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FINANCIAL EFFICIENCY OF POLISH ENTERPRISES OPERATING IN THE TRANSPORT AND WAREHOUSE SECTOR IN THE CONDITIONS OF THE RUSSIAN-UKRAINE WAR

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Abstract. The study aimed to identify the dependence of the financial results of Poland's transport and warehousing sector on the current macroeconomic situation and security conditions related to the war in Ukraine. The econometric method was used – a dynamic panel model. Data from January 1, 2007, to June 30, 2023, from the Central Statistical Office and the National Bank of Poland were used. It was found that the impact of macroeconomic factors on the financial efficiency of individual industries in Poland's warehouse and transport sector varies in terms of direction and strength of effects. Key factors were identified as macroeconomic determinants of the financial condition of this sector and industries (subsectors) sensitive to hostilities in Ukraine were indicated. The implications of the findings for decision-makers, investors, businesses and researchers are outlined.

Keywords: transport, storage management, financial efficiency, macroeconomic factors, economic effects of the Russian-Ukrainian war, dynamic panel model.

JEL Classification: D00, E66, G30, R40.

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Notations

Variables

accu_yy – change in the accumulation year to year;
brent_yy – change in the price of crude oil on the London Intercontinental Exchange year to year;
CPI_yy – year-on-year change in the CPI;
CPIenergy_yy – year-on-year change in the CPI for energy sources;
CPIfood_yy – year-on-year change in the food CPI;
CPIfuels_yy – year-on-year change in the fuel CPI;
EBITDA – EBITDA margin;
ECBrate – interest rate of the European Central Bank;
EURPLN – EUR/PLN exchange rate;
EURUSD – EUR/USD exchange rate;
exp_yy – change in export value year to year;

imp_yy – change in the value of imports year to year;
inv_yy – change in gross fixed capital formation year to year;
cons_yy – change in the private current consumption year to year;
ddem_yy – change in domestic demand year to year;
Ptby2y – yield of two-year Polish treasury bonds;
PPI_yy – year-to-year change in the price index of producer goods;
ROA – return on assets;
ROE – return on equity;
ROIC – return on invested capital;
ROS – return on sales;
dcons_yy – change in the direct consumption year to year;
uerate – unemployment rate;
wages_yy – change in wages in the economy from year to year;
war? – a binary variable indicating whether hostilities were carried out in Ukraine in a given period;
WIBOR3m – three-month interbank interest rate in Poland.

Abbreviations
CPI – consumer price index;
FDGMM – first difference generalized method of moments;
GMM – generalized method of moments;
PKD – Polish classification of activities;
ROA – return on assets;
ROE – return on equity;
ROIC – return on invested capital;
ROS – return on sales;
SGMM – system generalized method of moments.

1. Introduction

A characteristic feature of economic reality is common feedback loops. This mechanism occurs, for example, in the relations between a separate sector of the economy and its entirety. Based on the criterion of the subject of economic activity, it is possible to distinguish branch sectors and consider the national economy as an economic system in a generic system – to study the structure of the economy and the mutual dependencies between its elements, as well as the relations between individual components of the economy and its whole. Such insight into the economic system makes it easier to see that the transport and storage sector co-creates the national economy, determining overall economic results in proportion to its size. At the same time, its economic situation depends on the current economic situation. This specific sector is considered a barometer of the economy, as its condition reflects well the condition of the entire economy.

Transport and storage infrastructure is a component of property resources – it co-creates the technical and economic infrastructure, including buildings, structures, and devices serving the population and the production sphere. It connects various elements of the national economy in space and enables the supply of raw materials and energy to economic entities, their production specialization and cooperation, as well as the supply and movement of people (Winiarski & Winiarska, 2012).

In recent years, the dynamics of the Polish transport and warehousing sector, as well as the direction of its changes, have been strongly influenced by the COVID-19 pandemic (Wielechowski et al., 2020; Rokicki et al., 2022; Olejniczak et al., 2023; Stankiewicz et al., 2023; Wodnicka & Szukalski, 2023; Banaszyk et al., 2024; Chodakowska et al., 2024) and by the regulations introduced under the Mobility Package (Olejniczak et al., 2023; Banaszyk et al., 2024). Currently, the sector is significantly impacted by the war in Ukraine (SpotData, 2023; Wodnicka & Szukalski, 2023; Banaszyk et al., 2024), among others due to the supply needs of the war-torn neighbour (Husieva & Kot, 2024; Sadłowski et al., 2025) and to the need to develop alternative export routes for Ukrainian grains (Sadłowski et al., 2023; Sadłowski & Zając, 2024).

The transport and warehousing industry plays a pivotal role in supporting other sectors by ensuring the uninterrupted flow of essential goods, including raw materials, food, energy, and medical supplies. During wartime, the disruption of these supply chains can have cascading effects on production and consumption patterns across the entire economy. Poland's geographic proximity to the conflict between Russia and Ukraine further amplifies the significance of this sector, as the country has become a key logistics hub for both humanitarian aid and military supplies flowing to the conflict zone (Kiss et al., 2022). The strategic position of Poland in this context has led to increased demand for logistical infrastructure, underscoring the importance of analysing how Polish transport and warehousing enterprises manage operational efficiency under such volatile conditions. The academic literature explores various aspects of this issue, e.g. Tzeremes (2020) examined the relationship between the market value of transnational corporations and their operational performance.

Moreover, the transport and warehousing sector is particularly affected by wartime volatility in fuel prices, shifts in demand, border closures, and regulatory changes (Chen et al. 2022; Organisation for Economic Co-operation and Development, 2023). These factors introduce significant uncertainty and complexity, requiring firms to develop robust financial strategies to maintain liquidity, profitability, and long-term sustainability. The impact of such variables on the financial efficiency of firms in this sector offers important insights into the broader economic resilience of industries heavily reliant on transportation and logistics, especially in times of conflict (International Transport Forum, 2023).

Unlike other sectors that may experience immediate declines in demand (e.g., tourism, hospitality), the transport and warehousing industry often sees fluctuating demand patterns – ranging from sharp contractions in certain markets to heightened demand in others, such as military logistics or emergency aid services (World Bank, 2022). This dynamic environment presents a unique opportunity to examine how firms in this sector adapt to and manage financial stress, disruptions, and opportunities during wartime.

Furthermore, the financial performance of enterprises in transport and warehousing during the Russian-Ukraine war offers valuable lessons in risk management and crisis adaptation strategies. The ability to sustain operations amidst fuel price volatility, disrupted supply chains, and shifting geopolitical landscapes highlights the sector's role in supporting national and regional economic stability (Chen et al., 2022; Jere et al., 2024). Analysing the financial efficiency of firms in this sector during wartime conditions can contribute to a deeper understanding of their operational resilience and inform policy recommendations aimed at strengthening critical infrastructure and supply chain continuity during periods of crisis (UN Trade and Development, 2022).

The research part of this study is an exemplification of the use of an econometric model to study the dependence of the financial results of a sector separated based on the type of

economic activity (namely transport and warehousing) on the current macroeconomic situation (described by the dynamics of changes in more important economic aggregates, including those regarding trade relations with foreign countries, level of key prices in the financial and real economy and the state of security of the immediate external environment). The study aims to evaluate the impact of key macroeconomic changes on the financial efficiency of Polish enterprises operating within the transport and storage sector.

The structure of the article is as follows. After the introductory part, a literature review is conducted, with particular emphasis on research results related to Poland. The next section presents the research intention, the essence of the econometric model used, and the sources that provided empirical data for this model. The following section presents and discusses the research results obtained at a 5% significance level. In the concluding section, macroeconomic factors that are key determinants of the financial condition of the Polish transport and warehousing sector are listed, the sensitivity of industries within this sector to the effects of the Russia-Ukraine war is assessed, the implications of the formulated conclusions for economic policy are pointed out, limitations of the conducted research are highlighted, and further research directions in this area are proposed.

