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Approval of an Arrangement in the Restructuring Proceedings and the Financial Condition of Companies Listed on the Stock Exchanges in Warsaw. Is There Any Relationship?

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Abstract: This paper attempts to identify the financial indicators differentiating companies that are insolvent or at risk of insolvency and have successfully entered into an arrangement with their creditors from those that have not. In addition, a two-factor model for predicting the odds of an arrangement has been proposed. The research was conducted using a population of companies listed on stock exchanges in Warsaw that initiated restructuring proceedings between October 2004 and 31 December 2020. Binary logistic regression was used as the research method. The research shows that the financial health of public companies in Poland, as measured by various financial indicators, has little impact on the effectiveness of a debtor–creditor arrangement. The main measure showing discriminatory features between groups of successful and unsuccessful entities is the share of short-term liabilities in total liabilities. A statistically significant influence was also recorded for the indicator showing the share of short-term receivables in the total assets. Furthermore, a statistically significant discriminatory power for both groups was recorded for the indicator showing the ratio of inventories to sales revenue. However, in this situation the selection of this measure was due to the industry diversity of the research population. The identification of these determinants and the proposed model may help courts and supervisors to divide insolvent companies into those that should be subject to liquidation or restructuring procedures at an early stage of the proceedings. Consequently, this can significantly reduce the direct and indirect costs of implementing bankruptcy proceedings.

Keywords: restructuring proceedings; approval of arrangement; corporate finance; financial condition; financial stability

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1. Introduction

One of the key objectives of the European Community is to support the development of entrepreneurship and economic activity. This area includes, inter alia, such issues as the implementation of the second chance policy, measures to reduce the stigma of insolvent entrepreneurs, simplification and improvement of effectiveness of bankruptcy and restructuring procedures. These are reflected, inter alia, in the following EU documents and legal acts: *Overcoming the stigma of business failure-for a second chance policy. Implementing the Lisbon Partnership for Growth and Jobs* (European Commission 2007); *Think Small First. A Small Business Act for Europe* (European Commission 2008); *Business Dynamics: Start-ups, Business Transfers and Bankruptcy. The economic impact of legal and administrative procedures for licensing, business transfers and bankruptcy on entrepreneurship in Europe* (European Commission 2011a); *Report of the Expert Group: A Second Chance for Entrepreneurs: Prevention of Bankruptcy, Simplification of Bankruptcy Procedures and Support for a Fresh Start* (European Commission 2011b); *Commission Recommendation of 12 March 2014 on a new approach to business failure and insolvency* (European Commission 2014); *Entrepreneurship 2020. Action Plan. Reigniting the entrepreneurial spirit in Europe* (European Commission 2013); *Directive (EU) 2019/1023 of the*

European Parliament and of the Council of 20 June 2019 on preventive restructuring frameworks, on discharge of debt and disqualifications, and on measures to increase the efficiency of procedures concerning restructuring, insolvency and discharge of debt (2019).

There is a trend across the world, including in EU countries, to change legislation to be more friendly to non-fraudulent debtors. In addition, the changes are directed at keeping in operation those business units that are experiencing temporary financial problems. New legal solutions for restructuring are proposed (Morawska et al. 2020; McCormack et al. 2016). Poland, as an EU country, has initiated reforms in this area. It introduced a new, more flexible restructuring law in 2016, which foresees several recovery procedures that companies can initiate, depending on their financial situation. After several years of this legislation being in force, it can be seen that restructuring proceedings are still not successful. Many companies that initiate restructuring proceedings are unable to reach an agreement with their creditors, and of those that succeed, few are able to implement the agreement. This generates high costs both of a direct nature (legal and administrative costs) and of an indirect nature (result from abandoning the company by the stakeholders due to growing risk of the bankruptcy, which quicken the deterioration in operating performance) (Sautner and Vladimirov 2018). Therefore, it is particularly important to separate, already at the time of filing for the introduction of restructuring proceedings, those entities which have a chance of successful implementation from those whose probability of success is low.

The main objective of the study was to examine whether certain indicators characterising the financial condition of public companies in Poland before the introduction of restructuring proceedings affect the odds of concluding an arrangement with creditors. Thus, an attempt was made to verify which financial indicators could affect the effectiveness of concluding an arrangement. On the basis of pre-selected financial indicators, a model was proposed to explain the odds of concluding an agreement between the debtor and the creditors in restructuring proceedings. To the authors' knowledge, this type of model is being proposed for the first time in the literature. The research was performed on a sample of companies listed on stock exchanges in Warsaw. The analysis period covered data from October 2004 to the end of 2020. The paper uses the binary logistic regression method. The results of the research may be helpful for, among others, court supervisors and courts when deciding on the initiation of specific proceedings, i.e., liquidation bankruptcy or restructuring. Separating, at an early stage in the process, companies that have a chance of being recovered from those that do not, would reduce the time taken to carry out proceedings and at the same time reduce costs.

Besides the introduction, the paper structure is as follows. The second part outlines the theoretical background and reveals factors that may increase the odds of concluding an arrangement with creditors as well as the likelihood of restructuring success. The third point contains information on regulations and statistics in the field of bankruptcy and restructuring in Poland. The next section presents the methodology. The results of the research are included in Section 4. The last part discusses the findings, limitations and implications of our research.

