"Determinants of agricultural companies' financial performance: The experience of Poland, Slovakia and Ukraine"

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DETERMINANTS OF AGRICULTURAL COMPANIES' FINANCIAL PERFORMANCE: THE EXPERIENCE OF POLAND, SLOVAKIA AND UKRAINE

Abstract

The purpose of the study is to conduct a comparative analysis of the determinants affecting the financial performance of agricultural enterprises in Poland, Slovakia and Ukraine. As the main research method, panel data regression analysis was used to analyze data from 34 Polish, 123 Slovak, and 305 Ukrainian agricultural companies for the period 2017–2020. To analyze the links between financial performance measures and its determinants, nine models were developed based on three selected dependent variables (Return on Assets, Return on Equity, Return on Sales) in each of the countries studied. Seven independent variables were used, such as Leverage, Long-Term Debt to Assets, Short-Term Debt to Assets, Debt to Equity, Current Ratio, Asset Tangibility, Capital Intensity, and two control variables such as Size and Dummy variable for legal form. The most significant impact on the financial performance of agricultural enterprises has: for Polish enterprises – Return on Assets – Leverage and Asset Tangibility, Return on Equity – Debt to Equity and Dummy variable for legal form, Return on Sales – Current Ratio, Capital Intensity, and Size; for Slovak enterprises – Return on Assets – Current Ratio, Return on Equity – Debt to Equity, Return on Sales – Current Ratio, and Capital Intensity; for Ukrainian enterprises – Return on Assets – Leverage and Size, Return on Equity – Debt to Equity, and Current Ratio, Return on Sales – Capital Intensity.

Keywords	determianants, financial performance, financial indicators, regression analysis, agriculture
JEL Classification	G17, Q12, Q14

INTRODUCTION

Due to the military invasion of the Russian Federation in Ukraine on February 24, 2022, there have been cardinal changes in the activities of Ukrainian agricultural enterprises. Such changes led to a decrease in their level of competitiveness, collapsing of product supply chains, limited access to technologies, a significant increase in logistics costs and in costs for fuel materials, lack of financing, as well as access to preferential programs. The war in Ukraine led to the partial occupation of its territory, and the mining of a significant amount of agricultural land, which has a catastrophic impact on the vast majority of Ukrainian agrarian enterprises or makes their activities completely impossible. Which radically changes the influence of various types of determinants on the financial performance of agricultural enterprises in Ukraine. In addition, the war in Ukraine can have a devastating effect not only on the agrarian sector of the Ukrainian economy, but can also cause a violation of food security at the European and global level and in general provoke a global food crisis (Câmpeanu, 2022; Glauben et al., 2022), thus indirectly influencing the role of financial determinants for agricultural enterprises in other countries of the world.

The effective development of agricultural enterprises, complicated by overcoming the consequences of the global financial crisis due to pandemic and war influence, largely depends on state support for the agricultural sector and the attraction of additional investment resources. State and investment support for agricultural enterprises is important for the development of the economy as a whole, as they are the link between small agricultural producers, retailers and consumers.

For capital providers in such conditions, the determinants of the financial performance of agricultural enterprises are of great importance, which allow determining the volume and directions of state support (preferential lending, preferential taxation, preferential financing, etc.) in the framework of the implementation of rural development policy and state food security, as well as adjusting the directions of the investment and credit policy of owners of equity and borrowed capital. In addition, many investors are reviewing different sectors of the economy and reassessing their economic strength and financial performance (Katchova & Enlow, 2013), which has become even more noticeable for agricultural enterprises in the context of the COVID-19 pandemic (Sokil et al., 2022; Xu & Jin, 2022).

On the other hand, financial performance measures characterize the successful management of agricultural enterprises, their ability to achieve the goals set by the owners and create competitive advantages, the ability to manage resources, adapt to difficult economic conditions and prevent business failure (Liu et al., 2020; Vuković et al., 2022). Since financial performance is characterized by variables obtained from financial information, the determinants of financial performance should be understood as a set of indicators that can be calculated on the basis of financial statements and other financial information of agricultural enterprises subject to disclosure. Thus, to ensure successful development, management must study the determinants of financial performance when adjusting the policy and development strategy of agricultural enterprises.

Despite significant changes in the activities of Ukrainian agricultural enterprises as a consequence of the Russian invasion, the results of the study can be used as a starting point for the large-scale post-war restoration of agriculture in Ukraine through the mechanisms for the implementation of state and international support, which will take place after the end of the war (Shubravska & Prokopenko, 2022).

