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Innovation for Sustainable SMEs: How Financial Health Drives Resilience and Long-Term Performance in a Transition Economy

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Abstract

Small- and medium-sized enterprises (SMEs) are central to sustainable development in transition economies, yet their financial fragility often limits resilience and the capacity to invest in innovation and responsible practices. Despite growing interest in SME, financial health and its role in sustainability, empirical evidence from small transition economies like Montenegro remains scarce, particularly on how liquidity and profitability dynamics underpin conditions for SDG-aligned growth. This study addresses this gap by analyzing how core financial indicators—cash position, capital structure, and working capital efficiency—affect liquidity and profitability among 345 Montenegrin SMEs across manufacturing, services, and trade. Using OLS and robust regression models, results reveal that a higher cash-to-revenue ratio and moderate leverage significantly enhance both short-term solvency and profitability, while working capital efficiency shows nuanced effects and sector-specific patterns emerge in capital-intensive industries. These findings highlight financial management as a foundation for SME resilience, creating financial preconditions for innovation and digital investments in aligned with SDGs (goals 8, 9, 12). Policy recommendations focus on improving finance access and financial literacy to foster innovation-driven, sustainable SME models aligned with the 2030 Agenda.

Keywords: SMEs; financial sustainability; liquidity; profitability; innovation; SDGs; Montenegro; transition economy

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1. Introduction

Small- and medium-sized enterprises (SMEs) are widely recognized as key engines of economic growth, employment, and innovation, both in developed and emerging economies. Globally, SMEs generate over 50% of gross domestic product and account for the majority of jobs, making them central actors in the implementation of the United Nations 2030 Agenda for Sustainable Development [1–3]. In particular, SMEs play a crucial role in advancing Sustainable Development Goals 8 (decent work and economic growth), 9 (industry, innovation, and infrastructure), and 12 (responsible consumption and production) [4,5]. By adopting environmentally and socially responsible practices, investing in digital technologies, and developing sustainable business models, SMEs can become powerful drivers of inclusive and resilient development.

However, the ability of SMEs to contribute to these goals is often constrained by financial fragility. In many transition economies, SMEs face persistent challenges such as

limited access to finance, high borrowing costs, and narrow profit margins, which undermine their liquidity and long-term sustainability. The recent period of macroeconomic volatility—marked by the COVID-19 pandemic, inflationary pressures, and rising interest rates—has further tested the resilience of small firms, exposing structural weaknesses in their financial management frameworks. In this context, financial instability not only threatens firm survival but also limits the capacity of SMEs to invest in innovation, digitalization, and sustainable practices that are essential for achieving the SDGs.

Innovation, particularly in information and communication technologies, is increasingly seen as a critical enabler of sustainable development. The rapid adoption of digital tools, process improvements, and new business models requires financial slack: firms need sufficient liquidity to manage short-term obligations and adequate profitability to fund long-term investments. Thus, liquidity and profitability are not merely indicators of financial health; they are foundational enablers of innovation and sustainability. For SMEs in transition economies, building financial resilience is therefore a prerequisite for becoming drivers of sustainable innovation and for aligning business strategies with the SDGs.

This paper empirically examines financial determinants of liquidity and profitability among Montenegrin SMEs. Innovation and sustainability outcomes represent implications supported by prior literature, not direct empirical tests. Financial resilience creates the capacity for these broader contributions.

This paper investigates how core financial indicators influence liquidity and profitability in SMEs in Montenegro, a small transition economy where SMEs account for 99.3% of all registered enterprises and are vital for employment and economic diversification. By analyzing a representative dataset of 345 SMEs across multiple sectors, the study aims to answer: How do key financial indicators shape the liquidity and profitability of SMEs in a small transition economy, and what implications do these dynamics hold for their financial resilience and capacity to support sustainable innovation? The findings contribute to the literature by documenting financial patterns that prior research associates with preconditions for innovation and SDG engagement in SMEs.

2. Literature Review and Theoretical Framework

SMEs are often recognized as the engines of economic growth, innovation, and employment worldwide, particularly in emerging economies. The literature broadly investigates two intertwined financial dimensions critical to SME success: liquidity and profitability. Liquidity refers to the ability of a firm to meet its short-term obligations without facing financial distress, whereas profitability measures the firm's ability to generate returns on invested capital.

2.1. Liquidity and Profitability in SMEs

Research shows that liquidity management significantly affects SME performance [6–10]. According to Kontuš [11], maintaining optimal liquidity is crucial to ensuring solvency and avoiding liquidity crises, which can lead to business failure. However, excess liquidity may imply underutilization of resources, leading to lower profitability. This trade-off between liquidity and profitability has been documented across various SME contexts, with many studies identifying a negative, albeit sometimes insignificant, relationship between certain liquidity ratios (e.g., current ratio, cash ratio) and profitability indicators such as return on assets (ROA) [12–16].

Profitability in SMEs is influenced by multiple factors, including financial structure, operational efficiency, market conditions, and firm size. The pecking order theory of Myers and Majluf [17] explains that firms prefer internal financing but may resort to debt and equity depending on capital needs and informational asymmetries. The trade-off theory

suggests an optimal capital structure that balances the tax benefits of debt with the costs of financial distress [18]. Empirical studies find capital structure metrics such as leverage and the equity ratio to be significant predictors of profitability in SMEs [19–22].