2. Literature review

Duraj et al. (2020) include macroeconomic factors, such as the level of the country's socio-economic development, the level of inflation, the unemployment rate, the state's fiscal and monetary policy, the stability of regulations governing business activity and the economic situation, among the key external determinants of the financial security of enterprises. Many researchers are interested in searching for connections between various indicators describing the state of the macro-environment of enterprises and their financial situation (cf. Comporek et al., 2022), which is reflected in the extensive literature on the subject.

Research on Poland is diverse in terms of subject and time scope, as well as in terms of the research method used. Szydło (2015) identified the macroeconomic determinants of the financial stability of enterprises based on data from the period 1995–2013. In turn, the aim of the research by Juszczyk et al. (2020) was to determine the direction and strength of the impact of selected macroeconomic factors on the level of financial efficiency of food industry enterprises in 2005–2018. Dawidziuk (2020) examined the relationship between macroeconomic factors and the financial liquidity of enterprises in twenty years covering the years 2000–2019, concluding that the strongest correlation between interest rates, exchange rates, inflation rate, unemployment rate, and financial liquidity indicators occurred in the case of enterprises representing transport and warehousing sector. This means that econometric models with macroeconomic explanatory variables may have particular predictive value concerning this particular sector.

The loss of a company's ability to settle its current liabilities is the first symptom of possible bankruptcy. The issue of macroeconomic causes of company bankruptcy, with particular emphasis on transport companies, was addressed by Siciński (2019, 2021), and the result of these investigations was the design of an econometric model for predicting company bankruptcy.

Observing the financial situation of enterprises allows us not only to notice signs of bankruptcy, but also to recognize development potential. The latter aspect is related to the ability and tendency of enterprises to invest in fixed capital. As indicated by research conducted by Nehrebecka and Jarosz (2012) based on data from the period 1995–2010 regarding

non-financial enterprises, their financial condition translates into investment decisions, and the investments of a fraction of small enterprises are characterized by a much greater sensitivity to economic downturns than the investments of the entire group of enterprises. An attempt to identify the macroeconomic determinants of corporate investment was made by Czyżowska (2014), using data from the period 1995–2011. Similarly, Juszczyk et al. (2017) and Sytnik et al. (2019) – based on data from the period 1995–2015 and 2005–2017, respectively – identified macroeconomic factors of key importance for corporate investment.

Analogous research is conducted for countries other than Poland. These are usually sectoral analyses, i.e. they concern enterprises grouped based on various criteria, in particular based on the type of business activity or the level of employment. Researchers recognize the impact of macroeconomic factors on the financial results of enterprises representing both the real sphere of the economy (e.g. manufacturing enterprises in Nigeria (Egbunike & Okerekeoti, 2018), industrial enterprises in Ukraine (Vlasova & Nosyriev, 2018), textile industry enterprises in Pakistan (Ullah et al., 2020)), as well as enterprises in the financial and insurance sphere (e.g. banks in Turkey (Civan et al., 2023), insurance companies in Malaysia (Ismail et al., 2018) or Bangladesh (Hasan et al., 2018)).

An example area of practical application of the results of this type of research is banking feasibility studies of investment projects. The study by Engelhardt (2020) discusses the principles of analysis of the macroeconomic market environment as part of feasibility studies of rolling stock projects in rail transport.

An important subject of economic research is the impact of wars on the economies of countries involved in military operations, as well as on other countries, especially neighbouring countries. Guidolin and La Ferrara (2007) studied the relationship between civil war and the value of private firms in the example of Angola. In turn, De Groot (2010) examined the influence of conflict on the economies of neighbouring countries. Although these studies concerned African countries, the author, like the authors of this study, tried to identify the spillover effects of conflict on neighbouring countries' economies. Similarly, the impact of civil wars on economic growth in the country at war and in neighbouring countries was studied by Murdoch and Sandler (2002).

An et al. (2020) provided their model with rich empirical material, giving their research a wide spatial scope. The authors concluded that wars increase the supply of military directors in corporate boards, and management by military directors reduces firm performance as measured by Tobin's Q and ROA. Martins et al. (2023) studied the short-term market impact of the beginning of the military conflict between Russia and Ukraine on the largest European banks.

Nielsen et al. (2023) formulated some generalizations based on an extensive review of the scientific literature, including empirical studies aimed at determining the economic impacts of disasters (natural or human-induced), i.a. wars and the COVID-19 pandemic. The impact of COVID-19 on the financial liquidity of Greek firms listed on the Athens Stock Exchange was studied by Nerantzidis et al. (2023). An in-depth study of the relationship between conflicts and economics, including valuable recommendations for economic policy aimed at reducing the risk of conflicts, shortening ongoing conflicts, and promoting peace, is the work of Humphreys (2003).

In this study, when examining the impact of macroeconomic factors and the impact of the war in Ukraine on the financial results of the selected sector of the Polish economy, key characteristics of the macro environment, as well as the spillover effect of the economic consequences of the war on neighbouring countries, were taken into account.

3. Material and methods

The econometric model used in this study was supplied with empirical input in the form of the following data sets:

- financial efficiency indicators of enterprises based in Poland, representing the "Transport and warehousing" sector – they were calculated using unpublished data from the Central Statistical Office regarding enterprises that – by the obligation established in the Legal Act (Lower House of Parliament of the Republic of Poland, 1995) – submitted, on a standardized form marked "F-01/I-01", "financial statement on revenues, costs, and financial result as well as expenditure on fixed assets", relating to the period included in the time scope of the research;
- selected macroeconomic data for Poland, regarding aggregate demand, investments, trade relations with foreign, wage income, unemployment, and inflation – these data come from the Macroeconomic Data Bank of the Central Statistical Office (Statistics Poland, 2024);
- basic data from various segments of the financial market, which included profitability rates of Polish treasury bonds and exchange rates and interest rates that are more important from the point of view of the Polish economy – these data have been taken from tables published on the website of the National Bank of Poland (2024);
- prices of crude oil (an energy raw material with a strong impact on transport costs), listed on the London Intercontinental Exchange (Investing.com, 2024) and constituting a benchmark for the shares of other exchanges where this raw material is traded.

In addition, a factor was taken into account that describes external conditions related to national security that are important for the Polish economy, namely a binary variable indicating whether hostilities were carried out in Ukraine in a given period.

A summary of the explanatory variables used to model the financial efficiency of companies in the transport and warehousing sector is presented in Table 1, together with the definition of the variables and a reference to the literature.

Table 1. List of explanatory variables concerning sources (source: own elaboration)

Variable	Definition	Source
ddem_yy	change in domestic demand year to year	Fernandes and Winters (2021)
inv_yy	change in gross fixed capital formation year to year	Fernandes and Winters (2021)
exp_yy	change in export value year to year	Feenstra (2018)
imp_yy	change in the value of imports year to year	Fernandes and Winters (2021)
wages_yy	change in wages in the economy from year to year	Siebert (2024)
uerate	unemployment rate	Blanchflower and Bryson (2021)
CPI_yy	year-on-year change in the CPI	Bolhuis et al. (2022)
CPIfuels_yy	year-on-year change in the fuel CPI	Bolhuis et al. (2022), Chen et al. (2022)
CPIenergy_yy	year-on-year change in the CPI for energy sources	Bolhuis et al. (2022)
CPIfood_yy	year-on-year change in the food CPI	Bolhuis et al. (2022)

End of Table 1

Variable	Definition	Source
PPI_yy	year-to-year change in the price index of producer goods	Bolhuis et al. (2022)
EURPLN	EUR/PLN exchange rate	Derayati (2016)
EURUSD	EUR/USD exchange rate	Derayati (2016)
ECBrate	The interest rate of the European Central Bank	Binici et al. (2019)
WIBOR3m	three-month interbank interest rate in Poland	Król (2023)
Ptby2y	yield of two-year Polish treasury bonds	Binici et al. (2019)
brent_yy	change in the price of crude oil on the London Intercontinental Exchange year to year	Crawford et al. (2021)
war?	a binary variable indicating whether hostilities were carried out in Ukraine in a given period	Ruta (2022)

Financial efficiency indicators of enterprises are explained variables in the developed models, while the remaining data refer to the macro-environment of the enterprise and act as explanatory variables in the models.