2. Literature Background

The literature has devoted much attention to the issue of forecasting corporate bankruptcy so far (Altman 1968, 1983; Bellovary et al. 2007; Altman et al. 2017; Prusak 2018; Alaka et al. 2018; Shi and Li 2019), and, to a lesser extent, to the problem of modelling the chance of success of implementing restructuring proceedings. Corporate turnaround is an inherent stage in the life cycle of an organisation and accompanies the functioning of many businesses. On the one hand, it may take the form of restructuring proceedings regulated by the law, regardless of whether they are of a judicial or extrajudicial nature. Therefore, it may constitute a set of actions taken by organisations with the intention of improving their financial condition without applying the procedures provided for in the law. The effectiveness and selection of appropriate resolution strategies depends on many factors, including, among others, the external and internal causes of crisis, the current financial

situation and the threat of insolvency (Robbins and Pearce 1992; Barker and Mone 1994). Moreover, in the literature the differences between financial distress and economic distress of the company are underlined. Some authors claim that a firm facing financial distress is viable as a going concern, but is currently having certain difficulties in the process of repaying debts. However, in a unit facing economic distress, low or negative operating profitability is revealed, and there is a questionable going concern value even in the absence of leverage (Lemmon et al. 2009). In other approaches, 'economic distress' means that a firm is experiencing a large drop in earnings, while 'financial distress' indicates the difficulty in meeting debt obligations (Jiang and Wang 2009). So, economic distress might be measured through a negative trend of different results, i.e., the net income and/or the operating income, as well as numerous ratios that are used in the financial analysis, but it is not obvious what degree of decline signifies this phenomenon (Santosuosso 2013). Thus, it results in different methods of restructuring and differing possibilities of the success (Balcaen et al. 2012).

In this study, the focus is on assessing the effectiveness of the implementation of legally regulated restructuring proceedings. Recovery regulations are not uniform even across EU countries. In some countries, bankruptcy and restructuring provisions are contained in a single piece of legislation, while in other countries they are separated from each other. In addition, there are some countries where there are only single recovery procedures, and some where legislation provides for several types of restructuring procedures. They mainly depend on the degree of involvement of the court. A distinction is made between those countries where the entire procedure takes place outside of the court's interference and those where the court's influence the course of the recovery procedure, varying from full control of the court to limiting the court's activity to approving the arrangement, stating its execution or discontinuance (McCormack et al. 2016; Morawska et al. 2020).

The effectiveness of the implementation of bankruptcy and restructuring proceedings is affected by many factors, both institutional, concerning the closer and further surroundings, and individual characteristics for each company. Not only is good legislation important, but also its effective application in practice. For this purpose, it is important to confront the so-called *law in books* with *law in action* (Pound 1910; Halperin 2011). Studies carried out in Poland, the Netherlands, Portugal and Italy show, inter alia, that the effectiveness of bankruptcy and restructuring proceedings is adversely affected by: instability of law; failure to adapt the level of detail of the regulation of proceedings according to the size of enterprises; the existence of numerous barriers to the lengthiness of proceedings; lack of access to modern digital tools; and the lack of specialist administrative staff. Moreover, the effectiveness of the conduct of proceedings depends to a large extent on the behaviour and strategies adopted by debtors and creditors. In the case of restructuring proceedings, it has been pointed out that they are often initiated too late, i.e., when companies are already insolvent (Kruczalak-Jankowska et al. 2019). Time is of the essence in this case, as the chances of a successful restructuring decrease as the financial situation deteriorates and the insolvency situation persists for a longer period. Similar barriers were pointed out by Nigam and Boughanmi (2017) in their analysis based on other countries. They further indicated that one of the many solutions to improve the implementation of bankruptcy and restructuring proceedings are out-of-court proceedings, the so-called prepacks. It is worth noting here that their implementation depends on many factors and they are not universal. One of the more recent studies concerns Croatia, where prebankruptcy settlements were introduced in 2012 as an out-of-court procedure. The prerequisites obliging a debtor to initiate this procedure were defined as, among others: late payment of liabilities, including liabilities to employees; inability to repay liabilities in the long term and insufficient assets to cover liabilities. One of the novelties is the so-called account blockage. It consists of blocking funds contained in an account in a situation when a debtor does not pay its liabilities. Failure to settle liabilities within a reasonable period of time results in the obligation to introduce out-of-court restructuring proceedings. In the absence of an agreement between the debtor and the creditors, bankruptcy proceedings are automatically initiated. Research

results show that in 79% of cases an agreement between the debtor and the creditors was successfully concluded. The probability of concluding an agreement was higher where the concentration of liabilities was high and the suppliers of products and services were private rather than state-owned enterprises. The introduction of out-of-court settlements in Croatia has significantly shortened the length of restructuring proceedings, reduced costs and increased the chances of survival for companies (Srhoj et al. 2021).