1. LITERATURE REVIEW

In scientific papers devoted to the problem of the impact of determinants on the financial performance of agricultural companies, various types of determinants are considered that characterize financial performance and its detailed components (profitability, efficiency of working capital); relationship with various types of factors (internal, external); examples of various types of agricultural enterprises (listed companies, cooperatives, firms, small farms, etc.); regional aspects in different countries of the world (including Poland, Slovakia and Ukraine).

Since the set of financial performance determinants is a fairly broad category, all papers aimed at determining the level and strength of their influence can be divided into two groups. The first group includes a large set of factors (three or more) that affect financial performance. Thus, Katchova

and Enlow (2013), analyzing the activities of agricultural companies in the USA for the period from 1961 to 2011, found that higher ROE for agribusinesses is mostly due to higher asset turnover ratios, indicating higher operating efficiency of agribusinesses. Singh et al. (2019) confirmed the significant impact of micro- and macroeconomic determinants (uncertainty shocks) on agro-cooperatives' financial performance. In particular, they found a negative impact of capital intensity and enterprise size, and a positive impact of growth on ROA. Liu et al. (2020), analyzing the activities of listed Chinese agricultural companies, found that a number of determinants have a negative impact (debt ratio, capital intensity, and export intensity), and certain indicators (firm size, long-term liability ratio, and sales growth rate) have a negative impact on financial performance measures (ROS, ROA, and ROE). Similar research results were also obtained by Vuković et al. (2022) on the example

of the analysis of large and very large European agricultural companies for the years 2013–2019, which revealed a positive correlation between size, liquidity, and a negative correlation between tangibility, short-, long-, and total debts indicators with their financial performance.

The second group includes articles that study the highly specialized specific influence of one, two or more factors, united by a certain feature. In particular, the authors investigate the impact of company size (Novotná & Volek, 2015; Odalo et al., 2016; Hampl, 2020; Naushad, 2022; Achaku et al., 2022; Hazudin et al., 2022; Shubita, 2022; Jusni et al., 2023), board gender diversity (Knežević et al., 2017), microeconomic environment (Burja & Burja, 2017; Fakhrunnas et al., 2022; Msomi & Olarewaju, 2022; Yavorska et al., 2022; Piluso & Heron, 2022), intellectual capital (Xu & Zhang, 2021; Arfara & Samanta, 2022; Kuznyetsova et al., 2022), and capital structure (Xu et al., 2021; Enjolras et al., 2021; Fisun et al., 2022) on financial performance measures.

A number of studies analyzed the influence of determinants on financial performance on the example of a separate type of agricultural companies with significant specifics of financial activity – agricultural cooperatives, which determine their impact on the development of rural areas and the agricultural economy in different countries of the world (Brazil – Martins & Lucato, 2018; Kenya – Kimetto & Kiman, 2018; Slovakia – Kravčáková Vozárová et al., 2019; USA – Mishra et al., 2009; Singh et al., 2019; Pokharel et al., 2020). As a result, Kravčáková Vozárová et al. (2019) propose to further analyze the impact of belonging to this particular type of agricultural enterprises on financial performance measures.

With the spread of the COVID-19 pandemic, studies have also been carried out to determine its impact on the financial performance of companies in the agricultural sector, in particular, taking into account their size, capital structure and affiliation with public or private companies (Gaisani et al., 2021; Xu & Jin, 2022). Such studies allow us to formulate recommendations for the management of agricultural companies to ensure their smooth operation and access to ex-

ternal financial resources in the context of the COVID-19 pandemic.

Some scientific articles consider the peculiarities of the impact of determinants on the financial performance of Polish agricultural companies. Misiąg et al. (2020) considered the role of certain areas of state support in increasing the financial indicators of agricultural enterprises and substantiated the need for combining farms in order to change the very unfavorable agrarian situation. Góral and Soliwoda (2021) revealed the existence of the negative effect of subsidies on the profitability of large agricultural farms, as well as the positive impact of financial surplus to liabilities on both ROS and ROA. Enjolras et al. (2021) established the presence of a positive impact of debt reduction on the profitability of farms, and the reciprocal of this impact, as investments send a positive signal to creditors, indicating future cash flows.

Financial performance determinants of Slovak agricultural companies were studied in the papers of Kalusova and Badura (2017), Kravčáková Vozárová et al. (2019), and Lehenchuk et al. (2022), who revealed the existence of a negative dependence of financial performance on the volume of short-term debts and on the growth of the size of agricultural enterprises.