Half-yearly time series data were used for the analyses. The time scope of the research is the period from January 1, 2007, to June 30, 2023 (16.5 years).

The object of the research was enterprises employing more than 9 employees (i.e. belonging to the sector of small, medium, and large enterprises), whose main subject of activity according to the PKD (Council of Ministers of the Republic of Poland, 2007) was:

"Other land passenger transport" (PKD 49.3), including, among others, urban or suburban passenger transport, passenger taxi operations, long-distance bus transport – scheduled and occasional;

"Road transport of goods and service activities related to removals" (PKD 49.4);

"Warehousing and storage of goods" (PKD 52.1);

"Service activities supporting transport" (PKD 52.2).

These are the most frequently represented PKD groups in section H "Transport and warehousing". According to data relating to 2022 (Statistics Poland, 2024), enterprises operating in these groups accounted for 96% of enterprises belonging to the transport and warehousing sector, and their sales revenues accounted for 78% of the sales revenues of the entire section H.

The methodology used in this study was designed to assess the impact of macroeconomic factors on the financial efficiency of Polish companies operating in the transport and storage sector, with particular attention to external shocks caused by the Russian-Ukrainian war. Given the dynamic nature of macroeconomic impacts and the need to analyse firm-level data across multiple time periods, a panel data approach was deemed most suitable. This methodology enables us to account for both cross-sectional and temporal variations, providing a comprehensive understanding of sector-wide effects.

The selection of variables for inclusion in the model was based on their significance in the existing literature and their impact on the financial efficiency of enterprises in the transport and warehousing sector under macroeconomic and geopolitical shocks. The use of macroeconomic variables such as inflation, exchange rates, fuel prices, interest rates, and demand and investment indicators is well justified by prior research on the determinants of corporate financial performance (Dawidziuk, 2020; Duraj et al., 2020; Comporek et al., 2022). Moreover,

previous studies have demonstrated that these variables play a crucial role in modelling financial efficiency in industries sensitive to macroeconomic fluctuations (Arellano & Bond, 1991; Blundell & Bond, 1998; Goddard et al., 2005). A particularly important factor in this study was the inclusion of the impact of the war in Ukraine as a binary variable, reflecting research on the economic consequences of armed conflicts (Murdoch & Sandler, 2002; Guidolin & La Ferrara, 2007; De Groot, 2010). The selection of these variables allowed for capturing the key mechanisms affecting the sector's financial performance and facilitated the application of dynamic panel models, which are widely used in macroeconomic studies analysing sectoral financial outcomes (AitBihiOuali et al., 2020; Ke et al., 2020).

To model the dynamic relationships inherent in financial performance and to address the potential endogenic of explanatory variables (e.g., macroeconomic indicators potentially influenced by firm-level financial performance), we adopted Generalized Method of Moments (GMM), which considers the potential endogenic of the explanatory variables. The GMM is widely used in panel data analysis, particularly in studies of corporate financial performance (Arellano & Bond, 1991; Blundell & Bond, 1998). The method controls for both time-invariant unobserved heterogeneity and dynamic relationships between variables.

Dynamic panel data models were used to estimate the relationships, i.e. econometric models whose parameters are estimated based on panel data, assuming that the explained variable is influenced, in addition to the explanatory variables, by lagged levels of the explained variable and unmeasurable constants in time and facility-specific factors, called group effects (Dańska-Borsiak, 2009; Ahmad et al., 2021). The dynamic panel model has the form:

$$y_{it} = \gamma y_{i,t-1} + x_{it}^{T}\beta + u_{it} = \gamma y_{i,t-1} + x_{it}^{T}\beta + \alpha_i + \varepsilon_{i,t}, \tag{1}$$

where: $i = 1,\ldots,N$; $t = 1,\ldots,T$; $\varepsilon_{i,t} \sim N(0,\sigma_{\varepsilon}^{2})$ for all i, t, α_i – group effect, random or non-random. However, if α_i are random, then $\alpha_i \sim N\left(0,\sigma_{\alpha}^{2}\right)$, $[x_{kit}]_{Kx1}$ is a vector of explanatory variables with K coordinates, β is a vector of parameters ($Kx1$), the same for all i and t (Arellano & Bond, 1991; Baloch et al., 2021).

Using the method described above, 20 models were developed. The number of models is the product of the number of explained variables (5 financial efficiency indicators) and the number of analysed PKD groups from the "Transport and warehousing" section (4). There were 18 explanatory variables in each equation.

4. Results and discussion

Estimation of model parameters allowed us to determine the direction and strength of the influence of individual factors on the financial efficiency indicators of four industries representing the transport and warehousing sectors.

The results of estimating the parameters of models in which the explained variable was the ROE are presented in Table A1 of the Appendix. At the assumed significance level of 5%, seven of the macroeconomic factors included in the modelling had a statistically significant impact on the ROE value of all four considered industries (PKD groups) of the warehouse and transport sectors. These factors are the dynamics of changes in total investment outlays on fixed assets (inv_yy), the dynamics of changes in the general level of prices of production goods (PPI_yy), the EUR/USD exchange rate (EURUSD), the level of interest rates in the eurozone (ECBrate) and on the interbank market in Poland (WIBOR3m), yield of national treasury bonds (Ptby2y) and fluctuations in crude oil prices on the European benchmark

stock exchange (brent_yy).

At a significance level of 5%, the impact of the war in Ukraine on the ROE value was statistically significant in the case of the subsectors "Other land passenger transport" (PKD 49.3) and "Road transport of goods and service activities related to removals" (PKD 49.4), and the impact this factor was negative.

In the second set of models (Table A2 of the Appendix), the dependent variable was the ROIC. Econometric modelling indicates that for each of the four analysed subsectors (PKD groups), there was a statistically significant impact, with a significance level of 5%, on the value of the ROIC of domestic demand (ddem_yy), the unemployment rate (uerate), and consumer inflation in the fuel commodity group (CPIfuels_yy), the EUR/USD exchange rate (EURUSD), the level of interest rates of the European Central Bank (ECBrate) and the yield of Polish treasury bonds (Ptby2y).

The impact of the variable regarding the war in Ukraine on the ROIC value was statistically significant in the case of three of the four analysed PKD groups: 49.3 – "Other land passenger transport", 49.4 – "Road transport of goods and service activities related to removals" and 52.1 – "Warehousing and storage of goods". In each of these cases, the impact was negative.

Table A3 of the Appendix presents the results of estimating the parameters of models in which the dependent variable was the ROA. In all four studied PKD groups, the impact of investment outlays on fixed assets in the economy (inv_yy), the level of producer inflation (PPI_yy), the level of interest rates in the eurozone (ECBrate), and the yield of domestic treasury bonds (Ptby2y) and fluctuations in oil prices on world markets (brent_yy) was statistically significant with a significance level of 5%.

The war in Ukraine had a statistically significant negative impact on the value of the ROA of the subsectors "Other passenger land transport" (PKD 49.3) and "Road transport of goods and service activities related to removals" (PKD 49.4).

The results of the calculations relating to the ROS index are summarized in Table A4 of the Appendix. In all four analysed industries, the impact of changes in the value of exports (exp_yy), inflation – both consumer (CPI_yy) and producer inflation (PPI_yy), EUR/USD exchange rate (EURUSD), profitability investments in government bonds (Ptby2y) and fluctuations in oil prices on the benchmark London Intercontinental Exchange (brent_yy) was statistically significant at a significance level of 5%.

In the case of industries engaged in other land passenger transport (PKD 49.3), and road transport of goods and service activities related to removals (PKD 49.4), the negative impact of the war in Ukraine on the value of the ROS index was statistically significant.