In addition to institutional factors, firm-specific variables also influence the effectiveness of restructuring. In France, for example, a study was carried out on businesses that had initiated a restructuring procedure between 1995 and 2004. In the case of some of them, the decision was taken to continue implementing the restructuring plan, while in the other group of units a decision was taken to sell them. Companies with higher levels of profitability, a higher proportion of intangible assets and with business and funding problems were more likely to continue with the resolution plan. The likelihood of a decision to sell shares increases with the size of the bankrupt firm, the secured debt-to-assets ratio and for debtors having personal problems (Ayadi 2012). The number and structure of different creditor groups can have a significant impact on the effectiveness of an arrangement and its subsequent implementation. They are characterised by different strategies for dealing with the debtor and, at the same time, different perceptions of the time horizon when it comes to recovering money. Their decisions may be significantly influenced by the form and elements contained in credit agreements, such as seniority of claims, complexity of the credit agreement, collateral, covenants, maturity. The division between private and public-law, secured and non-secured, as well as private and state owned creditors, which are generally characterised by different objectives, also plays an important role here (Blazy and Chopard 2012; Jenkins and Smith 2014; Adler and Triantis 2017; Srhoj et al. 2021). A study carried out in Germany between 1997 and 2004 on a sample of 116 publicly traded distressed companies showed that companies with a higher chance of successful out-of-court restructuring compared to bankruptcy are those that: are financed to a greater extent with external capital, have a high share of debt coming from banks, show a higher going concern value. In turn, entities with lender coordination problems and with a high share of secured liabilities were more likely to fail (Jostarndt and Sautner 2010). A specific group of units are small and medium-sized enterprises. Research concerning them has been carried out, among others, in Spain. They show that the probability of successful restructuring is higher in companies from a specific sector, characterised by a higher ROA (return on assets ratio) and cash ratio as well as operating in a group (Camacho-Miñano et al. 2015). In contrast to the above-mentioned studies, research carried out in Estonia suggests that financial indicators among companies that have successfully and unsuccessfully conducted restructuring proceedings do not differ significantly (Lukason and Urbanik 2013). A similar conclusion can be drawn from research conducted in Finland, i.e., that relying solely on financial data does not effectively separate potential bankrupts from entities with a chance of successful restructuring. Non-financial data, such as resignations of management and prior payment behaviour, play an important role in the filtering process (Laitinen 2011). Research studies carried out by the same author on a sample of small and medium-sized enterprises come to similar conclusions, i.e., non-financial data play an important role in the filtering process, while financial information only marginally improves the quality of forecasts (Laitinen 2008).

For some analyses, both institutional and individual factors were taken into account. In the UK, a popular but relatively often unsuccessful procedure is the so-called CVA (Company Voluntary Agreements). A study of 552 companies that initiated the above procedure in 2013 found that as many as 360 proceedings failed at an early stage (Walton et al. 2020). Based on a survey of practitioners carried out by the same authors in 2017, it was found that:

1. The failure to reach an arrangement was mainly due to: lack of support from the institution responsible for, among other things, such actions, namely Her Majesty's

Revenue and Customs (HMRC)—an institutional factor; reluctance of unsecured creditors; and lack of interest from key suppliers.

2. The failure of the CVA despite the agreement was mainly due to: overoptimistic financial projections and underestimation of the impact of the agreement on working capital, failure to pay post-CVA creditors, failure of management to implement the required changes and the fact that the proposals in the agreement did not address all the issues that the company was facing.

Based on the literature analysis, it can be concluded that corporate restructuring is a multidimensional problem and its effectiveness depends on many factors. Therefore, some authors suggest that there are different strategies for dealing with distressed companies (Kärkinen 2019). Moreover, research on the predictive ability of financial information in forecasting the effectiveness of restructuring proceedings is inconclusive.

3. Bankruptcies and Restructurings in Poland

In Poland, after the economic transformation initiated in 1989, the new Bankruptcy and Restructuring Act of 28 February 2003 (2003) was introduced and, with a few amendments, remained in force until the end of 2015. The law provides for three basic proceedings, i.e., liquidation, composition and recovery. The first two were intended for insolvent entities and the last for entities at risk of insolvency. After several years of operation, it turned out that this law did not work in practice, i.e., the proceedings were very long and costly and the number of composition proceedings was small (Staszkiewicz and Morawska 2019). Recovery proceedings were rare. Hence, a new restructuring law (Restructuring Act of 15 May 2015) came into force from the beginning of 2016. Henceforth, bankruptcy proceedings are governed by the above-mentioned 2003 Act, while the restructuring law provides for four procedures of a corrective nature that differ in terms of court intervention and the degree of formalisation.

As shown in Figure 1, the prerequisites for initiating a recovery procedure are insolvency or the threat of insolvency. The proceedings for the approval of an arrangement are among the least formalised. Most actions take place outside the interference of the court. The debtor independently negotiates with their creditors in order to conclude an arrangement. The court merely decides whether to approve the arrangement. Other proceedings take place with greater court involvement. The accelerated arrangement procedure is less formal than the arrangement procedure. Moreover, the latter is used where there is a larger number of disputed claims. Of all restructuring proceedings, sanative proceedings are among the most complex and are characterised by the greatest influence of the court and the appointed supervisor on its course. On the other hand, however, it makes it possible to reconstruct the debtor's business using more advanced restructuring measures than in other proceedings. It also guarantees the greatest protection from creditors. It is also worth mentioning that during the COVID 19 pandemic, simplified proceedings for the approval of an arrangement (so-called simplified restructuring proceedings) were introduced in Poland, the provisions of which are in force until 30 November 2021 (Act of 19 June 2020 on interest subsidies for bank loans granted to entrepreneurs affected by COVID-19 and on simplified proceedings for approval of an arrangement in connection with the occurrence of COVID-19, as amended, OJ 2020, No. 1086). This procedure is practically in an out-of-court form, where the debtor independently selects a court supervisor. The announcement of the implementation of this recovery procedure in the relevant official journal shall be deemed to be the date of the opening of this proceeding. Its certain limitation is that it has a maximum duration of 4 months. During this time it is assumed that the debtor will enter into an arrangement with their creditors.