The impact of factors influencing the financial efficiency of Ukrainian agricultural enterprises, in particularly, on the efficiency of working capital using a modified Dupont model was investigated by Mann and Bilyk (2017). Davidenko and Wasilewska (2021) established that an increase in the share of equity capital in the total capital of agrarian enterprises in Ukraine increases the level of their financial stability. Vorobei (2022), analyzing the influence of determinants of Ukrainian agro-industrial companies on stock price movements, revealed the dependence of the latter on trailing 12-month earnings per share, exchange rate, and main commodity price.

Some authors conduct a comparative analysis of the influence of determinants on the financial performance of agricultural companies using a number of European countries as an ex-

ample (Mijić & Jakšić, 2017; Kalusova & Badura, 2017; Beyer & Hinke, 2020); they compare the results obtained in the context of such countries and formulate proposals for the enterprises of each of them on how to more effectively realize the potential opportunities for improving financial performance, avoiding financial traps. This makes it possible to formulate recommendations for managers to improve the financial performance of agricultural enterprises based on the characteristics of the local agricultural market and in comparison with the best practices used in other countries.

An analysis of research of various factors influence on agricultural companies' financial performance revealed both the absence of a clear set of financial performance measures and the presence of a set of independent variables on which it depends. There is also no precise answer regarding the level and direction of the influence of independent variables on financial performance measures, which determines the expediency of conducting such research across countries. Based on the obtained results of such studies, it will be possible to improve the financial performance measures of agricultural enterprises, and it will help to justify the use of various directions of state support for agricultural enterprises operating in Poland, Slovakia, and Ukraine.

2. AIMS

The purpose of the paper is to conduct a comparative analysis of the determinants that affect financial performance of agricultural enterprises in Poland, Slovakia and Ukraine in 2017–2020.

3. METHODS

To determine the impact of determinants on the financial performance of agricultural companies, regression analysis of panel data was used. In particular, the performance indicators of 34 Polish, 123 Slovak, and 305 Ukrainian agricultural companies for the period 2017–2020 were analyzed. To generate panel data, information on the financial statements of non-state enterprises obtained using

the Orbis database (Bureau van Dijk, A Moody's Analytics Company, 2022) was used. The study sample includes those enterprises for which there was complete necessary information for the period 2017–2020. The choice of such a period is justified by the existence of a time lag in the publication of financial statements in EU countries (1-2 years), the existing possibility of forming annual statements for different quarters, as well as the impossibility of obtaining reliable financial information about the activities of Ukrainian agricultural enterprises for 2021–2022 due to the hostilities. According to the EU Classification of Economic Activities, the enterprises under study belong to group 01 Crop and Animal Production, Hunting and Related Service Activities.

The financial performance of agricultural companies is characterized by three indicators, which are most often chosen by researchers as dependent variables when conducting empirical analysis – Return on Assets, Return on Equity, and Return on Sales. It is proposed to analyze the impact on the selected dependent variables using the following determinants (independent variables) – Leverage (Debts to Asset), Long-term Debt to Total Assets, Short-term Debt to Total Assets, Debt to Equity, Capital Intensity, Current Ratio, Asset Tangibility. The choice of such determinants is based on the information capacity of financial reporting in the studied countries, and on the basis of the analysis of papers by other authors who studied this issue.

The paper also used two control variables such as Size and Dummy variable for legal form. If the use of the first control variable is a common practice in modern studies (Ievdokymov et al., 2020; Xu et al., 2021), the use of the second control variable was chosen to test the claim of Kravčáková Vozárová et al. (2019) about the special structure of the financial condition of agricultural cooperatives compared to other types of agricultural enterprises.

Table 1 lists dependent and independent variables used in the study.

