

Internal Determinants of Sales Revenue Growth in Agricultural Enterprises: A Strategic Management Approach

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Abstract

Background: Sales revenue growth represents one of the key indicators of firm success and competitiveness, particularly in the agricultural sector, which is characterised by high price fluctuations, climate-related risks, and pronounced seasonal variations. Although numerous external factors affect the performance of firms in the agrarian sector, less is known about the extent to which internal financial and strategic factors contribute to the dynamics of sales growth.

Purpose: The purpose of this study is to examine how internal factors – profitability, liquidity, leverage, firm size, and presence in foreign markets – affect sales revenue growth of agricultural enterprises in Serbia.

Study design/methodology/approach: The empirical analysis is based on panel regression techniques applied to a sample of 104 enterprises over the period from 2022 to 2024. Pooled OLS, fixed effects, and random effects models were employed, along with relevant diagnostic tests, including correlation analysis, VIF diagnostics, the White test for heteroskedasticity, the Wooldridge test for autocorrelation, and the Hausman test for selecting the optimal model specification.

Findings/conclusions: The results indicate that presence in foreign markets has a positive and statistically significant effect on sales revenue growth, confirming the importance of internationalisation as a strategic growth factor. In addition, liquidity emerges as a significant and positive determinant of sales growth, suggesting that financial flexibility plays an important role in ensuring business stability and continuity in the agricultural sector. In contrast, profitability (ROA), leverage, and firm size do not exhibit a statistically significant impact on sales growth over the short observation period.

Limitations/future research: The main limitations of the study relate to the short time dimension of the panel ($T = 3$), which restricts the identification of long-term effects, as well as difficulties in incorporating key external growth determinants into the model, such as climatic conditions, government subsidies, and input price volatility. Future research should cover a longer time horizon and integrate external factors to provide a more comprehensive understanding of growth determinants in the agricultural sector.

Keywords

sales revenue growth, panel analysis, internal factors, agricultural enterprises, internationalisation, Serbia

Introduction

The agricultural sector of the Republic of Serbia plays an important role not only in the domestic economy but also across the Western Balkans region. Serbia's agricultural sector dominates the regional market, reflecting its comparative advantages in agricultural production and trade (Bozic & Nikolic, 2019). This country consistently maintains the highest share of agricultural and food product exports relative to its total exports, outperforming its neighbouring economies (Mizik, 2012). Moreover, Serbia is recognised as “the only net producer of agricultural and food products” among the Western Balkans countries (Dimitrijevic et al., 2025). The agricultural sector is highly complex, not only intrinsically, but also through its interaction with other sectors (Redlichová et al., 2025). Agricultural production holds a crucial position in the food production chain by providing raw materials (Milić et al., 2023; Toušek et al., 2025). The agriculture sector and the food production industry play key roles in vertical coordination to ensure national food security (Tekić et al., 2022; Li et al., 2025).

Owing to fertile soil and favourable climate, Serbia has emerged as a significant producer and exporter of diverse agricultural products, including cereals (corn and wheat flour), sunflower oil and meal, soybean oil and protein products, sugar and sugar beet, potatoes, fruit (raspberries, apples, plums, cherries, grapes), meat (pork, beef and poultry), and milk (Mihajlovic et al., 2024; Rakic et al., 2022). Despite these structural advantages, the competitiveness of Serbia's agricultural sector remains below that of European Union member states. Strengthening long-term sustainability and productivity therefore requires substantial modernization, technological upgrading, and improved institutional support (Jurjevic et al., 2019; Han et al., 2025).

Despite extensive research on firm growth determinants in manufacturing and service sectors, limited empirical evidence exists on how internal strategic and financial factors jointly shape sales revenue growth in agricultural enterprises within emerging and transition economies. This study addresses this gap by employing panel data from Serbian agricultural enterprises to quantify the effects of key internal determinants on short-term revenue growth.

Although the agricultural sector was largely neglected during the transition period, it continues to play a significant role in Serbia's economic structure in terms of gross domestic product (GDP), employment, and exports (Stanojevic & Krstic, 2019; Kljajic, 2025). Notably, the share of agriculture (including agriculture, forestry, and fishing) in Serbia's GDP remains higher than in some neighbouring EU member states (Grujic Vuckovski et al., 2022). However, recent empirical studies indicate a slowdown in agricultural growth, accompanied by a declining contribution of agriculture to total GDP and employment (Radovic et al., 2025; Dimitrijevic et al., 2023; Zelenovic et al., 2023). These trends are largely attributed to adverse weather conditions, particularly climate-related shocks, as well as the structural expansion of the service sector.