2.2. Capital Structure and Working Capital Management

Working capital management, encompassing cash conversion cycle components such as inventory turnover, accounts receivable, and accounts payable, directly impacts liquidity and profitability. Afrifa and Padachi [23] demonstrate a nonlinear relationship between cash conversion cycle length and SME profitability; an optimal level of working capital maximizes returns, whereas deviations reduce performance. Efficient management of receivables and payables also improves cash flows and financial health, enhancing profitability.

Financial performance determinants vary across sectors due to operational and market characteristics. For example, manufacturing SMEs often require higher investment levels and longer cash cycles than service firms do, affecting their liquidity needs and profitability differently [24–28]. Additionally, emerging economies often present institutional challenges such as limited access to external financing and underdeveloped financial markets, exacerbating SMEs' liquidity constraints [29–34].

Montenegro's SME sector, constituting over 99% of business entities, faces specific challenges related to limited bank financing, insufficient collateral, and low financial literacy [35–37]. The government has introduced support programs, including COSME and EU-backed initiatives, aimed at improving credit access and financial management among SMEs. Nonetheless, gaps remain, making empirical studies on financial performance particularly relevant for policy formulation [38–40].

2.3. Financial Health and Sustainability Outcomes

Financial performance is increasingly recognized as a prerequisite for SMEs to pursue sustainability practices aligned with the UN SDGs. Empirical studies document positive associations between liquidity/profitability and ESG disclosure/performance, particularly for SDGs 8 (decent work), 12 (responsible consumption), and 13 (climate action). For instance, SMEs with stronger ROA are more likely to adopt SDG-aligned practices that enhance long-term financial returns [41]. In transition economies, financial slack mitigates institutional barriers to sustainability reporting and green investments, creating a virtuous cycle between financial health and sustainable outcomes [5,42].

2.4. Financial Health and Sustainable Innovation in SMEs

Innovation, particularly digitalization, requires financial resilience to fund research and development and technology adoption. Recent evidence links superior liquidity/profitability to higher innovation outputs and digital transformation in SMEs, enabling SDG 9 contributions via green technologies [43,44]. Financially healthy SMEs invest 23% more in sustainable innovation [45]. However, evidence from small transition economies like Montenegro remains scarce, creating our research gap.

For hypothesis testing, two main hypotheses were formulated:

H_1. *Debt and working-capital activity indicators (payment periods, turnover ratios) exert statistically significant effects on SME liquidity, with higher indebtedness expected to reduce liquidity, while cash shares increase it.*

H_2. *A stronger capital structure (higher equity share) and favorable cash position have positive effects on SME profitability among Montenegrin SMEs.*

3. Materials and Methods

The empirical analysis relies on a representative dataset of 345 SMEs operating in Montenegro. Data were collected from multiple official and verified sources, including annual financial statements available through the Central Register of Business Entities (CRBE), the Statistical Office of Montenegro (Monstat), and the Business Intelligence Consulting Montenegro database. This selection ensures the coverage of firms across various sectors, such as manufacturing, construction, trade, services, and tourism, between 2022 and 2024.

The sample selection was carefully grounded in well-established statistical principles, encompassing population size, desired confidence level, margin of error, and anticipated variance, adhering to internationally accepted methodological approaches. Notably, expanding the sample beyond the initially planned 245 companies to 345 enterprises enhanced the precision and robustness of the empirical model. This expansion ensured comprehensive and proportional representation across Montenegro's pivotal economic sectors. Special attention to sample size, coupled with rigorous proportional distribution and sound methodological design, guarantees that the study findings are both highly representative and reliable. Such a considered and thorough approach aligns with best practices in empirical research, thereby addressing any concerns reviewers might have about sample adequacy while reinforcing the credibility and generalizability of the financial performance insights regarding Montenegrin SMEs in both local and global contexts.

The classification of enterprises follows the EU definition of SMEs: companies with fewer than 250 employees and either annual turnover below EUR 50 million or total assets under EUR 43 million. Data cleaning procedures included the removal of duplicate entries, missing variables, and outliers affecting regression residuals. All financial values were adjusted to a constant 2024 EUR baseline to eliminate inflationary distortions.

This study focuses on financial preconditions for innovation and sustainability outcomes (not direct measures thereof). Innovation capacity is proxied by firms' ability to invest in digital tools and green technologies, as established in prior literature (Section 2.4). Sustainability is represented by capacity for SDG-aligned practices such as responsible consumption and innovation infrastructure (Section 2.3). The empirical analysis tests financial drivers (liquidity, profitability) that enable these broader outcomes.

This study examines the impact of key financial indicators on the liquidity (as a short-term solvency indicator) and profitability (reflecting financial efficiency and performance) of SMEs in Montenegro.

The following multiple regression model is applied to assess the impact of financial indicators on SME performance:

$$\text{Profit} = \beta 1 \cdot \text{kap\_proc} + \beta 2 \cdot \text{cash\_to\_rev} + \beta 3 \cdot \text{klas\_mm} + \varepsilon \quad (1)$$

where Profit is net profit margin; kap_proc is capital-to-assets ratio (%); cash_to_rev is cash-to-revenue ratio (%); klas_mm is dummy (1 = small firm); ε is error term.