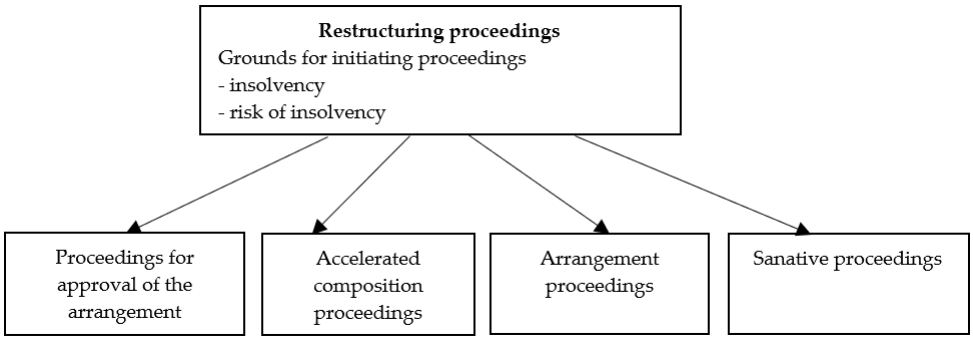

Figure 1. Types of proceedings in Polish restructuring law. Source: Own elaboration.

Table 1 shows the structure of bankruptcy and restructuring proceedings. It shows that until 2015, arrangement proceedings accounted for a small share of the total number of proceedings. As a result of the introduction of the restructuring law in 2016, the number of bankruptcies decreased in comparison to the previous few years, while the share of restructuring proceedings in the total number of proceedings increased. The year 2020 was an exceptional year, which saw a significant increase in the number of restructuring proceedings, a very large share of which were the out-of-court simplified procedures introduced with the intention of counteracting the negative effects of the COVID 19 pandemic. The increase in the share of restructuring proceedings since 2016 in the total number of proceedings can be assessed positively, although the final effect of their implementation is also important. Due to the short period in which the restructuring law has been in operation, it is still difficult to clearly assess its effectiveness. For example, the study carried out by Zaremba (2020) shows that the share of court-approved arrangements in the total number of open restructuring proceedings between 2016 and 2019 was just over 30%, of which only a fraction was implemented. Based on a report performed by Zimmerman Filipiak Restrukturyzacja S.A. (2020, p. 6), this share was approximately 26% in the period from the beginning of 2016 to 30 September 2020. This shows that many restructuring proceedings that are opened end in failure already at the stage of approving the arrangement with creditors. This prolongs the process of dealing with insolvent companies and at the same time generates additional direct and indirect costs, resulting in lower recovery rates. Therefore, the role of the court supervisor and also of the creditors is extremely important, so as to separate at an early stage those entities which have a chance of success in the implementation of recovery processes from those which do not have such a chance. This paper shows the results of research on public joint-stock companies only. Hence, for example, for the year 2020, Table 2 presents the structure of bankruptcies and restructuring by organisational and legal form. Of all entities, the largest number of proceedings are carried out among limited liability companies. Joint-stock companies rank third and the structure has been similar over the past several years. Among joint-stock companies, only a very small share are those listed on the stock exchange. However, it should be remembered that listed entities are generally larger than others and their impact on the environment is much more significant.

As shown above, the effectiveness of restructuring proceedings in Poland is also low. Preliminary research using ratio analysis and basic methods of descriptive statistics conducted on a selected group of commercial law companies in 2016–2019 showed that their financial condition prior to the introduction of restructuring proceedings had no impact on the effectiveness of these proceedings (Zaremba 2020). Compared to these studies, our paper focuses exclusively on public joint-stock companies, which have a much greater impact on the economic environment, it also takes into account a much longer research period and uses more advanced quantitative methods.

Table 1. Bankruptcies and restructurings in Poland in 2005–2020.

Details	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bankruptcy (liquidation) proceedings (business activities)	793	576	377	348	572	538	616	711	703	701	650	530	537	558	574	507
Bankruptcy proceedings with the possibility to make an arrangement	n/a	n/a	70	63	119	117	107	166	180	122	91	26	0	0	0	0
Restructuring proceedings	-	-	-	-	-	-	-	-	-	-	-	204	348	417	445	380
Simplified restructuring proceedings (out-of-court)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	356

Source: Coface Report (2009, 2013, 2019, 2021).

Table 2. Bankruptcies and restructurings in Poland by legal forms—the year 2020.

Legal Form	Number of Bankruptcies and Restructurings
Limited liability company	526
Sole proprietorship	497
Join-stock company	**101**
Limited partnership	60
General partnership	44
Cooperative	7
Others	8
Sum	1243

Source: Coface Report (2021).

4. Methodology

One of the key moments for the success of restructuring proceedings is the conclusion of an arrangement by the debtor with their creditors. This means that concluding an agreement is a step on the road to recovery but does not guarantee it. Indeed, in order to restore the company's ability to compete in the market, a number of reorganisation and recovery measures need to be taken, which will lead to the implementation of the arrangement. This research takes the entering into of an arrangement and its approval by a final court judgment as the necessary moment to prove the effectiveness of restructuring proceedings. The situation where the arrangement has been implemented is a better measure of the effectiveness of the restructuring procedure. Unfortunately, in Poland, due to the short period in which the new restructuring law is in force, many agreements are in the process of being implemented. Therefore, it was impossible to take the implementation of the arrangement as a measure of its success. As a research objective, we set out to investigate whether the financial condition of public companies in Poland before the introduction of restructuring proceedings affects the odds of concluding a debtor–creditor arrangement. In addition, we attempted to isolate the financial measures that most significantly differentiated companies entering into an arrangement from those that failed to do so. On this basis, we have built a model to predict the odds of concluding an arrangement.