Serbia's GDP reached USD 89.08 billion in 2024, accounting for approximately 0.08% of global GDP, and is projected to increase to USD 92.82 billion in 2025 (World Bank, 2025a; Trading Economics, 2025). Despite this overall economic growth, agriculture was the only sector that recorded a contraction in 2024. Specifically, gross value added (GVA) in agriculture declined by 7.0%, reducing its share in total GDP from 3.8% in 2023 to 3.2% in 2024 (Statistical Office of the Republic of Serbia, 2025). Over the period 1995–2024, the average share of agriculture in GDP amounted to 7.82%, making the 2024 outcome a historical minimum (The Global Economy, 2025). This decline was primarily driven by reduced crop production resulting from a severe drought during the summer months. Overall, crop production, particularly cereal production, exerts the most significant influence on agricultural GVA (Novakovic et al., 2024). According to estimates by the National Bank of Serbia (2025), agricultural output in 2025 is expected to remain at a level comparable to, or slightly below, that of 2024.

Despite positive GDP dynamics, Serbia continues to face structural challenges in the labour market, as evidenced by an employment rate substantially below the European Union average. Although the employment rate has gradually increased, from 45.7% in the first quarter of 2021 to 51.4% in the first quarter of 2025, the agricultural sector has experienced a decline in employment (Statista, 2025). In 2024, employment in agriculture accounted for approximately 12.8% of the total workforce (World Bank, 2025b).

Serbia maintains a strong export position in agri-food products and has consistently generated trade surpluses in this sector. In 2024, the total value of agri-food exports reached EUR 5.1 billion, exceeding the preceding five-year average by 24.6%. Imports of agri-food products also reached a record level of EUR 3.8 billion, representing a substantial increase relative to the five-year average. As a result, the positive foreign trade balance amounted to EUR 1.3 billion, although this figure was 15.2% lower than the corresponding five-year average (Ministry of Agriculture, Forestry and Water Management, 2025).

The subject of the study is an empirical analysis of 104 agricultural companies operating in the Republic of Serbia over the 2022-2024 period. The main objective of this study is to examine the impact of internal variables at the company level on sales revenue growth. In particular, the analysis focuses on the effects of independent variables including foreign operations (foreign sales), profitability measured through return on assets (ROA), liquidity, leverage, and company size, and their influence on sales revenue growth, as a dependent variable. The paper is structured in five sections. The first section offers a detailed overview of the literature that is relevant to the subject of research. The second section describes the dataset and the methodology framework applied in the analysis. The subsequent section provides an explanation of the empirical results and a discussion. The final section summarises the key findings and outlines recommendations for future research.

1. Literature review

From a strategic management perspective, firm growth is strongly associated with the development of dynamic capabilities that enable firms to reconfigure internal resources in response to environmental changes (Teece, 2023). In this context, internal financial and strategic determinants should not be viewed merely as accounting indicators, but as managerial choices concerning resource allocation and competitive positioning. Liquidity management reflects a firm's ability to preserve strategic flexibility and absorb environmental shocks, thereby sustaining competitive positioning under uncertainty. Internationalization represents a growth-oriented strategic commitment involving market diversification, risk spreading, and capability development across institutional environments. By framing these determinants as strategic choices

rather than purely financial outcomes, this study positions firm-level growth within broader debates on capability development and growth persistence.

Numerous empirical studies have examined how internal firm-level determinants influence sales revenue growth across sectors (e.g., Lang et al., 1996; Aivazian et al., 2005; Carpenter & Petersen, 2002a; Baños-Caballero et al., 2014; Coad, 2007; Yazdanfar & Öhman, 2015). Analysis of sales growth is of particular importance as it reflects market expansion and contributes to business risk reduction (Žiković et al., 2025). Continuous monitoring of sales performance enables firms to mitigate risk and exploit emerging business opportunities (Nuševa et al., 2025a).