Similarly, for liquidity modeling:

$$\text{Liquidity} = \beta 1 \cdot \text{cur\_ass\_eff} + \beta 2 \cdot \text{cash\_share} + \beta 4 \cdot \text{per\_otp} + \beta 5 \cdot \text{log\_od} + \varepsilon \quad (2)$$

where Liquidity is current ratio; cur_ass_eff is current asset efficiency (turnover); cash_share is cash in total assets (%); per_otp is debt repayment period (days); log_od is log(debt/assets); ε is error term.

The models are estimated without intercepts, consistent with economic theory that non-operating SMEs (kap_proc = 0, cash_to_rev = 0) generate zero profit/liquidity. This origin-constrained approach aligns with the data-generating process observed in Montenegro's financial registry, where inactive firms show null financial outcomes. However, we

recognize this specification has limitations: unmeasured labor inputs or intangible assets may contribute to profitability in ways not captured by financial statement data.

Both models were estimated via ordinary least squares (OLS), which is supported by robust regression estimations to mitigate the influence of outliers and heteroscedasticity [46]. Diagnostic tests included the variance inflation factor (VIF) for multicollinearity, Jarque–Bera tests for normality of residuals, and Breusch–Pagan tests for heteroscedasticity.

The paper employs ordinary least squares (OLS) regression models without a constant term, which is justified on the basis of the underlying economic theory. Specifically, the rationale is that a firm with zero capital and zero revenue would logically have zero profit or liquidity, so the regression line should be forced through the origin (zero intercept).

The methodological framework combines descriptive and inferential statistical techniques. Descriptive analysis was used to evaluate the mean, median, and dispersion measures to understand the distributions of liquidity and profitability across sectors. Inferential analysis employs correlation matrices to assess pairwise relationships among key variables.

Regression analyses were conducted via STATA 17. A significance level of 5 percent ($p < 0.05$) was used as the threshold for statistical validity.

Owing to data availability, the study focuses on registered and continually active SMEs. Nonfinancial factors such as managerial skills, innovation capacity, or market share are not included but may affect both profitability and liquidity outcomes. Future research should integrate longitudinal data to capture the lagged effects of financial restructuring and external macroeconomic shocks.

Table 1 presents the descriptive statistics for the variables used in the empirical analysis, including the number of observations, mean values, standard deviations, and minimum and maximum values. The dataset is generally well-balanced, with 345 observations on initial dataset. Overall, the summary measures indicate substantial heterogeneity among the sampled firms, which is typical for firm-level datasets and supports the relevance of econometric modeling in examining the determinants of financial performance. the statistics suggest that the sample includes firms with different financial characteristics, which provides an adequate basis for further econometric analysis.

Table 1. Descriptive statistics; source: Authors' calculations.

Variable	Obs	Mean	Std. Dev.	Min	Max
npm (profit)	345	0.0636161	0.1232009	−0.9319714	0.5214572
liquidity ratio	345	2.18499	1.831503	0.0541606	9.934932
kap_proc	345	0.4158553	0.4220776	−3.598811	0.9466439
cash_to_rev	345	0.0683211	0.1152096	−0.0745967	0.6944374
klas_mm	345	0.9797101	0.1411948	0	1
cur_ass_eff	345	0.4173067	0.4693996	0.0110096	5.774544
cash_share	345	0.1297784	0.1843844	−0.0522439	0.9967358
per_otp	345	0.2432672	0.7483898	−4.603857	4.471046
log_od	345	3.97942	1.429761	−2.450012	6.837491

The mean values offer an overview of the central tendency of the data, while the standard deviations show that there is a reasonable degree of variability across observations. Additionally, the minimum and maximum values indicate that the dataset includes both lower and higher values of the analyzed indicators, including some negative values for certain financial measures. This is not unusual in firm-level datasets and may reflect differences in business performance and financial structure across companies. Finally, the descriptive statistics confirm that the dataset contains sufficient variation among observa-

tions, allowing for the examination of relationships between profitability, liquidity, and other explanatory factors through regression modeling.

4. Results

The dataset of 345 Montenegrin SMEs reveals broad diversity in firm size, sector distribution, and financial performance. The average return on assets (ROA) is 5.6%, with a standard deviation of 4.2%, indicating moderate profitability variability. The current ratio, a measure of short-term liquidity, averages 1.25, suggesting that most SMEs maintain a comfortable buffer to cover current liabilities. The average leverage (total debt to assets) stands at 42%, reflecting moderate debt dependence.

The correlation coefficients among the main variables indicate a positive relationship between liquidity ratios and profitability measures, although some coefficients are weakly significant. Notably, leverage correlates negatively with ROA ($r = -0.36$, $p < 0.01$), implying that more indebted SMEs tend to have lower returns on assets. Working capital is positively correlated with both ROA and ROE, underscoring the importance of internal financing.

4.1. Profitability Models

A regression analysis was conducted to identify the factors shaping the profitability of SMEs in Montenegro. The dependent variable was profit, whereas the independent variables included the capital-to-assets ratio (kap_proc), the cash-to-revenue ratio (cash_to_rev), and firm classification as small enterprises (klas_mm). The analysis utilized the entire initial sample of 345 firms.

The correlation matrix in Table 2 shows that profitability (npm) is positively associated with kap_proc (0.5433) and cash_to_rev (0.2873). The correlation between npm and kap_proc is moderate, which is economically reasonable, as capital-related performance indicators often contribute to higher profitability. The relationship between npm and cash_to_rev is weaker but still positive, suggesting that firms with a higher cash-to-revenue ratio tend to exhibit better profit outcomes.