The research covered only companies listed on the main market of the Warsaw Stock Exchange and on the Newconnect market, which is dedicated in particular to young companies with smaller capitalisation. Restructurings of listed companies represent only a some fraction of all the restructurings shown in Table 1. However, due to the size of the listed corporations and their importance to the economy, they play a key role. The research

period was October 2004 through 31 December 2020. The choice of starting point was determined by the availability of data in the form of current reports of companies contained in the ESPI system-Electronic System for Information Transmission. In the first stage, in order to select companies that initiated restructuring proceedings and to obtain information on whether or not they concluded an arrangement with creditors, over 390,000 current reports available on Polish Press Agency websites (PAP—Polish Press Agency n.d.) were analysed. Preliminary data were obtained for 72 companies where either an arrangement procedure was introduced in the period before 2016 or one of the restructuring proceedings after 2016. After checking the availability of financial data and removing entities that generated negative sales revenues (negative sales revenues with negative financial results resulted in positive sales profitability ratios, which made it much more difficult to infer), the final research population consisted of 63 public companies, of which 31 entities had an arrangement approved by a final court judgment, while the remaining 32 companies did not. In the next stage, information on individual financial statements was obtained from the Notoria Service database, on the grounds of which the values of financial ratios were later determined. In order to obtain the most up-to-date data, we have taken into account financial information from the four most recent quarters preceding the moment when the restructuring procedure was introduced or, in the case of balance sheet data, from the most recent quarterly financial statements preceding that moment. Basic financial ratios grouped under four main areas, i.e., profitability, efficiency, indebtedness and liquidity, were used to assess the financial health of companies. The types of measures, together with the formulae, are shown in Table 3.

Table 3. Financial ratios and their calculation formula.

Financial Ratio	Formula
Profitability ratios	
Gross profit margin (gpm) %	(profit on sales/net sales revenues) * 100%
Operating profit margin (opm) %	(operating profit/net sales revenues) * 100%
Net profit margin (npm) %	(net profit/net sales revenues) * 100%
Return on assets (roa) %	(net profit/average total assets) * 100%
Efficiency and other ratios	
Turnover of receivables in days (tor)	average value of short-term receivables * 365 days/net sales revenues
Turnover of liabilities in days (tol)	average short-term liabilities * 365 days/(cost of sales + selling costs + general administrative expenses) or (operating costs excluding other operating costs)
Inventories to sales revenues (itsr) %	(average inventory value/net sales revenues) * 100%
Short-term receivables to total assets (strtta) %	(short-term receivables/total assets) * 100%
Debt ratios	
Debt to assets ratio (dtar) %	(liabilities and provisions for liabilities/total assets) * 100%
Debt structures (ds) %	(short-term liabilities/liabilities and provisions for liabilities) * 100%
EBITDA (earnings before interest, taxes, depreciation and amortization) to debt ratio (etdr)	(operating profit + depreciation and amortization)/average value of liabilities and provisions for liabilities
Liquidity ratio	
Cash ratio (cr)	cash and cash equivalents/short-term liabilities

Source: Own elaboration.

The return on equity (ROE) was omitted from the group of profitability measures. This is because companies in financial difficulties often generate losses with negative equity. Consequently, for such entities the ROE is positive, but this does not indicate good financial health. In such a situation, the selection of this measure for analysis would not be useful.

In addition to the commonly used measures, a debt structure indicator was also included in the group of debt ratios. This is because in entities with poor financial health, not only is the relationship between liabilities and equity important, but also the ratio of short-term liabilities to total liabilities. It can be assumed that companies in a worse position will be characterised by a higher share of liabilities in the financing structure, and among them short-term liabilities will dominate. Besides, only the cash ratio was used in the area of liquidity, as it compiles relatively uniform financial categories, i.e., cash and short-term liabilities. The other liquidity ratios, i.e., current and quick, take into account the other components of current assets, i.e., inventories and short-term receivables. Consequently, their combination in a liquidity analysis could point to erroneous conclusions due to the different directions of the impact of the various current assets. The other selected financial measures can be considered as commonly used in ratio analysis of companies.

This study has also considered the type of industry in which the analysed companies operate. The chosen division was adapted to the applied research method. At the same time, care was taken to ensure that the individual groups were of an appropriate size. Therefore, a group of companies from the least numerous industries was created. Consequently, the 63 analysed entities were characterised by the following industry structure: industrial production (ip)—16; construction (constr)—13, wholesale and retail trade—8, financial intermediation—8, other—18. At the same time, it should be added that different industry combinations were implemented in the estimation process of logistic regression models.

In this paper, logistic regression models were used to explain the dichotomous quality variable Y depending on the level of exogenous variables $X1$, $X2$, ..., Xk (quantitative or qualitative) (Jackowska 2011). In these models, the explanatory variable is usually represented by a zero–one variable (1):

$$Y = \begin{cases} 1 - an\ arrangement\ has\ been\ approved\ by\ a\ final\ court\ decision \\ 0 - no\ final\ court\ decision\ has\ been\ approved\ to\ accept\ the\ arrangement \end{cases} \quad (1)$$

Thus, the logistic regression model for a dichotomous variable is given by the Formula (2):

$$P(Y = 1|X_1\ ,\ X_2\ ,\ \ldots\ ,\ X_k) = \frac{e^{\beta_0 + \sum_{i=1}^{k} \beta_i X_i}}{1 + e^{\beta_0 + \sum_{i=1}^{k} \beta_i X_i}} \quad (2)$$

In such a model its individual parameters β_0, β_1, ..., β_k are estimated using the maximum likelihood method.