By engaging in foreign markets, companies can expand their customer base, thereby increasing sales volumes and positively affecting growth and profitability (Pacheco, 2019). International expansion may enhance firm growth not only through market size effects but also through access to strategic resources and competitive advantages in foreign markets (Hennart, 2012). However, the internationalization–performance relationship may be non-linear, as firms face coordination and governance costs at higher levels of foreign expansion (Lu & Beamish, 2001). In emerging markets, the performance effects of internationalization are particularly sensitive to institutional quality and firms' internal resource configurations (Peng et al., 2024). Sales revenues generated through international operations depend on a wide range of external factors in foreign markets over which companies exert limited control. Foreign market activities expose firms to exchange rate volatility, higher operational costs, different market entry modes, competitive pressures, and varying macroeconomic environments. A high dependence on exports may additionally increase exposure to geopolitical risk (Eldomiaty et al., 2025). Consequently, companies must carefully evaluate whether engagement in foreign markets yields greater benefits compared to domestic operations. Empirical evidence further indicates that exchange rate fluctuations significantly influence foreign sales revenues through both price competitiveness and customer perceptions (Chen, 2024), while foreign market entry modes characterised by stronger managerial control positively affect sales performance (Kirca, 2005).

Existing empirical research provides evidence that profitability measured by return on assets (ROA) plays a significant role in explaining firms'

sales revenue growth. Firm growth dynamics are highly heterogeneous, and the relationship between profitability and growth differs across firms depending on their financial constraints and growth patterns (Bottazzi et al., 2014). A company's ability to generate profit and reinvest internal funds represents a key factor for long-term sustainability and business expansion (Herman & Zsido, 2023; Kong et al., 2023; Novakovic et al., 2025). Empirical studies based on panel data confirm that more profitable firms tend to experience faster sales growth (Coad, 2007; Ye et al., 2023; Yazdanfar & Öhman, 2015).

The role of liquidity has been extensively examined in the growth literature. Carpenter and Petersen (2002a) demonstrated that liquidity indicators are valid explanatory variables when modelling sales revenue growth under the capital market imperfections. Firms with stronger liquidity positions tend to grow faster, as they are better able to finance inventories, grant trade credit, and maintain operational continuity (Baños-Caballero et al., 2014). However, excessively high liquidity may signal inefficient resource allocation, suggesting a potential non-linear relationship between liquidity and growth (Muzayyanah & Dewi, 2025).

Panel data analyses indicate that higher leverage is often associated with lower subsequent growth rates (Lang et al., 1996). This negative relationship is particularly pronounced among firms with limited growth opportunities, highlighting leverage as a binding financial constraint. Similar findings were reported for Canadian publicly traded firms, where higher debt levels reduced financial flexibility and limited growth potential (Aivazian et al., 2005). These findings are consistent with the financial constraints literature, which emphasises that limited access to internal and external finance constrains firms' capacity to fund expansion (Hadlock & Pierce, 2010). Credit constraints may therefore act as structural barriers to post-entry growth, particularly in volatile environments (Aghion et al., 2007). Conversely, financial flexibility can be conceptualised as a strategic capability that enhances resilience and supports sustained growth under uncertainty (Zhou & Wu, 2023).

Firm size represents another important determinant of growth. Empirical evidence suggests that growth rates often decline with increasing firm size (Bentzen & Tung, 2023; Nuseva et al., 2025b), indicating potential

diminishing marginal returns to scale or organisational rigidities that constrain expansion.

Based on the above theoretical considerations, the empirical analysis tests the following hypotheses.

2. Methodology

The research conducted in this paper is designed as empirical and explanatory, focusing on the analysis of the impact of internal financial and business factors on sales revenue growth of firms in the agricultural sector in Serbia. The study is motivated by the need to empirically identify which factors, and to what extent, influence sales growth of agricultural enterprises. Sales revenue growth was selected as the primary growth indicator because it directly reflects market expansion and competitive positioning. Alternative measures such as asset growth or employment growth were not included due to data limitations and the short observation period, which may not adequately capture structural changes in firm size or workforce. Attention is paid to the specific characteristics of the agricultural sector in Serbia, viewed through the prism of limited access to capital, pronounced market fluctuations, and the importance of international business activities.