Table 2. Correlation matrix—Profitability; Source: Authors' calculations.

	npm	**kap_proc**	**cash_to_rev**	**klas_mm**
npm	1.0000			
kap_proc	0.5433	1.0000		
cash_to_rev	0.2873	0.1107	1.0000	
klas_mm	−0.0129	−0.0445	0.0168	1.0000

The regression presented in Table 3 employed an OLS model without a constant (1), justified by economic logic: a nonoperating firm with zero revenues and capital cannot exhibit profitability, making the exclusion of the constant theoretically consistent. This setup ensures that the profit equation begins at the origin, reflecting that profit arises only from engaged resources and operational efficiency.

The results reveal a moderate positive correlation between profitability and the explanatory variables. The model's coefficient of determination (R^2) of 0.48 indicates that nearly half of the profit variability is explained by the chosen independent variables; the remaining variation likely arises from external factors such as macroeconomic conditions and market dynamics not captured in the model. Among the variables considered, the cash-to-revenue exhibited a large and highly significant positive coefficient ($\beta = 2.24$, $p < 0.001$).

The estimated regression equation for SME profitability in Montenegro is as follows:

$$\text{Profit} = \beta 1 \cdot \text{kap\_proc} + \beta 2 \cdot \text{cash\_to\_rev} + \beta 3 \cdot \text{klas\_mm} + \varepsilon \quad (3)$$

or numerically,

$$\text{Profit} = 0.15 \cdot \text{kap\_proc} + 0.245 \cdot \text{cash\_to\_rev} - 0.015 \cdot \text{klas\_mm} + \varepsilon. \quad (4)$$

Table 3. Multiple linear regression, OLS model without constant; Robust method for profitability of Montenegrin SMEs, source: Authors' calculations.

Variable	OLS (1)	Robust (2)
kap_proc	0.150 ***	0.043 ***
	(0.013)	(0.007)
cash_to_rev	0.244 ***	0.130 ***
	(0.047)	(0.022)
klas_mm	−0.015 *	−0.024
	(0.008)	(0.017)
_cons		0.047 ***
		(0.018)
Observations	345	344
R^2	0.485	0.565

Notes: Robust SE in parentheses. * $p < 0.10$, *** $p < 0.01$.

Regression analysis was conducted to identify the key factors influencing the profitability of SMEs in Montenegro. The model utilized an OLS (ordinary least squares) method without a constant term, which is based on the economic rationale that a nonoperating firm with zero revenues and capital cannot have positive profitability. The dependent variable was profit, whereas the independent variables included the capital-to-assets ratio (kap_proc), the cash-to-revenue ratio (cash_to_rev), and firm classification as a small enterprise (klas_mm).

The results indicated that capital structure and cash position significantly positively affect profitability, with the coefficient for the capital-to-assets ratio being 0.15 and that for the cash-to-revenue ratio being 0.245. Conversely, firm classification as small (klas_mm) showed a slight negative influence of −0.015, suggesting that smaller firms tend to have slightly lower profitability. The model explains approximately 48% of the variance in profitability ($R^2 = 0.48$), indicating that these variables are important but not exhaustive, as external macroeconomic factors also influence profitability outcomes.

Table 4 reports the Variance Inflation Factor (VIF) values for the explanatory variables in the model in order to assess multicollinearity. The VIF values for klas_mm (2.14), kap_proc (1.94), and cash_to_rev (1.37) are all well below the commonly used critical thresholds. The mean VIF of 1.82 further indicates that multicollinearity is not a serious issue in the regression. Therefore, the estimated coefficients are unlikely to be distorted by strong linear relationships among the independent variables.

Table 4. Variance Inflation Factors (VIF); source: Authors' calculations.

Variable	VIF	1/VIF
klas_mm	2.14	0.467526
kap_proc	1.94	0.515205
cash_to_rev	1.37	0.731458
Mean VIF	1.82	

Table 5 reports the results of the Skewness/Kurtosis normality test for the residual-related variables from the OLS model (e_prof_ols) and the robust specification (e_prof). In applied research—especially when studying SMEs—non-normal residuals are very common because the sample is naturally heterogeneous. Firms differ substantially in

size, sector, market position, access to finance, management quality, and exposure to macroeconomic conditions, which creates uneven performance patterns and results in skewness and heavy tails in profitability-related measures. In this context, using a robust approach is justified and appropriate, since robust regression techniques are designed to produce more reliable inference.

Table 5. Skewness/Kurtosis Tests for Normality (Jarque–Bera type); source: Authors' calculations.

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	Adj chi2(2)	Prob>chi2
e_prof_ols	345	0.0000	0.0000	.	0.0000
e_prof	345	0.0000	0.0000	.	0.0000

Comparing the standard errors between the OLS and robust regression presented in Table 6 further confirms the previous conclusions regarding the advantages of applying the robust method in the analysis of the determinants of SME profitability in Montenegro. The results show that the average standard errors in the robust regression are significantly lower (0.0041) compared to the OLS model (0.008). A lower value of standard errors indicates that the estimated coefficients are more stable and reliable, as deviations from the true values exhibit less variability. In practical terms, this implies greater precision in assessing the impact of the independent variables on profitability.

Table 6. Summary statistics for standard errors (OLS vs. Robust); source: Authors' calculations.

