propensity to pay dividends, the Lintner model, dividend payout ratio models and many other previously developed ones), changing their existing parameters. This will require the development of new or improved existing methods of verifying individual theories and hypotheses. For example, from the econometric point of view, this will require the introduction of additional variables describing only this individual event.

The next direction should be empirical research on the robustness of individual dividend theories to the uncertainty brought about by an unpredictable individual event such as COVID-19.

Another direction of research should be comparative studies with other countries with a similar methodology. This approach would help determine to what extent the observed behaviour of Polish companies was similar to the behaviour of companies in other countries during the epidemic.

Future research should continue monitoring data for the emergence of unpredictable individual events (similar to COVID) and consider incorporating new sources to further generalize the findings.

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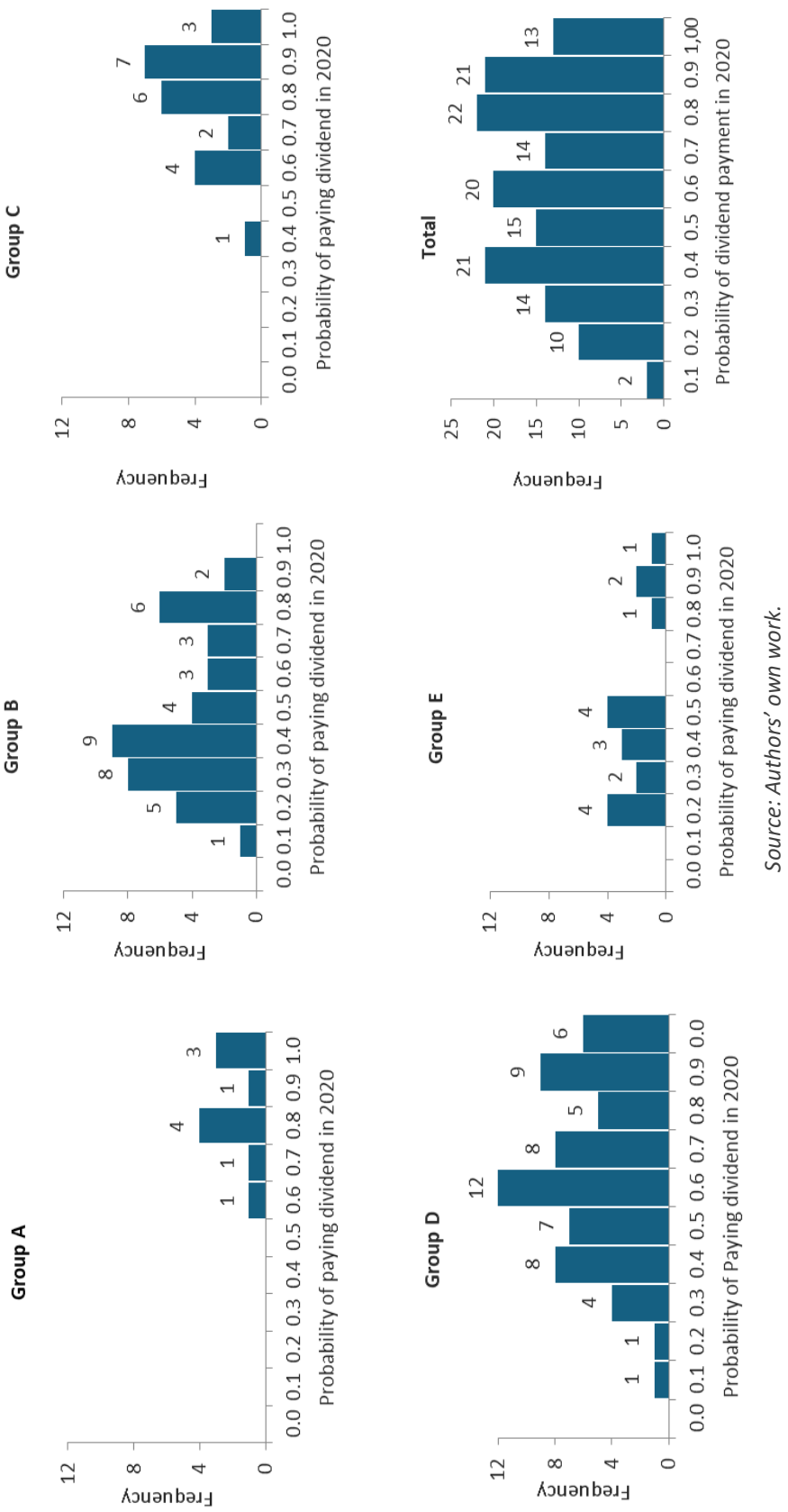
## Apenndix

**Appendix 1: Probability distributions of dividend payments in 2020 depending on the specified group of companies**




*Source: Authors' own work.*