The objective of the research was to quantify, through the construction of a panel regression model, the impact of engagement in foreign markets, profitability (measured by ROA), liquidity, leverage, and firm size on sales revenue growth of agricultural enterprises over the observed period. The authors sought to address the central research question: "Which internal firm characteristics have the greatest influence on sales revenue growth in the agricultural sector?". A panel data approach was applied, as it allows for the simultaneous observation of changes over time and differences across firms, thereby contributing to greater estimation precision and improved control of unobservable factors.

The research sample consists of 104 enterprises operating in the agricultural sector within the territory of the Republic of Serbia. Data on these enterprises were collected from the Scoring database (Scoring, 2025). The panel regression model includes a total of 312 observations, as the selected enterprises were observed over a three-year period (2022–2024). Given the short panel structure ($T = 3$), dynamic panel estimators such as system GMM are not statistically appropriate. To mitigate potential simultaneity bias, we applied

lagged independent variables in robustness specifications.

The analysis covers five key determinants—engagement in foreign markets, profitability (ROA), liquidity, leverage, and firm size—which are treated as independent variables in the model, while sales revenue growth is specified as the dependent variable (see Table 1).

Table 1 List of variables used in panel analysis

Variable	Type of variable	Definition	Calculation method	Expected effect on Sales Revenue Growth
Sales Revenue Growth	Dependent	Measures the change in sales revenue between two consecutive years.	$\frac{Sales_t - Sales_{t-1}}{Sales_t} \cdot 100$	—
Foreign Operations (Foreign Sales)	Explanatory	Indicates whether the company generates revenue from foreign markets reflects international business activity.	Dummy variable: 1 = company has foreign sales. 0 = otherwise.	Positive (internationalisation may increase market reach and sales)
Return on Assets (ROA)	Explanatory	Measures profitability relative to total assets. Higher ROA indicates better asset efficiency.	$ROA = \frac{Net\ income}{Total\ Assets}$	Positive (more profitable firms tend to grow faster)
Liquidity Ratio	Explanatory	It indicates the firm's ability to meet short-term obligations.	$Current\ ratio = \frac{Current\ Assets}{Current\ Liabilities}$	Positive (financially stable firms are more capable of supporting sales expansion)
Leverage	Explanatory	Shows the degree of debt financing in the firm's capital structure.	$Leverage = \frac{Total\ Debts}{Total\ Assets}$	Ambiguous/Negative (high debt may restrict growth, but moderate leverage can support investment)

Company Size	Explanatory	Represents the scale of the firm's operations.	Commonly measured as the natural log of Total Assets (ln Total Assets)	Positive (larger firms usually have more resources to expand sales)
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Source: The authors, based on Hitt et al. (2017); Zahra and Garvis (2000); Delmar et al. (2003); Coad (2009); Davidsson et al. (2009); Carpenter and Petersen (2002b); Myers (1984); Lang et al. (1996); and Penrose (1959).

Building on the research objective and theoretical foundations derived from the existing literature, the following hypotheses were formulated:

H₁: Engagement in foreign markets has a positive effect on sales revenue growth. *Rationale*: Participation in foreign markets expands demand, enhances market diversification, and increases revenue potential.

H₂: Higher profitability (ROA) has a positive effect on sales revenue growth. *Rationale*: More profitable firms allocate resources more efficiently and possess greater internal capacity to finance expansion.

H₃: Firms with higher liquidity achieve faster sales revenue growth. *Rationale*: Greater liquidity enhances financial stability and facilitates the financing of operational and sales-related activities.

H₄: Leverage has a negative or ambivalent effect on sales revenue growth. *Rationale*: High leverage may constrain investment capacity due to debt obligations, whereas moderate leverage may stimulate growth through external financing.

H₅: Larger firms (measured by total assets) achieve higher sales revenue growth. *Rationale*: A greater resource base, economies of scale, and stronger market positioning may increase the capacity for revenue expansion.

The empirical analysis was conducted using panel regression techniques. Both fixed effects (FE) and random effects (RE) specifications were estimated, with the final model selection based on the Hausman test. To ensure the validity of the estimations, diagnostic procedures were implemented to assess multicollinearity, heteroskedasticity, and autocorrelation. Where appropriate, standard errors were adjusted using robust clustered estimators.