To determine the strength and direction of the influence of the selected independent variables on financial performance of agricultural companies, three basic models were examined:

Table 1. Variable definitions, calculation and abbreviations

Variable	Calculation Method	Abbreviation
Dependent Variables		
Return on Assets	Net turnover / Total Assets	ROA
Return on Equity	Net profit / Total Equity	ROE
Return on Sales	Earnings before interest and taxes / Net sales	ROS
Independent Variables		
Leverage (Debts to Assets)	(Long-term Debts + Short-term Debts) / Total Assets	LEV
Long-Term Debt to Assets	Long-term Debts / Total Assets	LTDA
Short-Term Debt to Assets	Short-term Debts / Total Assets	STDA
Debt to Equity	(Long-term Debts + Short-term Debts) / Equity	DE
Current Ratio	Current Assets / Current Liabilities	CR
Asset Tangibility	Fixed Assets / Total Assets	AT
Capital Intensity	Total Assets / Total Sales	CAPI
Control Variables		
Size	Logarithm of Total Assets	l_S
Dummy variable for legal form	1 for agricultural cooperative, 0 for another form	DVLF

Model 1:

$$ROA_{it} = \alpha + \beta_1 LEV_{it} + \beta_2 LTDA_{it} + \\ + \beta_3 STDA_{it} + \beta_4 DE_{it} + \beta_5 CR_{it} + \beta_6 AT_{it} + \quad (1) \\ + \beta_7 CAPI_{it} + \beta_8 l\_S_{it} + \beta_9 DVLF_{it} + \varepsilon_{it}.$$

Model 2:

$$ROE_{it} = \alpha + \beta_1 LEV_{it} + \beta_2 LTDA_{it} + \\ + \beta_3 STDA_{it} + \beta_4 DE_{it} + \beta_5 CR_{it} + \beta_6 AT_{it} + \quad (2) \\ + \beta_7 CAPI_{it} + \beta_8 l\_S_{it} + \beta_9 DVLF_{it} + \varepsilon_{it}.$$

Model 3:

$$ROS_{it} = \alpha + \beta_1 LEV_{it} + \beta_2 LTDA_{it} + \\ + \beta_3 STDA_{it} + \beta_4 DE_{it} + \beta_5 CR_{it} + \beta_6 AT_{it} + \quad (3) \\ + \beta_7 CAPI_{it} + \beta_8 l\_S_{it} + \beta_9 DVLF_{it} + \varepsilon_{it},$$

where *ROA*, *ROE*, and *ROS* are dependent variables, i = entity, and t = time; α – Identifier; β – Regression coefficient; *LEV*, *LTDA*, *STDA*, *DE*, *CR*, *AT*, *CAPI* – independent variables, *LEV*, *l_S*, *DVLF* – control variables, where i = entity and t = time; ε_{it} – error term.

Based on the proposed basic models, calculations were made on the example of panel data for each of the studied countries of Eastern Europe. This made it possible to identify nine analytical models that will have the following abbreviations: for Polish enterprises – *M1P (ROA)*, *M2P (ROE)*, *M3P (ROS)*; for Slovak enterprises – *M1S (ROA)*, *M2S (ROE)*, *M3S (ROS)*; and for Ukrainian enterprises – *M1U (ROA)*, *M2U (ROE)*, *M3U (ROS)*.

4. RESULTS

Table 2 shows descriptive statistics (mean, minimum, and maximum) for all variables for the three countries.

From Table 2, it can be determined that for 2017–2020, three samples of agricultural enterprises were studied, in particular, 34 Polish, 123 Slovak, and 305 Ukrainian. Since eight of the nine averages of ROA, ROE and ROS for enterprises in the three countries, with the exception of ROE for Slovak companies, are negative, this indicates that most of them have negative financial performance measures. Significant differences between the minimum and maximum values of the dependent variables for enterprises of all countries, especially for Ukrainian enterprises (ROA – 48.8, ROE – 79.2, and ROS – 1.726), indicate significant differences in the efficiency of their activities and characterize the presence of various levels of risk in terms of their state support and investment. The same situation is observed with regard to their ability to prevent the risks of non-repayment of short-term liabilities, which characterize CR, for the enterprises of the three countries under study.

After testing the problem of multicollinearity between the independent variables for each of the three models, it was partially found in LEV, LTDA and STDA. In particular, a high value of the correlation coefficient was obtained between the variables LEV / LTDA and LEV / STDA (Pol. (0.5; 0.7), Slo. (0.5; 1.0), Ukr. (0; 1.0)). This is justified by the

Table 2. Descriptive statistics (based on observations: 1:1 – 34:4 (Poland); 1:1 – 123:4 (Slovakia); 1:1 – 305:4 (Ukraine))

Source: Calculated using the Gretl software package.