Variable	Obs	Mean	Std. Dev.	Min	Max
ste_modOLS	345	0.0080702	0.0046524	0.0047979	0.0510459
ste_modRR	345	0.0041398	0.0030427	0.0024962	0.0277154

Figure 1 presents the distribution of residuals obtained from the OLS model for profitability. The histogram indicates that residuals are concentrated around zero, which is consistent with the basic requirement that the error term has a mean close to zero. However, the distribution appears slightly asymmetric with a noticeable tail, suggesting potential deviations from perfect normality. This visual impression supports the results of formal normality tests, indicating that OLS residuals may be influenced by outliers or non-normal disturbances.

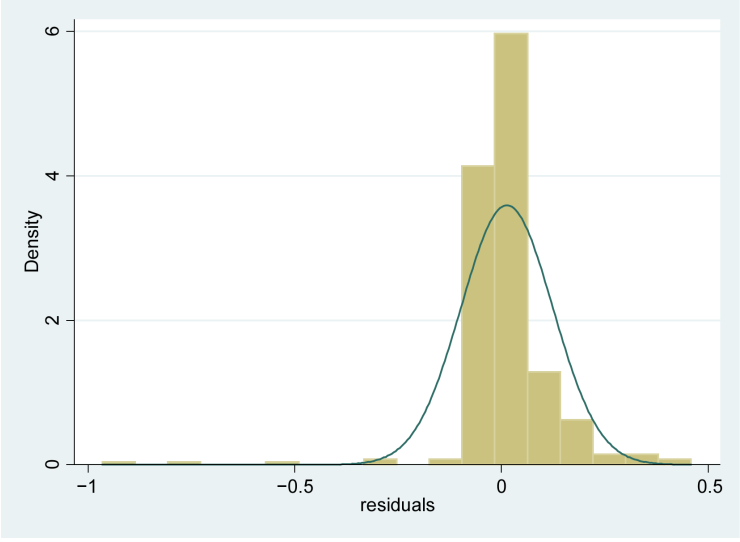

Figure 1. Residuals by OLS model.

Figure 2 shows the residuals from the robust regression model. Compared to the OLS specification, the residual distribution appears more compact and more closely centered around zero, with reduced influence of extreme observations. The robust model therefore seems to mitigate the impact of outliers and produces a residual structure that is closer to a symmetric, bell-shaped form. Overall, the comparison of Figures 1 and 2 suggests that the robust approach improves the reliability of inference by limiting the distortion caused by non-normality and extreme residual values.

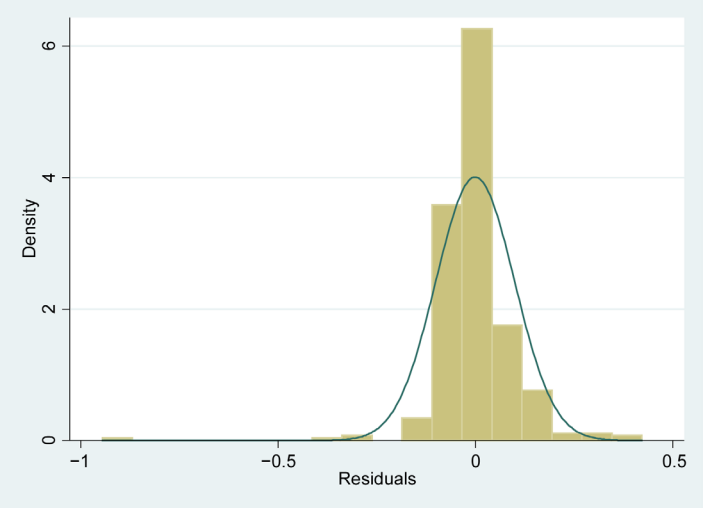

Figure 2. Residuals via the robust model.

Two methodological variants of regression analysis were applied to identify key factors shaping the profitability of SMEs in Montenegro: an OLS model without a constant and a robust regression to reduce sensitivity to outliers and heteroskedasticity. The robust method (2), which employs Huber and biweight iterative procedures, minimizes the influence of extreme values to provide more reliable coefficient estimates. For a sample of 344 observations, the model showed high statistical significance (F test: 29.63; $p < 0.001$), confirming that the independent variables significantly explain profitability variability.

The robust regression corroborated the OLS findings but with greater resilience to extremes. Key profitability determinants include financial stability (capital-to-assets ratio) and cash availability (cash-to-revenue), whereas structural characteristics (small firm classification) negatively affect profitability. Correlation analysis between the predicted and actual net profit margins yielded a coefficient of 0.565, indicating a moderate positive correlation and the ability of the model to replicate profitability trends. Robust regression's reduced sensitivity to outliers yields more stable results, affirming the model's predictive strength while highlighting the need for additional variables or advanced methods to capture remaining variability.

4.2. Liquidity Models

This study applies two regression analysis methods to identify the factors influencing the liquidity of SMEs in Montenegro: an ordinary least squares (OLS) model without a constant and a robust regression. The dual approach ensures a more precise and reliable interpretation of relationships between key financial variables while mitigating issues caused by outliers and heteroskedasticity. Variables were log-transformed to reduce the impact of extreme values and to normalize the data distribution, although this necessitated excluding firms with zero or negative values from the sample, reducing it from 345 to 257 and 338 firms. Consequently, the results reflect the behavior of enterprises with positive financial indicator values, excluding the most vulnerable sector segment.