The general form of the estimated panel regression model is:

$$Y_{it} = \beta_0 + \beta_1 X_{1,it} + \beta_2 X_{2,it} + \dots + \beta_k X_{k,it} + u_i + e_{it} \quad (1)$$

where:

- Y_{it} – dependent variable (sales revenue growth),
- $\beta_k X_{k,it}$ – the set of independent variables,
- u_i – unobserved firm-specific characteristics,
- e_{it} – the random error term.

To account for potential cross-sectional dependence resulting from common sectoral shocks, the Pesaran (2004) CD test was applied. The results indicate no statistically significant cross-sectional dependence among panel units ($p > 0.05$), supporting the appropriateness of the RE specification.

Given the short time dimension of the panel ($T = 3$), conventional panel unit root tests lack sufficient statistical power and are therefore not appropriate. Moreover, the key variables are expressed as ratios or growth rates, which mitigates concerns related to non-stationarity.

To address potential simultaneity and endogeneity concerns, a robustness check was conducted by re-estimating the model with lagged independent variables. The results remained qualitatively consistent, confirming the stability of the main findings.

Data analysis was performed using Gretl software and included descriptive statistics, correlation analysis, panel regression estimation, and corresponding diagnostic testing.

The study is subject to certain methodological limitations. The short panel dimension ($T = 3$) restricts the application of dynamic panel estimators and limits the ability to capture long-term growth dynamics. Additionally, data constraints prevented the inclusion of certain external macroeconomic and institutional factors that may influence sales growth. These limitations should be considered when interpreting the findings and represent avenues for future research.

3. Results and discussion

Table 2 presents the basic descriptive statistical measures for all variables included in the analysis.

Table 2 Descriptive statistics

Variable	Count	Mean	Median	Std. Dev.	Min	Max
<i>Dependent variable</i>						
Sales Revenue Growth	104	1.033	1.043	0.225	0.234	1.81
<i>Independent variables:</i>						
Foreign Operation	104	0.753	1.0	0.372	0.0	1.0
ROA	104	0.069	0.054	0.135	0.293	0.597
Leverage	104	0.509	0.414	0.305	0.012	2.166

Liquidity	104	2.355	1.978	2.469	0.365	19.86
Company size	104	15.046	15.52	1.213	9.213	16.541

Source: the authors

The average sales revenue growth amounts to approximately 103%, with moderate dispersion (std = 0.23). The range of values (from 0.23 to 1.81) indicates that the sample includes firms with very modest growth as well as those achieving substantially above-average sales revenue growth rates. In other words, there is considerable heterogeneity in growth dynamics among the observed enterprises.

The mean value of the Foreign Operation variable is 0.75, indicating that approximately 75% of the firms in the sample are present in foreign markets, while the remainder are oriented exclusively towards the domestic market. This sample structure points to a relatively high degree of internationalisation among the Serbian agricultural enterprises included in the analysis.

Firm profitability, measured by return on assets (ROA), averages 0.069 (6.9%), but exhibits pronounced variability (std = 0.135). The minimum ROA value is negative (-0.29), indicating that a portion of enterprises operates at a loss, while the maximum value (0.60) suggests that some firms achieve very high asset utilisation efficiency. These results confirm the presence of substantial differences in profitability within the sector.

Observing the leverage variable, the average value is 0.51, with a range from 0.01 to 2.17, indicating the presence of firms with negligible levels of debt as well as those exposed to very high financial risk. The standard deviation (0.31) confirms that capital structures among the observed enterprises are highly uneven.

Firm liquidity is also markedly heterogeneous. The mean value amounts to 2.35, accompanied by a high standard deviation (2.47) and a wide range of values (from 0.36 to 19.86). These results indicate that while some firms operate with minimal working capital, others maintain extremely high liquidity levels, which may also point to inefficient management of short-term assets.

Firm size, measured by the logarithm of total assets, exhibits a moderate range (9.21–16.54) and relatively low variability (std = 1.21), suggesting that the sample includes both smaller and larger agricultural enterprises, but without extreme size outliers.

The data included in the sample indicate pronounced heterogeneity in financial indicators across enterprises, meaning that the sample comprises both highly successful and financially risky firms. Such a data structure justifies the application of panel regression analysis, which allows for the simultaneous examination of within-firm variations over time and differences between firms.