Table A5 of the Appendix presents the results of parameter estimation for models with EBITDA margin as the explained variable. In all analysed industries, the impact on this variable of changes in the value of exports (exp_yy), the EUR/USD exchange rate (EURUSD), the interest rate of the European Central Bank (ECBrate), and fluctuations in oil prices (brent_yy) were statistically significant, with a significance level of 5%.

The war in Ukraine had – at the assumed significance level of 5% – a statistically significant negative impact on the EBITDA margin in subsectors dealing with other passenger land transport (PKD 49.3) and warehousing and storage of goods. (PKD 52.1).

Based on the calculation results presented in Tables A1–A5 of the Appendix, it can be concluded that the factors that impact the explained variables – at the 5% significance level – were statistically significant in the case of the largest number of models (19 out of 20) were the EUR/USD exchange rate (EURUSD), the level of interest rates in the euro area (ECBrate) and fluctuations in oil prices on world markets (brent_yy). The yield on domestic treasury

bonds (Ptby2y) is a variable whose impact was statistically significant in 18 cases, and producer inflation – in 17 cases of econometric equations.

The war in Ukraine determined the financial efficiency in particular of the "Other passenger land transport" subsector (PKD 49.3), as evidenced by the statistically significant, at a significance level of 5%, impact of this variable on each of the five efficiency indicators included in the study, calculated for this subsector. In the case of the subsector "Road transport of goods and service activities related to removals" (PKD 49.4), this variable influenced four of the five performance indicators taken into account (ROE, ROIC, ROA, and ROS), and in the case of the subsector "Warehousing and storage of goods" (PKD 52.1) – for two of them (ROIC and EBITDA margin). In each of these cases, the impact of this variable was negative.

The regularity of the direction of influence on the financial indicators of individual industries is noticeable in the case of the production price index (PPI_yy), with which – in each case when the relationship was statistically significant at a significance level of 5% – the values of all financial efficiency indicators included in the study, calculated as for the subsectors "Road transport of goods and service activities related to removals" (PKD 49.4) and "Warehousing and storage of goods" (PKD 52.1) were positively correlated, while in the econometric equations for the subsectors "Other land transport of passengers" (PKD 49.3) and "Service activities supporting transport" (PKD 52.2) this factor was an inhibitor. These findings suggest that for the first two industries, demand was stiff, which allowed them to pass on rising service costs to their customers. As a result of the simultaneous increase in margins, there was an increase in financial efficiency with rising prices of production goods. However, in the case of the remaining two industries, the increase in costs was accompanied by a deterioration of the financial situation, which proves that they operated in conditions of flexible demand. These industries were unable to compensate for rising costs by increasing the prices of services provided without compromising sales volumes.

In addition, to check the robustness of the findings, models were estimated by breaking down the macroeconomic data characterizing economic growth in Poland into private current consumption (cons_yy), direct consumption (dcons_yy), and accumulation (accu_yy). Estimation results are presented in Tables A6–A9 of the Appendix. It is worth noting that the results of the robustness of the models confirmed the results obtained, which indicates the relevance of macroeconomic factors and the very occurrence of the Russian-Ukrainian war on the operation and efficiency of companies in the transport and warehousing sector.

The findings of this study highlight the significant impact of macroeconomic factors and the Russian-Ukrainian war on the financial efficiency of Polish enterprises operating in the transport and warehouse sector. Key macroeconomic variables, including the EUR/USD exchange rate, interest rates in the eurozone, fluctuations in oil prices, and producer inflation (PPI), were shown to critically influence financial performance indicators such as ROE, ROIC, ROA, ROS, and EBITDA margin. These results underscore the sensitivity of the sector to external economic conditions. The negative influence of the Russian-Ukrainian war on financial performance was particularly evident in subsectors such as "Other passenger land transport" (PKD 49.3), "Road transport of goods and service activities related to removals" (PKD 49.4), and "Warehousing and storage of goods" (PKD 52.1), emphasizing the vulnerability of these industries to geopolitical disruptions.

5. Conclusions

The impact of macroeconomic factors on the financial efficiency of individual industries in Poland's warehouse and transport sector varies in direction and strength, which reflects the specificity of these industries in the context of macroeconomic determinants of financial condition.

Factors of key importance as macroeconomic determinants of the financial condition of the transport and storage sector have their sources in the financial sphere (level of interest rates in the eurozone, profitability of national treasury bonds, EUR/USD exchange rate) as well as in the real economy (cost factor, which is the price of crude oil on world markets, and a measure of the change in the general level of production costs, which is the production price index). The great importance of the first group of factors indicates strong connections with financial markets and the internationalization of the sector.

The improvement in financial results observed in some industries along with an increase in the production price index can be explained by the stiffness of demand for services in these industries in conditions of limited competition, which would enable the increasing costs to be passed on to service recipients and a camouflaged increase in margins.

In the case of strictly transport industries, and to a lesser extent also in the case of the warehousing and storage industry, there is a noticeable sensitivity to the Russian-Ukrainian conflict. The consequence of the hostilities in Ukraine is the deterioration of the financial condition of these industries.

These findings have important implications for policymakers, investors, researchers, and businesses. Policymakers are encouraged to monitor exchange rate volatility, oil price trends, and producer inflation while designing targeted strategies, such as hedging mechanisms and fiscal support, to mitigate the adverse effects of macroeconomic shocks. Additionally, policies that stabilize interest rates and promote sectoral diversification could further enhance resilience. Investors can utilize these insights to better understand the risks associated with geopolitical tensions and incorporate them into investment decisions. For businesses, the differential impact observed across subsectors suggests that understanding demand elasticity is critical for designing pricing and operational strategies that align with sector-specific conditions. For instance, industries with stiff demand, such as "Road transport of goods" and "Warehousing and storage of goods" managed to pass rising costs to customers, while those with flexible demand, such as "Other passenger land transport" faced greater challenges in maintaining margins.

Monetary policy has a great potential to influence the storage and transport sector, as monetary impulses transmitted to the economy have a significant impact on the financial efficiency of this sector. At the same time, actions within the framework of fiscal and budgetary policy can eliminate the negative impact of shock phenomena in the broadly understood macro-environment of enterprises, such as the outbreak of the war in Ukraine. Research results in this area can support enterprises in taking preventive actions aimed at counteraction of the deterioration of their financial situation, and banks – in assessing the creditworthiness of the sector. These are further potential areas of using the results of this research in business practice.

The robustness of the findings, verified through models incorporating macroeconomic indicators such as private current consumption, direct consumption, and accumulation, underscores the relevance of macroeconomic factors and the war's impact on sectoral

performance. These results provide a foundation for further research into resilience strategies and the broader economic implications of geopolitical shocks. Furthermore, they emphasize the need for tailored policy interventions, including financial instruments to address uncertainties, investments in infrastructure to improve operational efficiency, and public awareness initiatives to foster informed discourse on the challenges faced by critical sectors.

While this study offers valuable insights into the financial efficiency of Polish enterprises in the transport and warehouse sector amid the Russian-Ukrainian war, several limitations should be acknowledged. One limitation arises from the rapidly changing economic environment, which may introduce data gaps and inaccuracies. The broad subsector-level analysis, though informative, may not fully capture sector-specific nuances or regional variations. Moreover, the interplay of concurrent global events, such as the COVID-19 pandemic and shifts in international trade policies, complicates the isolation of the war's specific effects. The study's temporal scope is another limitation, as it focuses primarily on the early phases of the war and does not explore long-term impacts or recovery trajectories. The selection of macroeconomic factors, while comprehensive, excludes other potentially influential variables such as political stability, technological advancements, or shifts in consumer behaviour.

Future research should address these limitations by adopting longitudinal designs to assess the long-term impacts of macroeconomic and geopolitical shocks. Detailed case studies of individual firms or regions could provide micro-level insights and help identify best practices for resilience. Comparative analyses involving different countries or regions affected by similar shocks could enhance the generalizability of the findings. Additionally, future studies should evaluate the effectiveness of existing government policies and industry strategies to identify areas for improvement. Exploring technological adaptations and their role in improving efficiency and resilience would further enrich the understanding of sector dynamics. Further research initiatives in this area can provide valuable insights that will help inform policy decisions, improve business practices and build a more resilient and efficient transportation and storage sector.