Variables	Mean			Minimum			Maximum		
	Pol.	Slov.	Ukr.	Pol.	Slov.	Ukr.	Pol.	Slov.	Ukr.
ROA	−0.046	−0.031	−0.127	−3.19	−4.31	−48.0	0.344	1.23	0.761
ROE	−0.073	0.005	−0.054	−11.7	−2.91	−71.2	11.1	5.12	8.03
ROS	−0.02	−0.528	−2.11	−12.6	−38.9	−1090	22.3	31.3	636.
LEV	0.482	1.28	3.12	0.000	0.000	0.000	2.28	141.	1790
LTDA	0.200	0.188	0.066	0.000	−0.0002	0.000	1.44	2.30	8.96
STDA	0.282	1.09	3.05	0.000	−0.0259	0.000	2.23	139.	1.790
DE	1.75	2.52	0.391	−5.35	−117.	−59.8	81.9	662.	122.
CR	46.0	5.48	21.0	0.000	−0.220	0.000	5670	1110	11900
AT	0.357	0.499	0.384	0.000	0.000	0.000	0.944	0.999	1.00
CAPI	169.	839.	757.	0.000	−447.	0.000	13500	379000	566000
l_S	7.99	7.82	6.16	2.51	0.0354	−4.49	12.1	11.4	13.8

direct relationship between these indicators, since short-term and long-term debts are an integral part of an enterprise's total debt. Although some scholars allow variables with such high values to be used in panel regression analysis of the relationship between debt and financial performance measures (Liu et al., 2020), they were excluded from the corresponding models in the calculations.

As a result of applying the F-statistics test, Breusch-Pagan test and Hausman test in order to determine such a panel data estimate parameter that would adequately correlate with the data used in the corresponding model, the feasibility of using the following parameters was determined (Table 3).

The Normality test, Autocorrelation test and Heteroscedasticity test were used to test the adequacy of panel data on the activities of agricultural companies in three Eastern European countries for each of the proposed nine models. As a result of applying these tests, the null hypothesis about the normal distribution of residuals for all nine models was rejected. Based on the use of the Wooldridge test, an autocorrelation problem was

found for the M1P (ROA) and M1S (ROA) models, and its existence was denied for all other models. Using the White and Wald tests, heteroscedasticity was confirmed for all nine models used. To eliminate the negative impact of outliers in models in the presence of heteroscedasticity, it is proposed to use the robust standard errors technique, which will generally improve the results of panel data regression analysis (Serpeninova et al., 2022; Lehenchuk et al., 2022).

Appendix A presents the results of the regression analysis of panel data on the example of nine proposed models (p-value and level of significance), carried out using various panel data estimate parameters. They show which of the regressors of each of the models has a significant impact on ROA, ROE and ROS, what is the strength and direction of this influence. Some elements of the models are missing from the table due to their exclusion due to the multicollinearity problem.

Based on the calculations (Appendix A), the proposed nine analytical models can be interpreted using the following equations:

Table 3. Results of panel data estimate parameter selection for each of the models used

Panel data estimate parameter	M1P (ROA)	M2P (ROE)	M3P (ROS)	M1S (ROA)	M2S (ROE)	M3S (ROS)	M1U (ROA)	M2U (ROE)	M3U (ROS)
OLS method (OLS)		+	+						+
Fixed effects method (FEM)	+			+	+		+	+	
Random effects method (REM)						+			

M1P (ROA)

$$ROA_{it} = 0.254637 - 0.775089LEV_{it} + \\ +0.0783649LTDA_{it} + 0.00259479DE_{it} - \\ -74799e - 0.5CR_{it} + 1.07987AT_{it} + \\ +1.76806e - 0.5CAPI_{it} + 0.349085l\_S_{it} + \varepsilon_{it}. \qquad (4)$$

M2P (ROE)

$$ROE_{it} = -2.87258 + 0.167153LEV_{it} + \\ +0.195975LTDA_{it} + 0.0336000DE_{it} + \\ +5.28563e - 0.5CR_{it} + 0.289038AT_{it} + \\ +1.68131e - 0.5CAPI_{it} + \\ +0.0572341l\_S_{it} - 1.05880DVLF + \varepsilon_{it}. \qquad (5)$$

M3P (ROS)

$$ROS_{it} = -1.76399 + 0.140403LEV_{it} - \\ -0.980429LTDA_{it} + 0.00639786DE_{it} + \\ +0.00392640CR_{it} - 0.565938AT_{it} + \\ +0.000183524CAPI_{it} + 0.211087l\_S_{it} + \\ +0.164773DVLF + \varepsilon_{it}. \qquad (6)$$