A panel regression model can be constructed only if the regressors are not excessively similar to one another, that is, if the assumption is satisfied that the variables exhibit sufficient independent variation within and across the units of observation (firms). To ensure the reliability of the panel regression analysis, the first step is to assess the presence of multicollinearity among the independent variables using a correlation matrix (see Table 3). “A correlation matrix offers a simple diagnostic check for potential multicollinearity before estimating a regression model. High correlations among regressors may signal unstable coefficient estimates and inflated standard errors” (Wooldridge, 2013, p. 95). According to Gujarati and Porter (2009, p. 338), “detecting multicollinearity often starts with examining the correlation coefficients between explanatory variables. If two or more regressors are highly correlated, the regression results become unreliable.”

Table 3 Correlation matrix

	Sales revenue growth	Foreign operation	ROA	Liquidity	Leverage	Company Size
Sales revenue growth	1.0000					
Foreign operation	0.3547	1.0000				
ROA	0.0071	0.1835	1.0000			
Liquidity	0.2099	0.0324	0.0281	1.0000		
Leverage	-0.1317	-0.0424	0.1493	0.3339	1.0000	
Company size	0.0925	0.3687	0.2401	0.2063	0.1458	1.0000

Source: the authors

As shown in Table 3, there are no strong correlations among the explanatory variables that could compromise the stability of the regression estimates; therefore, it can be concluded that the assumption of the absence of serious multicollinearity is satisfied. The most pronounced negative correlation is observed between the

Liquidity and Leverage variables (-0.33), while moderate positive correlations are present between Foreign operation and Company size (0.37), as well as between Company size and ROA (0.24).

All reported correlation coefficients are well below the ±0.7 threshold, which is most cited in the literature as the critical value for the presence of serious multicollinearity (Gujarati & Porter, 2009). This indicates that all explanatory variables can be included in the regression model without the risk of biased or unstable coefficient estimates.

Correlations between the dependent variable (Sales revenue growth) and the independent variables are weak to moderate. The highest positive correlation is observed with the Foreign operation variable (0.35), suggesting that firms operating in foreign markets tend, on average, to achieve faster sales revenue growth. Moderate positive associations are also found with the Liquidity variable (0.21), while correlations with ROA, Leverage, and Company size are relatively weak. All observed relationships exhibit economically plausible directions, which further justifies their inclusion in the panel regression analysis.

In addition to the correlation matrix, panel analyses almost invariably employ VIF diagnostics, as reported in Table 4. According to O’Brien (2017, p. 673), “the Variance Inflation Factor remains one of the most widely used and most important diagnostic indicators for detecting multicollinearity, as high VIF values indicate unstable coefficients and unreliable statistical inference.”

The simultaneous use of the correlation matrix and VIF is justified by the fact that the correlation matrix reveals pairwise linear relationships between explanatory variables, whereas VIF diagnoses multiple collinearity, that is, situations in which a variable is not linearly dependent on a single other variable but on a combination of several variables (Hair et al., 2019).

Table 4 Variance Inflation Factor (VIF) Multicollinearity Diagnostics

Variable	VIF
Foreign Operation	1.19
ROA	1.11
Liquidity	1.17
Leverage	1.18
Company size	1.29

Source: the authors

As shown in Table 4, all VIF values are below the threshold of 5 indicated by most authors, and well below the value of 10, which some authors consider a cause for concern. It can therefore be

concluded that the model is stable and free of multicollinearity among the independent variables, allowing them to be jointly included in the panel regression model without the risk of one variable’s effect being masked by another.

Heteroskedasticity was tested using the White test, which represents a robust procedure for detecting both linear and nonlinear forms of heteroskedasticity (White, 1980). The test results indicate a TR² statistic of 46.12, with a p-value of 0.0008, which is well below the conventional 5% significance level. On this basis, the null hypothesis of homoskedasticity is rejected, indicating the presence of heteroskedasticity in the model.

The presence of heteroskedasticity suggests that the variance of the residuals is not constant across the observed enterprises, which is expected in empirical analyses covering heterogeneous firms in the agricultural sector. To ensure the reliability of inferential conclusions, robust standard errors were applied in the subsequent analysis, thereby ensuring the validity of the estimates and statistical significance tests in the panel regression model.