The introduction of qualitative variables into the model required their appropriate coding (*dummy coding*, *indicator coding*). Hence, if a variable has m variants, then $m - 1$ *dummy variables* are introduced. When coding such predictors, a reference group is arbitrarily determined (e.g., by choosing the most numerous group, or even combining less numerous groups). This group becomes the reference group in the process of interpreting model parameters (Jackowska 2011).

The advantage of the logit model is the possibility to interpret the parameter e^{β_i} using the concept of *odds*, which is defined as the quotient of the probability of an event occurring and the probability of an event not occurring. Thus, for a quantitative variable, the *odds ratio*-e^{β_i} indicates how the odds will change if x_i (predictor, risk factor) increases by one unit, assuming *ceteris paribus* (Jackowska 2011; Gruszczyński 2012; Hailpern and Visintainer 2003).

The procedure for constructing the final form of the logistic regression models was as follows.

1. Logistic regression models were estimated including one quantitative risk factor (one explanatory variable from the group of variables listed in Table 3) followed by identification of outlier observations for their removal. The literature indicates that their inclusion may lead to an inappropriate model (Stanisz 2016, p. 503). Outliers were determined from the estimated Cook's distance. Consequently, outliers for which the Cook's distance exceeded a threshold value, determined according to the formula: $4/(n - k - 1)$, where: n-number of observations, k-number of explanatory variables, were excluded (Jeng 2020,

p. 44). Additionally, in certain cases some observation, which imply the problem of perfect prediction, could have been dropped (Long and Freese 2006). Therefore, the number of observations in the final models (Table 4) is different than the primary number of companies included in the research. Moreover, in their structure, the above models could not contain many variables due to the relatively small number of specified cases: Y = 0, Y = 1. It was therefore a matter of trying to maintain an adequate ratio: events per predictor variable (EPV) of no less than 10 (Vittinghoff and McCulloch 2006; Ogundimu et al. 2016).

Table 4. Estimation results of logistic regression models for concluding an arrangement in restructuring proceedings.

Details	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
The likelihood ratio test						
Chi^2	4.39	3.08	7.27	8.03	7.27	14.73
p-value	0.0361	0.0790	0.0070	0.0454	0.0070	0.0006
Number of observations	61	61	61	61	59	59
Specifications of the models [(1)]						
itsr	0.0231 * (0.0138)	-	-	-	-	0.0502 * (0.0257)
strtta	-	−0.0305 * (0.0183)	-	−0.0430 ** (0.0209)	−0.0326 * (0.0193)	-
ds	-	-	−0.0467 ** (0.0205)	-	−0.0427 * (0.0231)	−0.0554 ** (0.0217)
ip	-	-	-	1.3634 ** (0.6940)	-	-
constr	-	-	-	1.0991 (0.7304)	-	-
_cons	−0.3546 (0.3064)	0.5156 (0.4434)	3.9846 (1.7909)	0.1700 (0.4833)	4.3061 ** (2.0819)	4.0616 (1.8232)
Goodness of fit measures						
Log likelihood	−40.078	−40.666	−38.639	−38.192	−36.928	−33.523
R^2 McFadden	0.052	0.037	0.086	0.095	0.097	0.180
R^2 Cragg-Uhler (Nagelkerke)	0.093	0.066	0.150	0.165	0.167	0.295
AIC	84.156	85.331	81.278	84.384	79.855	73.046
BIC	88.377	89.553	85.499	92.828	86.088	79.278
Count-R^2	0.574	0.607	0.672	0.639	0.661	0.746
Adjusted Count-R^2	0.133	0.172	0.333	0.241	0.310	0.483
AUC	0.6075	0.6078	0.6548	0.7080	0.7276	0.7701

Remarks: [(1)] under the parameters there are standard errors of estimation; significance of parameters: ** *p*-value ≤ 0.05, * *p*-value ≤ 0.1. Source: Own estimation based on STATA 16.0.

2. After excluding outliers, the final form of the logit models was estimated, taking into account up to three predictors that generally showed their statistical significance. The impact of a qualitative variable indicating the industry of the business was also taken into account. To avoid multicollinearity between variables, the Variance Inflation Factor (VIF) and Tolerance Index (TI) were estimated for models with more than one predictor. In relation to these measures there are threshold criteria suggesting that predictors with values a VIF > 5 or a TI < 0.20 could be contributing considerably to multicollinearity and generally deserve close inspection (Marcoulides and Raykov 2019, p. 876).

3. Measures of goodness-of-fit of individual models were estimated, including: Pseudo R^2 measures such as R^2 McFadden, R^2 Cragg-Uhler (Nagelkerke) and Count-R^2, adjusted

Count-R^2, as well as information criteria: Akaike's Information Criterion (AIC), Bayesian Information Criterion (BIC) (Best and Wolf, pp. 160–61). The values of AUC—area under the curve-were also determined, and for the model characterised by its highest value the ROC curve was presented. Plotting this curve is a popular measure aimed at discriminatory accuracy visualization of the binary classification model, whereas the area under this curve (AUC) is a common measure of its exact evaluation (Gajowniczek et al. 2014).