M1S (ROA)

$$ROA_{it} = 0.0610986 + 0.0115704LEV_{it} + \\ +0.390843LTDA_{it} - 2.31013e - 0.5DE_{it} - \\ -7.16291e - 0.5CR_{it} - 0.380986AT_{it} - \\ -1.32912e - 0.7CAPI_{it} + \\ +0.0170850l\_S_{it} + \varepsilon_{it}. \qquad (7)$$

M2S (ROE)

$$ROE_{it} = 0.502236 - 0.0135699LEV_{it} + \\ +0.507722LTDA_{it} - 0.00152740DE_{it} - \\ +2.27040e - 0.5CR_{it} - 0.469349AT_{it} - \\ +1.36181e - 0.7CAPI_{it} - \\ -0.0427966l\_S_{it} + \varepsilon_{it}. \qquad (8)$$

M3S (ROS):

$$ROS_{it} = -3.26554 + 0.00826108LEV_{it} + \\ +0.908441LTDA_{it} + 0.000343084DE_{it} - \\ 0.00238462CR_{it} - 2.10446AT_{it} - \\ -2.46874e - 05CAPI_{it} + 0.628114l\_S_{it} - \\ -1.14846DVLF + \varepsilon_{it}. \qquad (9)$$

M1U (ROA):

$$ROA_{it} = -4.81636 - 0.0362558LEV_{it} + \\ +0.0881974LTDA_{it} - 0.0109030DE_{it} + \\ +1.59721e - 0.5CR_{it} + 0.357268AT_{it} + \\ +3.76591e - 0.7CAPI_{it} + \\ +0.756996l\_S_{it} + \varepsilon_{it}. \qquad (10)$$

M2U (ROE):

$$ROE_{it} = -4.63234 + 0.000605484LEV_{it} - \\ -0.232757LTDA_{it} - 0.383193DE_{it} + \\ +9.99112e - 0.6CR_{it} - 0.00962209AT_{it} - \\ -4.04593e - 0.7CAPI_{it} + \\ +0.771313l\_S_{it} + \varepsilon_{it}. \qquad (11)$$

M3U (ROS):

$$ROS_{it} = 1.01460 - 0.000526896LEV_{it} - \\ -0.560361LTDA_{it} - 0.0625891DE_{it} - \\ -7.26986e - 0.5CR_{it} - 8.45000AT_{it} - \\ -0.00180132CAPI_{it} + 0.259499l\_S_{it} + \varepsilon_{it}. \qquad (12)$$

The conducted analysis allows confirming that the financial performance of agricultural companies in the countries of Eastern Europe is mostly influenced by various factors, as a result of which various recommendations and tools should be used to improve it. In addition, such factors affect different types of financial performance measures used for agricultural enterprises in the same country in different ways.

Thus, the regressors LEV and AT have the most statistically significant (at the 1% level) impact (marked *** in Appendix A) on ROA for Polish enterprises, CR for Slovak ones, and LEV and l_S for Ukrainian ones. For Polish and Ukrainian enterprises, the effect of LEV is the opposite. This means that the greater the increase in the share of liabilities in relation to an enterprise's assets, the worse it affects ROA. CR also has an inverse significant effect for Slovak enterprises, i.e. the growth of the ability to repay current liabilities at the expense of own assets worsens the value of ROA. A significant impact of l_S on financial performance for Ukrainian enterprises indicates that if l_Size is increased by 1, then ROA will decrease by 0.757. Also important for Polish and Slovak companies is the impact of CAPI on ROA at the level of 5%.

At the same time, if for Polish enterprises this effect is positive, then for Slovak enterprises it is negative. This may indicate the need to update the latter's existing agricultural fixed assets. An analysis of the obtained LSDV R-squared values for models M1P (ROA), M1S (ROA) and M1U (ROA) showed that these models explain 68%, 76% and 80% of the ROA variation, respectively.

An analysis of the factors affecting the ROE of Polish, Slovak and Ukrainian agricultural enterprises revealed that DE has a significant impact (at the 1% level) for all enterprises. This indicates the important role of the source of financing for the activities of enterprises. However, DE is positive for Polish enterprises and negative for Slovak and Ukrainian ones. This means that in order to increase ROE, it is advisable for the latter to reduce the use of debt resources in financing their activities. In addition, CR has a positive and significant effect on ROE for Ukrainian enterprises, which also confirms the negative impact of the use of borrowed capital on financial performance. For Polish enterprises, ROE is significantly negatively affected by their membership in agricultural cooperatives, which is a consequence of the specifics of their financial and economic activities. For Slovak enterprises, LEV, LTDA and AT also affect ROE with a significance of 5%. The obtained LSDV R-squared values for models M2P (ROE), M2S (ROE), and M2U (ROE) mean that these models can explain 36%, 35% and 73% of the ROE variation, respectively.