Author contributions

A.Z.: conceptualization, design of the study, data collection, data analysis, formal analysis, supervision, interpretation of results, funding acquisition, writing – material, results and discussion, conclusions.

M.I.-B.: data curation, investigation, formal analysis, validation, interpretation of results, writing – methods, results and discussion, conclusions.

R.B.: investigation, formal analysis, validation, interpretation of results, writing – introduction, methods, results and discussion, conclusions.

A.S.: interpretation of results, funding acquisition, writing – introduction, literature review, results and discussion, conclusions.

Disclosure statement

The authors declare no conflict of interest.

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Appendix

Table A1. Calculation results for ROE (Significance level at: * 10%, ** 5%, *** 1%)

Specification	PKD 49.3		PKD 49.4		PKD 52.1		PKD 52.2	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Y(t-1)	0.97752	<0.0001***	–0.08329	0.494	0.59598	<0.0001***	–0.07637	0.5583
const	0.00158	<0.0001***	0.01462	0.0026***	0.00248	0.6062	0.01967	<0.0001***
ddem_yy	0.00227	<0.0001***	–0.00074	0.3784	–0.00469	<0.0001***	0.00591	<0.0001***
inv_yy	–0.00065	<0.0001***	0.00106	0.0007***	–0.00110	0.0143**	–0.00074	<0.0001***
exp_yy	–0.00064	0.0642*	0.00133	0.0974*	–0.00332	0.0506*	0.00559	0.0007***
imp_yy	0.00009	0.5785	0.00057	0.4197	0.00339	0.0743*	–0.00597	0.025**
wages_yy	0.00450	<0.0001***	–0.00162	0.6842	0.01096	<0.0001***	–0.00740	<0.0001***
uerate	0.00760	<0.0001***	0.00904	<0.0001***	0.00934	<0.0001***	–0.00158	0.6733
CPI_yy	0.01408	<0.0001***	–0.00754	0.2294	0.01378	<0.0001***	–0.02479	<0.0001***
CPIfuels_yy	–0.00198	<0.0001***	–0.00009	0.7405	–0.00437	<0.0001***	0.00345	<0.0001***
CPIenergy_yy	–0.00205	0.0021***	–0.00074	0.7864	–0.00658	0.0009***	0.00574	<0.0001***
CPIfood_yy	–0.00055	0.567	0.00170	0.1899	–0.00424	<0.0001***	0.00548	0.0328**
PPI_yy	–0.00426	<0.0001***	0.00828	<0.0001***	0.00698	<0.0001***	–0.00264	<0.0001***
EURPLN	0.00756	0.2197	0.09843	<0.0001***	–0.11643	<0.0001***	–0.03461	0.5056
EURUSD	–0.11220	<0.0001***	0.06806	<0.0001***	–0.04889	0.0036***	0.18535	<0.0001***
ECBrate	–0.01581	<0.0001***	0.02204	0.001***	–0.00143	0.005***	0.03196	<0.0001***
WIBOR3m	0.00954	<0.0001***	–0.00976	0.0028***	0.02641	<0.0001***	–0.04135	<0.0001***
Ptby2y	0.00300	<0.0001***	0.02158	<0.0001***	–0.02937	<0.0001***	0.05262	<0.0001***
brent_yy	0.00039	<0.0001***	–0.00085	0.0021***	0.00128	<0.0001***	–0.00092	<0.0001***
war?	–0.08728	<0.0001***	–0.11203	<0.0001***	–0.02685	0.3594	–0.01198	0.7231
The sum of squared residuals	0.00043		0.004865		0.008333		0.006741	
Standard error of residuals	0.006908		0.02325		0.030429		0.027368	
AR(1) test	–1.36412		–1.3993		–1.39495		–1.1585	
AR(2) test	1.4103		–1.29379		–1.31342		–0.419985	
Sargan test	8.68955		9.71119		8.96092		8.62455	

Table A2. Calculation results for ROIC (Significance level at: * 10%, ** 5%, *** 1%)

Specification	PKD 49.3		PKD 49.4		PKD 52.1		PKD 52.2	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Y(t-1)	0.91317	<0.0001***	–0.00893	0.9304	0.67004	<0.0001***	0.17641	0.0001***
const	0.00114	0.008***	0.00775	0.0318**	–0.00195	0.4782	0.00455	0.0004***
ddem_yy	0.00204	<0.0001***	0.00149	0.0127**	–0.00411	<0.0001***	0.00343	<0.0001***
inv_yy	–0.00032	0.0682*	0.00006	0.714	–0.00061	0.0947*	–0.00063	<0.0001***
exp_yy	–0.00022	0.6323	0.00074	0.2539	–0.00373	0.0004***	0.00203	0.0002***
imp_yy	–0.00003	0.9327	–0.00015	0.7559	0.00403	<0.0001***	–0.00266	0.0023***
wages_yy	0.00187	0.1701	–0.00283	0.3776	0.00865	<0.0001***	–0.00369	<0.0001***
uerate	0.00484	<0.0001***	0.00537	<0.0001***	0.00561	<0.0001***	–0.00399	<0.0001***
CPI_yy	0.00962	0.0002***	0.00483	0.3868	0.01595	<0.0001***	–0.00113	0.3342
CPIfuels_yy	–0.00148	<0.0001***	–0.00118	<0.0001***	–0.00421	<0.0001***	–0.00044	<0.0001***
CPIenergy_yy	–0.00115	0.2231	–0.00143	0.3966	–0.00480	<0.0001***	0.00119	0.0147**
CPIfood_yy	–0.00016	0.8758	–0.00224	0.1224	–0.00492	<0.0001***	–0.00182	0.1066
PPI_yy	–0.00293	<0.0001***	0.00502	<0.0001***	0.00369	<0.0001***	–0.00057	0.1781
EURPLN	0.01017	0.0065***	0.03798	<0.0001***	–0.04653	<0.0001***	–0.02935	0.056*
EURUSD	–0.08386	<0.0001***	0.04381	<0.0001***	–0.10521	<0.0001***	0.06147	<0.0001***
ECBrate	–0.01047	<0.0001***	0.01171	0.0174**	–0.01230	<0.0001***	0.00816	<0.0001***
WIBOR3m	0.00868	<0.0001***	0.00208	0.406	0.03220	<0.0001***	–0.00561	<0.0001***
Ptby2y	0.00115	0.0372**	0.00407	0.0078***	–0.02818	<0.0001***	0.01080	<0.0001***
brent_yy	0.00029	<0.0001***	–0.00022	0.2396	0.00119	<0.0001***	0.00013	0.0111**
war?	–0.06683	<0.0001***	–0.05277	<0.0001***	–0.05902	0.0429**	–0.00106	0.7057
The sum of squared residuals	0.000357		0.001669		0.003862		0.001249	
Standard error of residuals	0.006297		0.013619		0.020714		0.01178	
AR(1) test	–1.35118		–1.40708		–1.33405		–1.41394	
AR(2) test	–1.3731		0.441713		–1.36762		–1.2436	
Sargan test	8.63786		12.801		8.73337		10.381	

Table A3. Calculation results for ROA (Significance level at: * 10%, ** 5%, *** 1%)