4. The classification table was presented in order to indicate both sensitivity (proportion of true positives among all cases) and specificity (proportion of true negatives among all noncases) (Kleinbaum and Klein 2010, p. 349) of the final model. As a result, it was shown the Type I error (false positive) rate, and Type II error (false negative) rate. Additionally, the recall was included as the ratio of correctly predicted positive classes (DeFusco et al. 2015, p. 255).

5. An in-depth analysis of the model with the highest AUC value was performed. The literature indicates the following classification of the discriminatory ability of models according to AUC values: 0.90–1.0-excellent (outstanding) discrimination; 0.80–0.90-good discrimination; 0.70–0.80-fair (acceptable) discrimination; 0.60–0.70-poor discrimination; 0.50–0.60-failed discrimination (Kleinbaum and Klein 2010, p. 357; Hosmer and Lemeshow 2000, p. 162).

6. A linktest was performed to detect the specification error of the model with the highest AUC. The conception of this test is that if the estimated model is properly specified, one should not be able to find any additional predictors that are statistically significant except by chance. Unless the model is completely mis-specified, the predictor variable should be statistically significant, but not its squared value (Dudek and Lisicka 2013, pp. 69–70).

5. Results

Following the research procedure, logistic regression models were estimated separately for each of the analysed financial indicators. As a result, only in three models (model 1, model 2, model 3) did a specific risk factor show its significant impact on the conclusion of a debtor's arrangement with creditors in restructuring proceedings. This shows that of the 12 financial ratios analysed (Table 3), only inventories to sales revenues (model 1), short-term receivables to total assets (model 2) and the debt structure significantly influenced the conclusion of the agreement (model 3). As these one-factor models were characterised by relatively poor discriminatory abilities, further model variants were estimated, i.e., model 4, model 5, and model 6, which took into account the above variables and the analysed quality variable. The study shows that model 6 exhibits the highest AUC value (0.7701). Consequently, it has an acceptable discriminatory ability.

According to Model 6, a one percentage point increase in the share of short-term liabilities in liabilities and provisions for liabilities (ds) reduced the odds of concluding an arrangement under restructuring proceedings by 5.39% ($e^{-0.0554}$). This is because, in many cases, a high share of short-term liabilities in total liabilities may imply a worse financial situation and a more dispersed creditor structure. Hence, their greater number may limit the ability to reach agreement in the restructuring process. Model 6 also indicates that a one percentage point increase in the size of inventories as a proportion of total revenue (itsr) increased the odds of the analysed arrangement by 5.15% ($e^{0.0502}$). This is clearly not due to a situation of specific mismanagement or reduced efficiency in stock management. This indicator reflects the specific industry of the analysed companies. This is indicated by model 4, according to which belonging to the industry: industrial production (ip) increased the odds of concluding an agreement by almost four times ($e^{1.3634}$) in comparison with a company from the reference group (made up of industries: wholesale and retail trade, financial intermediation, other). It should be added that the average size of inventories in relation to sales revenue was 33.74% in companies in the industrial production sector and 13.20% in the reference group.

For model 6, the percentage of accurate predictions amounted to 0.746 (Count-R^2, Table 4). At the same time, its sensitivity was 68.97% and specificity was 80.00% (Table 5). Hence, 20 units which reached an agreement were correctly classified, whereas 24 companies which did not attain an agreement were correctly classified. Analyzing the two types of errors (Type I—false positive and Type II—false negative), this model in six cases was wrong in predicting value $\hat{Y} = 1$, while true was $Y = 0$ (20.00%). In turn, nine times it incorrectly classified observations predicting as $\hat{Y} = 0$, while true was $Y = 1$ (31.03%). So, the accuracy of model 6, as mentioned, was 74.58%. The recall ratio, as a positive predictive value, was 76.92%. In contrast, the AUC for model 6 amounted to 0.7701 (Table 4, Figure 2).

Table 5. Classification table for the model 6.

Classified	True		Total
	D (Y = 1)	~D (Y = 0)	
+ ($\hat{Y}$ = 1)	20	6	26
($\hat{Y}$ = 0)	9	24	33
Total	29	30	59
Classified + if predicted Pr(D) >= 0.5 True D defined as Y = 1			
Sensitivity	Pr(+ | D)		68.97%
Specificity	Pr(− | ~D)		80.00%
Positive predictive value	Pr(D | +)		76.92%
Negative predictive value	Pr(~D | −)		72.73%
False + rate for true ~D	Pr(+ | ~D)		20.00%
False − rate for true D	Pr(− | D)		31.03%
False + rate for classified +	Pr(~D | +)		23.08%
False − rate for classified −	Pr(D | −)		27.27%
Correctly classified		74.58%	

Source: Own estimation based on STATA 16.0.