Residual autocorrelation was tested using the Wooldridge test for panel data, which represents a standard procedure for detecting first-order autocorrelation in panel regression models (Wooldridge, 2013). The test results indicate a test statistic of $t = -14.62$, with a p-value below 0.001, implying that the null hypothesis of no autocorrelation is rejected.

These results point to the presence of first-order autocorrelation in the residuals, which is expected in short panels covering heterogeneous firms observed over time. To ensure the validity of inferential conclusions, robust standard errors that are simultaneously resistant to heteroskedasticity and autocorrelation are applied in the subsequent analysis, thereby ensuring the reliability of the estimates within the panel regression models.

In the next step, OLS, FE, and RE models were estimated, and the best-performing specification was identified (Table 5).

Table 5 Panel regression results (Pooled OLS, FE, RE)

Variable	Pooled OLS	Fixed effects (FE)	Random effects (RE)
Constant	0.7959 (0.0102)	0.6726 (0.1599)	0.7959 (0.0088)
Foreign operation	0.2019 (0.0013 ^{***})	0.1681 (0.3320)	0.2012 (0.0010 ^{***})
ROA	-0.0185 (0.8662)	0.2401 (0.4720)	-0.0185 (0.8658)

Liquidity	0.0265 (0.0339 ^{**})	0.0603 (0.0334 ^{**})	0.0265 (0.0315 ^{**})
Leverage	0.0082 (0.9318)	0.0839 (0.2848)	0.0082 (0.9317)
Company size	0.0013 (0.9485)	0.0021 (0.9470)	0.0013 (0.9483)
R-squared	0.0885	0.3846	0.0735

Source: the authors
 Note: p-values are reported in parentheses. Significance levels: * p<0.10, ** p<0.05, *** p<0.01. All models are estimated using cluster-robust standard errors at the firm level. R² for the fixed-effects model refers to the LSDV specification.

Panel diagnostics were conducted using standard tests for heteroskedasticity, autocorrelation, and model specification selection. The results of the White and Wooldridge tests indicate the presence of heteroskedasticity and autocorrelation; therefore, cluster-robust standard errors were applied in all models. The choice between fixed and random effects models was made using the Hausman test.

The Hausman test results ($\chi^2 = 5.04546$; $p = 0.41035$) indicate that the null hypothesis of no correlation between the individual effects and the regressors cannot be rejected, and the random effects (RE) model was therefore identified as the optimal specification.

The results of the random effects (RE) model suggest that internal factors exert a selective but economically meaningful impact on sales revenue growth of agricultural enterprises in Serbia.

Among the observed independent variables, presence in foreign markets (Foreign operation) emerges as a positive and highly statistically significant determinant of sales growth (0.2012; $p < 0.01$). The estimated coefficient suggests that firms engaged in international markets experience, on average, approximately 20 percentage points higher sales revenue growth compared to firms operating exclusively in the domestic market, holding other factors constant.

This finding indicates that internationalization substantially enhances short-term revenue expansion capacity. Although the liquidity coefficient (0.0265) appears numerically smaller, its economic relevance should not be underestimated, particularly in a sector characterised by tight working capital cycles and seasonal cash-flow fluctuations. Internationalisation can therefore be interpreted as a strategic driver of market expansion, increased sales volumes, and risk diversification.

This result is consistent with prior empirical evidence highlighting the growth-enhancing role of foreign market participation (Tica et al., 2023;

Pacheco, 2019; Lu & Beamish, 2001; Peng et al., 2024). While some studies report nonlinear or inverted U-shaped relationships between internationalisation and performance, our findings indicate a predominantly positive short-term effect within the specific context of agricultural enterprises in a transition economy.

In addition to foreign market presence, liquidity also emerges as a positive and statistically significant determinant of sales revenue growth (0.0265; $p < 0.05$). Firms with stronger short-term financial positions appear better equipped to maintain operational continuity, absorb seasonal fluctuations, and respond flexibly to market volatility characteristic of the agricultural sector. In this context, liquidity represents not merely a measure of solvency but a strategic buffer that enhances organisational resilience and growth capacity. This result aligns with prior research emphasising the role of financial flexibility in sustaining firm growth under conditions of uncertainty (Baños-Caballero et al., 2014; Zhou & Wu, 2023).