Specification	PKD 49.3		PKD 49.4		PKD 52.1		PKD 52.2	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Y(t-1)	1.00044	<0.0001***	–0.11069	0.2997	0.58973	<0.0001***	0.10349	0.5138
const	0.00036	0.0771*	0.00732	<0.0001***	0.00065	0.742	0.00955	<0.0001***
ddem_yy	0.00098	<0.0001***	0.00017	0.5435	–0.00148	<0.0001***	0.00242	0.0029***
inv_yy	–0.00026	0.001***	0.00026	0.0002***	–0.00045	0.016**	–0.00017	0.0329**
exp_yy	–0.00017	0.2758	0.00074	0.0016***	–0.00234	<0.0001***	0.00311	0.0021***
imp_yy	–0.00014	0.0008***	0.00010	0.5126	0.00235	0.0005***	–0.00313	0.0293**
wages_yy	0.00169	0.0006***	–0.00172	0.2636	0.00361	<0.0001***	–0.00478	<0.0001***
uerate	0.00285	<0.0001***	0.00314	<0.0001***	0.00401	0.0002***	–0.00138	0.2316
CPI_yy	0.00546	<0.0001***	–0.00457	0.0559*	0.00802	<0.0001***	–0.01372	<0.0001***
CPIfuels_yy	–0.00067	<0.0001***	–0.00023	0.1866	–0.00222	<0.0001***	0.00161	<0.0001***
CPIenergy_yy	–0.00072	0.0079***	0.00030	0.7414	–0.00323	<0.0001***	0.00365	<0.0001***
CPIfood_yy	–0.00027	0.5342	0.00085	0.0928*	–0.00198	<0.0001***	0.00317	<0.0001***
PPI_yy	–0.00178	<0.0001***	0.00321	<0.0001***	0.00313	<0.0001***	–0.00179	0.0129**
EURPLN	0.00350	0.2333	0.03359	<0.0001***	–0.04307	<0.0001***	–0.01602	0.4355
EURUSD	–0.04243	<0.0001***	0.03065	<0.0001***	–0.00723	0.4554	0.11361	<0.0001***
ECBrate	–0.00615	<0.0001***	0.01006	0.0002***	–0.00237	<0.0001***	0.01459	<0.0001***
WIBOR3m	0.00307	<0.0001***	–0.00310	0.0579*	0.01196	0.0003***	–0.01940	<0.0001***
Ptby2y	0.00102	<0.0001***	0.00848	<0.0001***	–0.01287	<0.0001***	0.02440	<0.0001***
brent_yy	0.00015	<0.0001***	–0.00027	0.0084***	0.00054	<0.0001***	–0.00035	<0.0001***
war?	–0.02926	<0.0001***	–0.04780	<0.0001***	–0.00515	0.6796	–0.00630	0.7414
The sum of squared residuals	0.000095		0.00065		0.001447		0.001532	
Standard error of residuals	0.003245		0.008498		0.01268		0.013049	
AR(1) test	–1.3548		–1.38866		–1.3691		–1.26933	
AR(2) test	1.40909		–1.28769		–1.26283		–0.182399	
Sargan test	8.10062		9.68412		9.63931		8.65675	

Table A4. Calculation results for ROS (Significance level at: * 10%, ** 5%, *** 1%)

Specification	PKD 49.3		PKD 49.4		PKD 52.1		PKD 52.2	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Y(t-1)	1.00581	<0.0001***	–0.12189	0.1697	0.39146	<0.0001***	–0.10267	0.4236
const	0.00155	<0.0001***	0.00598	<0.0001***	0.00218	0.485	0.02292	<0.0001***
ddem_yy	0.00229	<0.0001***	0.00015	0.5746	–0.00021	0.1268	0.00815	<0.0001***
inv_yy	–0.00064	0.001***	0.00012	0.0472**	–0.00032	0.0852*	–0.00131	<0.0001***
exp_yy	–0.00126	0.0058***	0.00073	<0.0001***	–0.00283	<0.0001***	0.00636	<0.0001***
imp_yy	0.00057	0.0753*	0.00013	0.0739*	0.00302	0.0003***	–0.00696	0.0178**
wages_yy	0.00624	<0.0001***	–0.00110	0.4529	–0.00016	0.8251	–0.00776	<0.0001***
uerate	0.00975	<0.0001***	0.00191	<0.0001***	0.00432	0.001***	–0.00128	0.8043
CPI_yy	0.01744	<0.0001***	–0.00438	0.0013***	0.00817	<0.0001***	–0.02516	0.0001***
CPIfuels_yy	–0.00261	<0.0001***	–0.00028	0.3529	–0.00279	<0.0001***	0.00416	<0.0001***
CPIenergy_yy	–0.00267	0.007***	0.00045	0.464	–0.00341	0.0015***	0.00520	<0.0001***
CPIfood_yy	–0.00062	0.6366	0.00081	0.0006***	–0.00079	0.1824	0.00526	0.152
PPI_yy	–0.00488	<0.0001***	0.00269	<0.0001***	0.00398	0.0003***	–0.00246	<0.0001***
EURPLN	0.01094	0.1065	0.03319	<0.0001***	–0.05805	<0.0001***	–0.04376	0.4915
EURUSD	–0.15535	<0.0001***	0.03033	<0.0001***	0.05217	0.0036***	0.19853	0.0003***
ECBrate	–0.02029	<0.0001***	0.00838	0.0001***	–0.00001	0.9468	0.03935	<0.0001***
WIBOR3m	0.01167	<0.0001***	–0.00364	0.0154**	0.01021	0.0756*	–0.04821	<0.0001***
Ptby2y	0.00418	<0.0001***	0.00749	<0.0001***	–0.01120	0.0023***	0.06143	<0.0001***
brent_yy	0.00053	<0.0001***	–0.00025	0.0248**	0.00055	<0.0001***	–0.00128	<0.0001***
war?	–0.11610	<0.0001***	–0.04449	<0.0001***	0.01254	0.3753	–0.00818	0.8503
The sum of squared residuals	0.000627		0.000745		0.004179		0.009289	
Standard error of residuals	0.008346		0.009101		0.021548		0.032127	
AR(1) test	–1.34589		–1.35512		–1.33967		–1.18091	
AR(2) test	1.39534		–1.12013		–0.839589		–0.198493	
Sargan test	8.82213		10.1295		10.213		8.63049	

Table A5. Calculation results for EBITDA (Significance level at: * 10%, ** 5%, *** 1%)

Specification	PKD 49.3		PKD 49.4		PKD 52.1		PKD 52.2	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Y(t-1)	0.85326	<0.0001***	0.64441	<0.0001***	0.02608	0.7984	–0.09618	0.004***
const	0.00506	<0.0001***	0.00317	0.4314	0.00292	0.0611*	0.01826	<0.0001***
ddem_yy	0.00205	<0.0001***	–0.00256	<0.0001***	0.00025	0.6172	0.00377	0.0305**
inv_yy	–0.00086	<0.0001***	0.00099	0.026**	0.00018	0.0864*	–0.00051	0.0015***
exp_yy	–0.00117	0.0013***	–0.00280	0.0133**	0.00085	0.0079***	0.00446	<0.0001***
imp_yy	0.00074	0.0191**	0.00378	<0.0001***	0.00006	0.7304	–0.00466	0.0291**
wages_yy	0.00142	0.1242	–0.00080	0.8041	–0.00083	0.7011	–0.00859	0.0006***
uerate	0.00735	<0.0001***	0.00485	<0.0001***	0.00004	0.9396	–0.00300	0.569
CPI_yy	0.01526	0.0047***	0.01562	<0.0001***	–0.00270	0.1457	–0.02577	0.0038***
CPIfuels_yy	–0.00309	<0.0001***	–0.00269	<0.0001***	–0.00034	0.1989	0.00366	<0.0001***
CPIenergy_yy	–0.00310	0.031**	–0.00228	0.2593	0.00051	0.5904	0.00566	<0.0001***
CPIfood_yy	–0.00202	0.3513	–0.00223	<0.0001***	0.00048	0.3357	0.00902	0.076*
PPI_yy	–0.00271	0.0519*	–0.00060	0.7498	0.00170	<0.0001***	–0.00393	<0.0001***
EURPLN	0.00904	0.4581	–0.03135	<0.0001***	0.03779	<0.0001***	–0.03967	0.493
EURUSD	–0.09278	<0.0001***	–0.02534	0.0062***	0.03298	<0.0001***	0.13744	0.012**
ECBrate	–0.01222	<0.0001***	–0.01675	<0.0001***	0.00635	0.0142**	0.02602	<0.0001***
WIBOR3m	0.01748	<0.0001***	0.01414	0.0659*	–0.00683	<0.0001***	–0.04672	<0.0001***
Ptby2y	0.00092	0.4578	–0.00195	0.242	0.00884	<0.0001***	0.05010	<0.0001***
brent_yy	0.00056	<0.0001***	0.00069	<0.0001***	-0.00026	0.0214**	–0.00058	<0.0001***
war?	–0.11443	<0.0001***	–0.06205	0.0777*	–0.03530	0.0002***	0.01338	0.4401
The sum of squared residuals	0.001113		0.001055		0.005034		0.008925	
Standard error of residuals	0.011118		0.010829		0.023651		0.03149	
AR(1) test	–1.38234		–1.41187		–1.33283		–1.38212	
AR(2) test	–1.19464		–0.747014		–1.0716		0.329336	
Sargan test	10.0836		9.21221		8.80439		9.24647	