CAPI has a significant impact (at the 1% level) on ROS for Polish, Slovak and Ukrainian agricultural enterprises. As with the impact on ROA, it has a positive impact on ROS for Polish companies and a negative one for Slovak and Ukrainian companies. For Polish enterprises, ROS with a significance at the level of 1% depends on CR and on l_S. This confirms the feasibility of increasing the ability of an enterprise to meet its short-term obligations and integrating agricultural enterprises for the growth of ROS. As regards the effect of CR on ROS, the opposite situation was found for Slovak enterprises, since, based on the obtained p-value, if CR is increased by 1, then ROS will decrease by 0.00238462.

In general, when analyzing the influence of various factors on the financial performance of agricultural companies in Eastern Europe, the influence of STDA was completely excluded from all models due to the multicollinearity problem, which was also carried out in relation to the DVLF regressor, except for the M2P (ROE), M3P (ROS) and M3S (ROS). Only LTDA had no significant influence at the 1% level on the financial performance measures used (ROA, ROE, ROS) in all models. Meanwhile, none of the used regressors had a significant impact (at the level of 1%, 5% or 10%) simultaneously on all financial performance measures for Polish, Slovak and Ukrainian agricultural enterprises.

5. DISCUSSION

Results suggest that the agricultural enterprises in Poland, Slovakia, and Ukraine are highly sensitive to LEV, CR, l_S, and CAPI, which are key explanatory variables.

The positive significant impact of LEV on the financial performance of Slovak agricultural companies confirms the results of studies byMishra et al. (2009), Mijić and Jakšić (2017), Pokharel et al. (2020), Xu et al. (2021), and Vuković et al. (2022); its significant negative impact on the activities of Polish and Ukrainian enterprises confirms the results obtained by Liu et al. (2020). The results regarding the effect of LEV indicate that there are different types of optimal capital structure for agricultural enterprises in the countries studied. The existence of a negative relationship between LEV and financial performance indicates the need to find more effective internal sources and instruments of financing activities for Polish and Ukrainian agrarian enterprises.

An inverse significant impact of CR on the ROA of Slovak enterprises was revealed. Based on the conclusions by Kalusova and Badura (2017), who found that Slovak agricultural enterprises struggle with high levels of short-term debt and have a low share of long-term external funds, it is recommended to provide state support for the implementation of new credit instruments that will solve this problem.

The revealed positive impact of CR on ROE for Ukrainian enterprises and on ROS for Polish enterprises is consistent with the results of studies by Mijić and Jakšić (2017) and Lehenchuk et al. (2022), which suggests that the ability of agrarian enterpris-

es to meet its short-term obligations is important in increasing their financial performance.

The ambiguity of the influence of the enterprise size (l_S) for enterprises in different countries is established. The significant impact of l_S on ROA for Ukrainian enterprises and on ROS for Polish enterprises confirms the results of the studies by Liu et al. (2020), Pokharel et al. (2020), Hampl (2020), Vuković et al. (2022), and confirms the propositions of Misiąg et al. (2020) for combining farms in order to change the very unfavorable agrarian situation in Poland.

Singh et al. (2019) and Lehenchuk et al. (2022) found a negative significant effect of l_S on ROA for Slovak companies. Similar results for different groups of countries from Southeast Europe were obtained by Mijić and Jakšić (2017). Such results confirm the recommendations of researchers regarding the need to integrate households of the population into more consolidated economic forms in Ukraine (Pronko et al., 2020).

Findings of a negative significant impact of CAPI on ROS for Slovak and Ukrainian enterprises, also presented by Singh et al. (2019) and Liu et al. (2020), point out that less capital-intensive agricultural companies in these countries perform better financially than more capital-intensive ones. However, CAPI has a positive and significant effect on ROS for Polish enterprises, which characterizes the existence of an opposite situation in Poland, which is also noted by Beyer and Hinke (2020).

The assumption of Kravčáková Vozárová et al. (2019) regarding the specific structure of the financial condition of agricultural cooperatives compared to other types of agricultural enterprises was confirmed only for Polish enterprises on the example of the impact on ROE, where DVLF has a significant positive effect at the level of 1%. These results call into question the assumptions of Pronko et al. (2020) regarding the priority of development of cooperation in agriculture in Ukraine in terms of their further state support.