From a managerial standpoint, liquidity management can be operationalised through prudent working capital policies, optimisation of receivables and inventory turnover, and the maintenance of adequate short-term reserves to buffer seasonal volatility. Internationalisation decisions may involve gradual export expansion, participation in regional value chains, strategic partnerships with foreign distributors, and investment in certification standards required for access to EU markets. These operational mechanisms translate strategic intent into measurable financial outcomes.

In contrast to studies that report a significant positive relationship between profitability and firm growth (Bottazzi et al., 2014), our results suggest that this relationship may be both sectorally and temporally conditioned, particularly in industries characterised by structural volatility and constrained capital markets. The remaining independent variables in the RE model do not exhibit a statistically significant impact on sales revenue growth, indicating that short-term revenue expansion in the observed period is not primarily driven by existing profitability levels, capital structure, or firm size. Instead, growth appears to depend more strongly on liquidity management and strategic international positioning.

The absence of statistical significance for profitability (ROA), leverage, and firm size may reflect structural characteristics of Serbian

agriculture rather than methodological limitations. The sector operates under pronounced price volatility, seasonal production cycles, subsidy dependence, and fragmented production structures, which limit the immediate scalability of financial efficiency (Dimitrijević et al., 2025). In such an environment, accounting profitability often serves a stabilising rather than expansionary function, as retained earnings are frequently allocated to risk mitigation and operational continuity instead of growth-oriented investments. Likewise, firm size does not automatically generate economies of scale due to infrastructural bottlenecks, limited vertical integration, and supply chain inefficiencies. The muted effect of leverage may additionally stem from conservative lending practices and underdeveloped agricultural credit markets, which constrain the growth-enhancing role of external financing (Muzayyanah & Dewi, 2025). Collectively, these structural features weaken the immediate transmission mechanism between financial efficiency and short-term sales revenue growth.

These findings provide a contextual explanation for the rejection of H2, H4, and H5, indicating that in the short-term and within the structural constraints of Serbian agriculture, profitability, leverage, and firm size do not constitute primary drivers of sales revenue growth.

Conclusion

The aim of this study was to examine the impact of internal firm-level factors on sales revenue growth in the agricultural sector of Serbia, based on panel data for 104 enterprises over the period 2022–2024. The analysis was conducted using Pooled OLS, fixed effects, and random effects models, accompanied by appropriate diagnostic tests. The results of the Hausman test indicated that the random effects model was the most appropriate specification for interpretation. The basic activity that leads to significant income for agricultural enterprises is the sale of agricultural products. Accordingly, sales growth analysis should be one of the key activities in monitoring the operations of these companies (Dakić et al., 2024).

The findings show that engagement in foreign markets has a positive and statistically significant effect on sales revenue growth, confirming that internationalisation represents an important strategic mechanism for the growth of agricultural enterprises. In addition, liquidity emerged as a significant and positive determinant of growth, indicating that financial flexibility and firms'

ability to meet short-term obligations smoothly play an important role in ensuring the continuity of production and sales in a sector exposed to seasonal and market shocks.

Overall, the results suggest that internal factors related to market orientation and financial stability are key drivers of sales revenue growth in the Serbian agricultural sector, while other internal indicators have limited explanatory power over the short observation period. Future research should cover a longer time horizon and incorporate relevant external determinants in order to provide a more comprehensive understanding of growth factors in this sector.

This study advances the literature by providing firm-level panel evidence on the internal determinants of sales revenue growth in agricultural enterprises within a transition economy, thereby addressing the limited empirical focus on strategic growth drivers in the Western Balkan agricultural sector.

From a policy perspective, the findings suggest that strengthening export-support mechanisms and improving access to short-term agricultural financing may enhance revenue growth potential in the sector. Managerially, the results highlight the importance of liquidity optimisation and gradual international market engagement as strategic levers for short-term growth. At the same time, the short observation period and the exclusion of external macroeconomic variables limit the ability to capture long-term structural effects. Future research should therefore consider longer panel horizons and incorporate external institutional and market factors to provide a more comprehensive understanding of growth dynamics.

Declarations

Availability of data and materials

The datasets used and analysed during the current study were obtained from the Scoring database (2025) and are available from the corresponding author on reasonable request.

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