Table A6. Verifying the robustness of the results for PKD 49.3 (Significance level at: * 10%, ** 5%, *** 1%)

Specification	ROE		ROIC		ROA		ROS		EBITDA	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Y(t-1)	0.82033	<0.0001***	0.75066	<0.0001***	0.74931	<0.0001***	0.85369	<0.0001***	0.68835	<0.0001***
const	0.00057	0.0536*	0.00023	0.344	0.00030	0.0037***	–0.00039	<0.0001***	0.00087	0.1128
cons_yy	0.00100	<0.0001***	0.00072	<0.0001***	0.00048	<0.0001***	0.00077	<0.0001***	–0.00018	0.5866
dcons_yy	–0.00090	<0.0001***	–0.00035	<0.0001***	–0.00045	<0.0001***	–0.00109	<0.0001***	–0.00176	<0.0001***
accu_yy	0.00066	0.0051***	0.00078	<0.0001***	0.00023	0.0319**	0.00090	<0.0001***	0.00150	<0.0001***
inv_yy	–0.00076	<0.0001***	–0.00056	<0.0001***	–0.00024	<0.0001***	–0.00094	<0.0001***	–0.00181	<0.0001***
exp_yy	–0.00109	0.0177**	–0.00027	0.5647	–0.00039	0.0497**	–0.00165	0.003***	–0.00163	0.001***
imp_yy	0.00066	0.0725*	–0.00001	0.9832	0.00022	0.1177	0.00102	0.0329**	0.00110	0.0064***
wages_yy	0.00699	<0.0001***	0.00448	<0.0001***	0.00234	<0.0001***	0.01003	<0.0001***	0.00997	<0.0001***
uerate	0.00728	<0.0001***	0.00504	<0.0001***	0.00260	<0.0001***	0.00934	<0.0001***	0.00694	<0.0001***
cpirr	0.01450	<0.0001***	0.00930	<0.0001***	0.00486	<0.0001***	0.01859	<0.0001***	0.01882	<0.0001***
CPIfuels_yy	–0.00219	<0.0001***	–0.00169	<0.0001***	–0.00070	<0.0001***	–0.00302	<0.0001***	–0.00424	<0.0001***
CPIenergy_yy	–0.00229	<0.0001***	–0.00129	0.0656*	–0.00064	<0.0001***	–0.00309	<0.0001***	–0.00399	0.0016***
CPIfood_yy	–0.00147	<0.0001***	–0.00085	0.1277	–0.00041	<0.0001***	–0.00204	0.0013***	–0.00499	0.0067***
ppirr	–0.00428	<0.0001***	–0.00279	<0.0001***	–0.00181	<0.0001***	–0.00485	<0.0001***	–0.00279	0.0045***
EURPLN	0.01727	<0.0001***	0.01567	<0.0001***	0.00854	<0.0001***	0.02031	<0.0001***	0.01759	0.0456**
EURUSD	–0.10936	<0.0001***	–0.08747	<0.0001***	–0.03682	<0.0001***	–0.15760	<0.0001***	–0.12077	<0.0001***
ECBrate	–0.01935	<0.0001***	–0.01297	<0.0001***	–0.00699	<0.0001***	–0.02610	<0.0001***	–0.02709	<0.0001***
WIBOR3m	0.01008	<0.0001***	0.01013	<0.0001***	0.00263	0.0011***	0.01422	<0.0001***	0.02684	<0.0001***
Ptby2y	0.00345	<0.0001***	0.00001	0.9739	0.00215	<0.0001***	0.00242	<0.0001***	–0.00676	0.0257**
brent_yy	0.00031	<0.0001***	0.00026	<0.0001***	0.00009	<0.0001***	0.00048	<0.0001***	0.00064	<0.0001***
war?	–0.08509	<0.0001***	–0.06061	<0.0001***	–0.02964	<0.0001***	–0.10921	<0.0001***	–0.10401	<0.0001***

Table A7. Verifying the robustness of the results for PKD 49.4 (Significance level at: * 10%, ** 5%, *** 1%)

Specification	ROE		ROIC		ROA		ROS		EBITDA	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Y(t-1)	–0.05777	0.6849	–0.00831	0.9535	–0.08183	0.5136	–0.08997	0.4197	0.02957	0.8086
const	0.01230	0.0015***	0.00138	0.6155	0.00627	<0.0001***	0.00440	<0.0001***	0.00225	<0.0001***
cons_yy	–0.00153	0.0164**	–0.00211	<0.0001***	–0.00041	<0.0001***	–0.00062	<0.0001***	–0.00027	0.0154**
dcons_yy	0.00089	0.5999	0.00044	0.4057	0.00043	0.5058	0.00036	0.6122	0.00018	0.8152
accu_yy	0.00045	<0.0001***	0.00225	<0.0001***	0.00033	0.0012***	0.00045	0.0031***	0.00015	0.178
inv_yy	0.00054	0.1716	–0.00155	<0.0001***	0.00003	0.1657	–0.00023	<0.0001***	0.00009	0.0898*
exp_yy	0.00196	<0.0001***	0.00180	0.0141**	0.00104	<0.0001***	0.00106	<0.0001***	0.00090	<0.0001***
imp_yy	–0.00036	0.3664	–0.00185	0.021**	–0.00034	0.0348**	–0.00037	0.0775*	–0.00002	0.958
wages_yy	0.00134	0.4317	0.00896	<0.0001***	–0.00015	0.3472	0.00136	0.0006***	0.00031	0.3113
uerate	0.00977	<0.0001***	0.00705	<0.0001***	0.00356	<0.0001***	0.00242	<0.0001***	0.00035	0.643
cpirr	–0.00754	0.0001***	0.00923	0.0481**	–0.00442	<0.0001***	–0.00371	<0.0001***	–0.00257	<0.0001***
CPIfuels_yy	–0.00063	0.0135**	–0.00294	<0.0001***	–0.00047	0.0674*	–0.00066	0.1186	–0.00049	0.2176
CPIenergy_yy	–0.00096	0.6314	–0.00276	0.0934*	0.00015	0.8029	0.00019	0.4485	0.00039	0.3589
CPIfood_yy	0.00118	<0.0001***	–0.00585	<0.0001***	0.00051	0.0397**	0.00017	0.7987	0.00028	0.5246
ppirr	0.00904	<0.0001***	0.00589	<0.0001***	0.00354	<0.0001***	0.00302	<0.0001***	0.00187	0.0002***
EURPLN	0.09183	<0.0001***	0.03358	<0.0001***	0.03169	<0.0001***	0.03111	<0.0001***	0.03825	<0.0001***
EURUSD	0.03717	<0.0001***	–0.03431	0.001***	0.01667	<0.0001***	0.01109	0.0278**	0.02216	<0.0001***
ECBrate	0.01880	<0.0001***	–0.00451	0.1608	0.00861	<0.0001***	0.00533	0.0006***	0.00512	0.0003***
WIBOR3m	–0.00384	0.1171	0.01999	<0.0001***	–0.00065	0.7584	0.00025	0.9194	–0.00515	0.0066***
Ptby2y	0.01376	0.0013***	–0.01352	<0.0001***	0.00525	<0.0001***	0.00293	<0.0001***	0.00705	<0.0001***
brent_yy	–0.00064	<0.0001***	0.00016	0.1054	–0.00019	<0.0001***	–0.00014	0.0224**	–0.00021	0.0002***
war?	–0.09782	0.0016***	–0.03415	<0.0001***	–0.04184	0.0003***	–0.03741	0.0003***	–0.03392	0.0107**