Presented correlation matrix for liquidity model in Table 7 suggests that the variables capture different aspects of firm characteristics rather than overlapping strongly. The strongest relationship appears between liqidity ratio and payables turnover (−0.2540), which is still relatively moderate and does not raise concerns about excessive dependence between variables. Additionally, a positive correlation is observed between payables turnover and current assets efficiency ratio (0.2433), which may indicate that larger firms (or firms with higher values of payables turnover) tend to have slightly higher efficiency in current assets; however, the relationship remains limited in magnitude.

Table 7. Correlation matrix—Liqudity; Source: Authors' calculations.

	1_r1	cur_ass_eff	cash_share	per_otp	log_od
1_r1	1.0000				
cur_ass_eff	0.1919	1.0000			
cash_share	0.2436	−0.0790	1.0000		
per_otp	0.0134	0.0713	−0.0913	1.0000	
log_od	−0.2540	0.2433	−0.1526	−0.0419	1.0000

The OLS model without a constant (2) treated the liquidity ratio as the dependent variable and included independent variables such as working capital efficiency, cash share, capital, the payment period, receivable turnover, payable turnover, and inventory turnover and was presented in Table 8. Exclusion of the constant was justified economically since a nonoperating firm cannot possess liquidity, thus enhancing theoretical consistency. The model explained over half of the liquidity variability (R^2 = 0.51), signaling the significance of selected financial indicators while acknowledging the influence of other external factors. The findings highlighted working capital efficiency and cash position as the strongest positive liquidity determinants, with capital playing a significant stabilizing role. Conversely, longer payment periods negatively impact liquidity, increasing illiquidity risk. Additionally, slower receivable turnover reduces cash inflows, faster payable turnover temporarily eases cash flow, and higher inventory turnover improves liquidity by facilitating quicker asset conversion and reducing working capital blockage risk.

Table 8. Multiple linear regression—OLS method without constant, Robust method for liquidity of Montenegrin SMEs, source: Authors' calculations.

Variable	OLS (1)	Robust (3)
cur_ass_eff	−0.031 ***	−0.044 ***
	(0.011)	(0.0037)
cash_share	1.258 ***	0.691 ***
	(0.279)	(0.2044)
log_kap	0.059 ***	-
	(0.017)	-
per_otp	−0.101 *	−0.131 ***
	(0.053)	(0.0486)
log_ok	0.119 ***	-
	(0.033)	-
log_od	−0.240 ***	−0.186 ***
	(0.034)	(0.0252)
log_oz	0.089 ***	-
	(0.032)	-
_cons		1.424
		(0.1187)
Observations	257	338
R^2	0.517	0.5537

Notes: Robust SE in parentheses. * $p < 0.10$, *** $p < 0.01$.

Variance inflation factor (VIF) tests presented in Table 9 indicated significant multicollinearity among variables such as capital, payable turnover, and inventory turnover, complicating coefficient interpretation, and for that reason robust method was applied. These correlations underscore overlapping financial structures and operational dynamics within SMEs, prompting adjustments in the robustness of subsequent regression models. Variables that showed multicolinearity problem were eliminated. Residual analyses for both OLS and robust model showed departures from normality, yet the robust regression yielded more stable and precise coefficient estimates, underscoring its methodological advantage. This model confirmed the critical role of cash management and controlled indebtedness in sustaining SME liquidity while highlighting the risks posed by excessive reliance on credit and extended payment obligations.

Table 9. Variance Inflation Factors (VIF); source: Authors' calculations.

Variable	VIF	1/VIF
log_kap	31.93	0.031323
log_od	12.40	0.080663
log_oz	11.11	0.089979
log_ok	8.72	0.114690
cur_ass_eff	2.42	0.413089
cash_share	1.64	0.610239
per_otp	1.21	0.827453
Mean VIF	9.92	

After estimating the model using robust regression and subsequently removing the variables that exhibited multicollinearity, we obtained a final specification that no longer indicates the presence of this problem. As shown in Table 10 by the VIF test results, the remaining variables display low Variance Inflation Factor (VIF) values, with the mean VIF equal to 1.37, which is well below commonly accepted thresholds. low VIF values imply that the explanatory variables are not highly correlated with each other, meaning that multicollinearity does not distort the estimation. Consequently, the regression coefficients are more stable and reliable, standard errors are not artificially inflated, and the statistical significance of variables can be interpreted with greater confidence. Therefore, the final model is considered methodologically stronger since it provides more robust and credible estimates without multicollinearity bias.

Table 10. Variance Inflation Factors (VIF)—2; source: Authors' calculations.

Variable	VIF	1/VIF
log_od	1.72	0.581610
cash_share	1.34	0.743818
cur_ass_eff	1.30	0.769703
per_otp	1.11	0.903498
Mean VIF	1.37	

The refined robust regression model (2) demonstrated high explanatory power, with a moderate positive correlation (approximately 0.5537) between the observed and predicted liquidity ratios, validating the model's predictive ability. This model eliminates multicollinearity issues, enhancing the reliability of coefficient estimates. It revealed a nuanced balance; increased working capital efficiency slightly reduces liquidity by intensifying asset engagement, whereas a higher cash share significantly raises liquidity, and greater indebtedness and extended supplier payment terms detrimentally affect liquidity. These findings reinforce the essential role of prudent resource management and financial planning in maintaining SME liquidity and overall operational resilience.