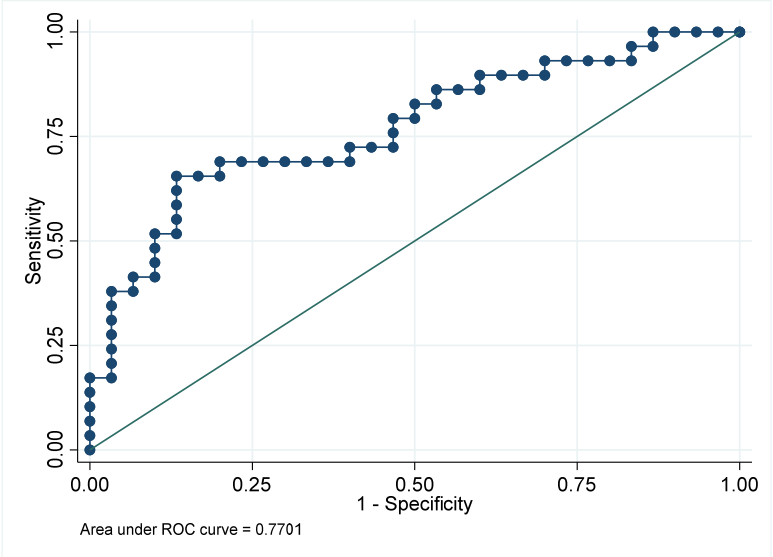

Figure 2. ROC curve for model 6. Source: Own estimation based on STATA 16.0.

It is also worth mentioning that, in relation to model 6, model 5 has a lower predictive ability. This model takes into account the share of short-term receivables in total assets

(strtta) in addition to the *ds* variable. It shows that a one percentage point increase in the *strtta* variable reduced the odds of an arrangement by 3.21% ($e^{-0.0326}$). This may mean that companies with cash frozen in short-term receivables are less likely to conclude an arrangement.

Moreover, no multicollinearity was observed between the explanatory variables in model 6: the Variance Inflation Factor (VIF) amounted to 1.01 and the Tolerance Index to 0.9945.

Furthermore, the results of the linktest (Table 6) indicates that the specification of model 6 is correct. The *_hat* is highly significant (*p*-value 0.0050), whereas *_hatsq* is non-significant (*p*-value = 0.8730). Therefore, the functional form of this model is proper.

Table 6. The results of the *linktest* for model 6.

Number of observations = 59						
LR Chi2(2) = 14.75 Prob > Chi2 = 0.0006						
Log likelihood = −33.5113						
Arrangement	**Coefficient**	**Standard Error**	**Z**	**P > |z|**	**95% Confidence Interval**	
_hat	1.0176	0.3603	2.82	0.0050	0.3114	1.7238
_hatsq	−0.0295	0.1844	−0.16	0.8730	−0.3909	0.3320
_cons	0.0259	0.3441	0.08	0.9400	−0.6486	0.7004

Source: Own estimation based on STATA 16.0.

6. Discussion and Conclusions

The creation of a tool and the identification of factors which, at the initial stage of selection of appropriate proceedings (restructuring versus liquidation) for insolvent companies or companies at risk of insolvency, facilitate taking a decision on dividing entities into those which have the odds of concluding an arrangement and those which do not, may contribute to a significant reduction in the costs of implementation of these proceedings. Hence, the conducted research is of a novel nature and may become a contribution for other authors in the development of such models.

The results show that the financial health of public companies in Poland, as measured by various indicators, has little impact on the effectiveness of a debtor–creditor arrangement. In this regard, the results are close to those obtained by Lukason and Urbanik (2013) and Laitinen (2011) in Estonia and Finland, respectively. However, among the selected profitability, liquidity, efficiency and debt ratios, the ratio of the share of short-term liabilities in total liabilities had the highest discriminatory capacity. It follows that entities with a high share of short-term liabilities in the debt structure are less likely to enter into an arrangement. This may be a consequence of the fact that the number of creditors and, at the same time, creditor groups with short-term receivables from the debtor is much larger than those with long-term receivables. In terms of the value of claims, there is also a predominance between short-term and long-term claims. With such a diverse and fragmented claims structure, it is more difficult to reach a compromise between different creditor groups and the debtor. In addition, creditors with short-term receivables are generally less willing to enter into an arrangement. Among these, public creditors are usually a significant group, often preferring liquidation over an arrangement. Another differentiating measure is the inventories-to-sales revenues ratio. A higher value of this measure positively influenced the possibility of concluding an agreement but only in production units. However, this direction of influence is not a consequence of the mismanagement of stocks by companies but of the industry-diverse research population. In fact, the share of inventories is much higher in industrial production enterprises than, for example, in service units. Additionally, a measure that explains the odds of an arrangement is the ratio of short-term receivables to total assets. A higher value indicates a higher cash freeze in receivables and consequently

has a negative impact on the odds of reaching an arrangement. As a final result of the research, a model that estimates the probability of concluding an arrangement was proposed. Of the three models shown in the paper, model 6, consisting of two explanatory variables (debt structure, inventories to sales revenues ratio), has the best measures of fit.

There are also some limitations associated with the conducted research. Although it was performed on the population of public companies listed on the stock exchanges in Warsaw over a relatively long period of time, the number of companies subject to the research was only 63 entities. It is important to stress that they came from different industries, which are characterised by certain specificities of their activity and sometimes this has an impact on certain financial measures. However, due to the relatively small size of the population, it was not possible to conduct a more detailed study taking into account this industry variation. Additionally, due to the small number of studied entities, we did not have the opportunity to perform a validation of the proposed model.

In the future, along with obtaining additional data, further directions of research will aim to: verify the effectiveness of the proposed model; take into account industry differentiation and propose so-called industry models, e.g., for service, industrial and commercial companies; conduct this type of research not only in Poland but also in other countries; identify non-financial determinants of success in concluding an agreement; analyse the structure of debt types (e.g., public, private, secured receivables, etc.) and its impact on the odds of concluding an arrangement.

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