Table A8. Verifying the robustness of the results for PKD 52.1 (Significance level at: * 10%, ** 5%, *** 1%)

Specification	ROE		ROIC		ROA		ROS		EBITDA	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Y(t-1)	0.76255	<0.0001***	0.77093	<0.0001***	0.66844	0.0011***	0.38018	0.0027***	0.66053	<0.0001***
const	–0.00608	0.1699	–0.00631	0.2752	–0.00074	0.6762	0.00475	<0.0001***	0.00833	0.0001***
cons_yy	–0.00558	0.044**	–0.00330	0.1821	–0.00130	0.2762	0.00058	0.5127	0.00018	0.687
dcons_yy	–0.00094	0.4872	–0.00140	0.3167	0.00000	0.9924	0.00098	<0.0001***	0.00185	<0.0001***
accu_yy	0.00109	0.5881	–0.00021	0.8927	0.00005	0.9439	–0.00044	0.4606	–0.00154	<0.0001***
inv_yy	–0.00309	0.0058***	–0.00140	0.155	–0.00080	0.0662*	0.00008	0.8231	0.00190	<0.0001***
exp_yy	–0.00287	0.0558*	–0.00422	<0.0001***	–0.00219	<0.0001***	–0.00246	0.0009***	–0.00226	0.0663*
imp_yy	0.00207	0.3228	0.00428	<0.0001***	0.00200	0.0045***	0.00268	0.0284**	0.00330	0.0084***
wages_yy	0.02180	0.0565*	0.01277	0.2728	0.00496	0.2956	–0.00418	0.2081	–0.01059	<0.0001***
uerate	0.01083	<0.0001***	0.00534	0.011**	0.00428	0.0028***	0.00453	0.0079***	0.00487	<0.0001***
cpirr	0.02281	0.0234**	0.02205	0.0834*	0.00929	0.0395**	0.00408	<0.0001***	0.00741	0.0076***
CPIfuels_yy	–0.00656	0.0028***	–0.00525	0.031**	–0.00256	0.0015***	–0.00218	<0.0001***	–0.00135	<0.0001***
CPIenergy_yy	–0.00899	<0.0001***	–0.00605	0.0066***	–0.00358	<0.0001***	–0.00256	<0.0001***	–0.00049	0.7884
CPIfood_yy	–0.00802	0.1626	–0.00686	0.2434	–0.00239	0.2991	0.00094	0.58	0.00185	<0.0001***
ppirr	0.00776	<0.0001***	0.00359	<0.0001***	0.00336	<0.0001***	0.00427	<0.0001***	–0.00008	0.9664
EURPLN	–0.14733	<0.0001***	–0.05837	<0.0001***	–0.05142	<0.0001***	–0.06072	<0.0001***	–0.04243	<0.0001***
EURUSD	–0.15396	0.1685	–0.14438	0.1273	–0.02413	0.6008	0.06841	0.0929*	0.01034	0.0098***
ECBrate	–0.02384	0.3545	–0.02560	0.3272	–0.00564	0.603	0.00907	0.1852	0.00190	0.6546
WIBOR3m	0.05209	0.0862*	0.04471	0.0756*	0.01641	0.1912	0.00486	0.6788	0.00302	0.7782
Ptby2y	–0.05829	0.0265**	–0.04120	0.0495**	–0.01860	0.1051	–0.00721	0.4895	0.00505	0.4405
brent_yy	0.00190	0.0007***	0.00144	0.0005***	0.00066	0.0025***	0.00050	0.0048***	0.00063	<0.0001***
war?	0.01171	0.2338	–0.04792	0.0009***	0.00439	0.1246	0.01274	<0.0001***	–0.05688	0.0115**

Table A9. Verifying the robustness of the results for PKD 52.2 (Significance level at: * 10%, ** 5%, *** 1%)

Specification	ROE		ROIC		ROA		ROS		EBITDA	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Y(t-1)	–0.12760	0.2588	–0.02436	0.7505	0.11125	0.389	–0.11732	0.2218	–0.19373	<0.0001***
const	0.02428	<0.0001***	0.00767	<0.0001***	0.01116	<0.0001***	0.02697	<0.0001***	0.02434	<0.0001***
cons_yy	0.00441	<0.0001***	0.00284	<0.0001***	0.00176	0.0025***	0.00507	<0.0001***	0.00262	0.0036***
dcons_yy	0.00233	0.0162**	0.00222	<0.0001***	0.00079	0.2486	0.00318	0.0001***	0.00577	<0.0001***
accu_yy	0.00061	0.0017***	0.00024	<0.0001***	0.00040	<0.0001***	0.00167	<0.0001***	0.00099	0.0006***
inv_yy	0.00011	0.0049***	–0.00004	0.7869	0.00005	0.7802	–0.00085	<0.0001***	–0.00016	0.0022***
exp_yy	0.00621	0.0007***	0.00267	<0.0001***	0.00345	0.0037***	0.00776	<0.0001***	0.00726	<0.0001***
imp_yy	–0.00652	0.0312**	–0.00331	<0.0001***	–0.00351	0.0379**	–0.00859	0.0025***	–0.00811	<0.0001***
wages_yy	–0.01197	<0.0001***	–0.00851	<0.0001***	–0.00599	0.0005***	–0.00966	<0.0001***	–0.01566	<0.0001***
uerate	–0.00026	0.9568	–0.00392	<0.0001***	–0.00080	0.6388	0.00121	0.8276	–0.00018	0.9674
cpirr	–0.03172	<0.0001***	–0.00721	0.0028***	–0.01562	<0.0001***	–0.03217	<0.0001***	–0.04142	<0.0001***
CPIfuels_yy	0.00466	<0.0001***	0.00061	<0.0001***	0.00198	0.0028***	0.00509	<0.0001***	0.00513	<0.0001***
CPIenergy_yy	0.00665	<0.0001***	0.00221	<0.0001***	0.00387	<0.0001***	0.00590	<0.0001***	0.00779	<0.0001***
CPIfood_yy	0.00799	<0.0001***	0.00056	0.7037	0.00372	<0.0001***	0.00697	0.0068***	0.01399	0.0011***
ppirr	–0.00169	<0.0001***	0.00009	0.7853	–0.00155	<0.0001***	–0.00111	0.0006***	–0.00065	0.3392
EURPLN	–0.02379	0.6473	–0.02513	0.0509*	–0.01346	0.4987	–0.03521	0.5434	–0.04999	0.2966
EURUSD	0.21156	<0.0001***	0.08485	<0.0001***	0.12304	<0.0001***	0.20722	<0.0001***	0.14856	<0.0001***
ECBrate	0.05006	<0.0001***	0.02487	<0.0001***	0.02018	0.0003***	0.05662	<0.0001***	0.05744	<0.0001***
WIBOR3m	–0.05475	<0.0001***	–0.01798	<0.0001***	–0.02367	<0.0001***	–0.05889	<0.0001***	–0.05795	<0.0001***
Ptby2y	0.06401	<0.0001***	0.02057	<0.0001***	0.02805	<0.0001***	0.06952	<0.0001***	0.05270	<0.0001***
brent_yy	–0.00118	<0.0001***	–0.00005	0.1656	–0.00043	<0.0001***	–0.00145	<0.0001***	–0.00060	<0.0001***
war?	–0.01627	0.6765	0.00164	0.6629	–0.00657	0.7567	–0.00465	0.915	0.04299	0.012**