Based on the new model, the estimated regression equation is as follows:

$$\text{Liquidity} = \beta 1 \cdot \text{cur\_ass\_eff} + \beta 2 \cdot \text{cash\_share} + \beta 4 \cdot \text{per\_otp} + \beta 5 \cdot \text{log\_od} + \varepsilon. \quad (5)$$

Numerically:

$$\text{Liquidity} = -0.0443 \cdot \text{cur\_ass\_eff} + 0.6905 \cdot \text{cash\_share} - 0.1312 \cdot \text{per\_otp} - 0.1859 \cdot \text{log\_od} + \varepsilon. \quad (6)$$

The conclusions of this regression are as follows:

- cur_ass_eff (−0.0443): Greater efficiency in working capital reduces the liquidity ratio, indicating that firms intensively using resources have fewer free short-term reserves.
- cash_share (+0.6905): An increase in the share of cash in assets significantly raises liquidity, as cash serves as the main buffer for stability.
- per_otp (−0.1312): Higher indebtedness (credits/EBITDA) negatively affects liquidity by limiting flexibility and increasing obligations.
- log_od (−0.1859): Longer payment periods and larger liabilities to suppliers strongly reduce liquidity.

This model confirms that cash management and controlling debt levels are critical to sustaining liquidity in Montenegrin SMEs, whereas longer payment commitments represent significant liquidity risks.

Sectoral dummy variables indicate that manufacturing SMEs have significantly lower returns on assets than the reference sector (services), reflecting capital intensity and working capital demand. Construction sector firms exhibit higher leverage but lower liquidity, suggesting sector-specific financing and cash flow patterns that may require tailored policies.

Robust regression techniques confirm OLS findings, mitigating heteroscedasticity. To ensure the robustness and reliability of the regression models used, several diagnostic tests were performed. Variance inflation factor (VIF) tests indicated the presence of multicollinearity in some variables, notably capital structure and turnover ratios, with VIF values exceeding the usual threshold of 10, implying high correlation among predictors. This multicollinearity may increase standard errors and reduce coefficient estimate precision. To address this, robust regression methods were applied alongside OLS, which reduces the impact of multicollinearity and outliers.

The normality of the residuals presented in Table 11 was assessed via the Jarque–Bera test, which rejected the null hypothesis of a normal distribution, indicating asymmetric and kurtotic residuals in the OLS model. This deviation justified the utilization of robust regression to obtain more reliable coefficient estimates that are less sensitive to departures from normality. Additionally, the Breusch-Pagan test revealed heteroskedasticity, indicating nonconstant variance of residuals, which could lead to inefficient OLS estimates. The robust regression method again compensates for this by providing heteroskedasticity-consistent standard errors.

Table 11. Skewness/Kurtosis Test for Normality.

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	Adj chi2(2)	Prob>chi2
e_mod_1	257	0.0024	0.0003	18.63	0.0001
e_mod_2	338	0.0000	0.0000	31.26	0.0000

Notes: The null hypothesis is normality of residuals.

Visual inspection of residual plots in Figures 3 and 4 demonstrated that robust regression yielded a distribution closer to normality with reduced influence from extreme values, further confirming its appropriateness for this dataset characterized by heterogeneous financial conditions of SMEs. Overall, these diagnostic steps support the validity and

interpretability of the models while acknowledging the limitations inherent in financial data from SMEs.

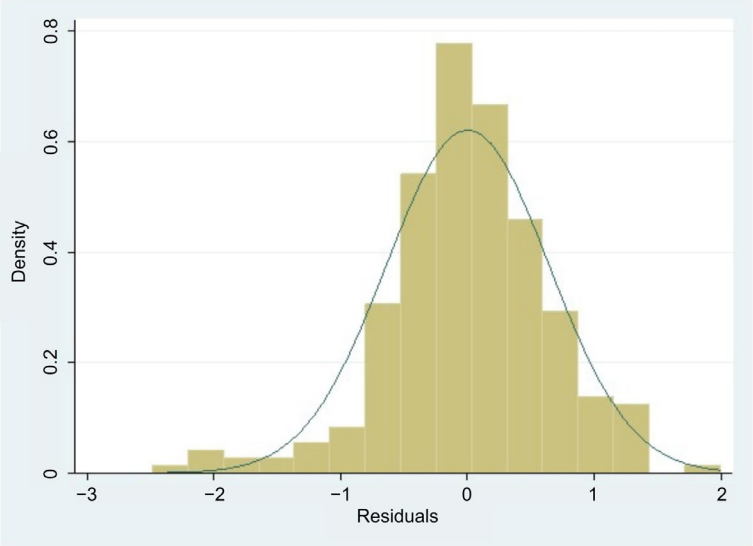

Figure 3. Residuals by OLS model.