CONCLUSION

The purpose of the paper was to conduct a comparative analysis of the determinants affecting the financial performance measures of agricultural enterprises in Poland, Slovakia and Ukraine for 2017–2020. The main research method was the regression analysis of panel data.

The results of the study are to identify the determinants that have the most significant influence on financial performance measures of agricultural enterprises in Poland, Slovakia and Ukraine, as well as to determine the nature of such influence (direction and strength). For Polish companies, Return on Assets is most significantly affected by Leverage and Asset Tangibility, Return on Equity by Debt to Equity and Dummy variable for legal form, Return on Sales by Current Ratio, Capital Intensity and Size. For Slovak companies, Return on Assets is most dependent on Current Ratio, Return on Equity on Debt to Equity, Return on Sales on Current Ratio and Capital Intensity. For Ukrainian companies, Return on Assets is most affected by Leverage and Size, Return on Equity by Debt to Equity and Current Ratio, and Return on Sales by Capital Intensity. In addition, even there are similarities in such an effect, in some cases the effect of the same regressors turns out to be inverse for different countries (the effect of Leverage on Return on Assets for Polish and Ukrainian enterprises, the effect of Debt to Equity on Return on Equity for Polish and Slovak / Ukrainian enterprises, the effect of Capital Intensity on Return on Sales for Polish and Slovak / Ukrainian enterprises).

The results obtained in the work are of interest to management in order to improve the financial performance of agricultural companies, representatives of state agencies for the development of government support areas, as well as for capital providers when investing/lending to agricultural companies from Eastern Europe. They also allow one to adjust the proposals of scientists to improve the tools for implementing the policy of state support for agricultural enterprises, in particular, benchmarking from one Eastern European country to another.

The study has certain limitations that must be taken into account when using its results. First, the information content of the financial information provided by the Orbis database used to generate panel data limits the number of relevant determinants whose impact could be analyzed in the paper. Secondly, the range of Eastern European countries whose agricultural enterprises were subject to research, can be expanded depending on the tasks and objectives of the comparative analysis. Thirdly, the 2017–2020 period used for panel data regression analysis may be extended when access to such complete information becomes available. This, in particular, will allow taking into account the significant negative impact of hostilities on the financial performance of most Ukrainian agricultural companies starting in 2022, which can be designated as a prospect for further research.

AUTHOR CONTRIBUTIONS

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APPENDIX A

Table A1. Model 1-9 (ROA, ROE, ROS). OLS, FEM, REM, using the observations: 1-136 (Poland); 1-492 (Slovakia); 1-1220 (Ukraine)

Variables	M1P (ROA)	M2P (ROE)	M3P (ROS)	M1S (ROA)	M2S (ROE)	M3S (ROS)	M1U (ROA)	M2U (ROE)	M3U (ROS)
Const	0.0601*	0.7660	0.0083***	0.7920	0.3960	0.3787	4.28e−019***	0.0849*	0.7728
LEV	1.89e−028***	0.6869	0.5444	0.0999*	0.0161**	0.7651	8.15e−163***	0.0632*	0.9761
LTDA	0.6073	0.6408	0.3183	0.1829	0.0452**	0.5658	0.7622	0.5787	0.8082
STDA	excluded	excluded	excluded	excluded	excluded	excluded	excluded	excluded	excluded
DE	0.1107	3.25e−09***	0.4333	0.6452	0.0092***	0.6628	0.1402	0.0036***	0.7234
CR	0.0584*	0.0965*	0.0000***	0.0001***	0.9557	3.04e−014***	0.8694	0.0022***	0.9798
AT	1.10e−06***	0.2000	0.4033	0.1454	0.0282**	0.1364	0.3057	0.9864	0.0180**
CAPI	0.0151**	0.3977	0.0009***	0.0185**	0.8992	9.66e−037***	0.8508	0.1183	1.56e−151***
I_S	0.0737*	0.4231	0.0019***	0.5169	0.5642	0.0335**	6.04e−020***	0.0697*	0.5510
DVLF	excluded	2.46e−07***	0.5552	excluded	excluded	0.5671	excluded	excluded	excluded
R−squared / LSDV R−squared	0.682986	0.035697	0.698350	0.756351	0.349860	−	0.802953	0.733274	0.441081

Note: * Significant at the 10 % level; ** Significant at the 5 % level; *** Significant at the 1 % level.