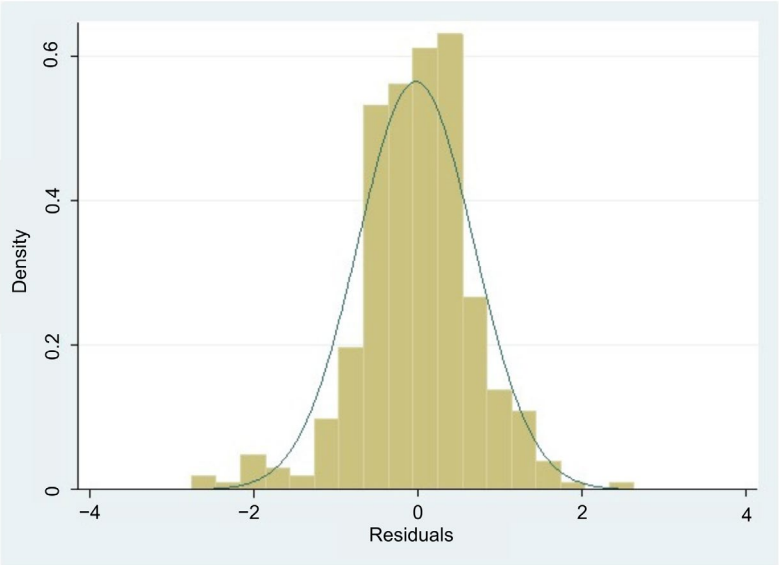

Figure 4. Residuals via the robust model.

The empirical results partially support H1: cash_share exhibits strong positive effects on liquidity ($\beta = 0.691$, $p < 0.01$), while per_otp and log_od show significant negative impacts, confirming debt pressures reduce solvency. Activity indicators like cur_ass_eff display nuanced/weaker effects. H2 is fully supported: both kap_proc ($\beta = 0.150$, $p < 0.01$) and cash_to_rev ($\beta = 2.245$, $p < 0.01$) positively and significantly predict profitability.

5. Discussion and Policy Implications

This study contributes novel evidence on SME liquidity–profitability dynamics in a small transition economy, extending established trade-off theories to Montenegro's institutional context. Unlike prior work focused on larger emerging markets, our robust regressions on 345 SMEs reveal cash management's primacy amid financing constraints, with sector-specific patterns (manufacturing/construction vulnerabilities) highlighting the need for targeted interventions. These financial patterns create empirically grounded preconditions for the sustainable innovation discussed in Section 2.4.

Suggested findings for the liquidity model (H1) align with prior SME evidence suggesting that the relationship between firms' financial structure and liquidity outcomes is not unidirectional. In particular, leverage-related variables can affect liquidity risk in either direction depending on the maturity structure of debt, firms' ability to refinance, and operational cash-flow patterns. Puerta-Guardo explicitly document this ambiguity in SMEs and note both theoretical expectations: "there is a positive relationship between liquidity and debt/capital structure ratios", while also emphasizing that "there must be a negative relationship between liquidity and capital structure" [47]. These competing mechanisms support the interpretation that debt and activity related ratios may exert mixed effects on liquidity in SMEs, consistent with the confirmation of H1 in our results [47].

The profitability results (H2) are consistent with established SME finance literature emphasizing the importance of internal financial capacity and liquidity buffers for firm performance. In particular, empirical evidence indicates that higher cash reserves can enhance operating outcomes by providing financial flexibility, reducing costly external financing needs, and strengthening firms' resilience to shocks. La Rocca using a wide sample of European SMEs, report that "cash holdings have a positive effect on operating performance," supporting the expected positive effect of cash-based indicators on profitability [48]. Furthermore, evidence from SME capital structure research suggests that excessive leverage can reduce profitability; for example, Abeywardhana finds a significant relationship between capital structure and profitability in UK SMEs that is "negatively related," implying that stronger equity positions and lower debt dependence are more likely to support profitability [49]. Overall, this prior evidence provides clear theoretical and empirical support for the positive cash/equity–profitability relationship confirmed by H2 [48,49].

The models included variables such as the efficiency of working capital (cur_ass_eff), the share of cash in assets (cash_share), the repayment period (per_otp), and the logarithm of the overall debt ratio (log_od). The regression results demonstrated that the model effectively explains a substantial portion of liquidity variability, with an R^2 close to 0.55, indicating that the selected variables account for over half of the observed differences.

The estimated coefficients reveal significant relationships: increased working capital efficiency (−0.0443) diminishes liquidity, suggesting that intensive resource utilization leaves less free liquidity, whereas a higher cash share (0.6905) markedly boosts liquidity, highlighting the importance of liquid reserves for stability. Longer repayment periods (−0.1312) and higher total debt relative to assets (−0.1859) significantly reduce liquidity, emphasizing the risks associated with prolonged obligations and excessive leverage. Residual analysis confirmed the robustness of the model, with residuals displaying acceptable distribution properties and reduced sensitivity to outliers, thus offering reliable insights into the primary factors affecting SME liquidity in Montenegro.

This modeling approach underscores the importance of efficient cash and working capital management, as well as prudent debt levels, in maintaining optimal liquidity conditions [47]. The results support the hypothesis that a balanced capital and liquidity management framework is pivotal for the operational stability of SMEs amid economic volatility, providing a solid basis for policy recommendations aimed at fostering financial resilience within the sector.

The empirical findings confirm that liquidity and profitability are closely interlinked among Montenegrin SMEs. The positive effects of liquidity indicators such as the current ratio on profitability highlight the critical role of effective working capital management in sustaining SME financial health. High leverage poses risks, indicating that excessive debt may constrain liquidity and reduce profitability, which is consistent with classic trade-off theory and agency cost arguments.

Sectoral disparities emphasize that manufacturing and construction SMEs face greater liquidity challenges and lower profitability, reflecting capital intensity and complex cash conversion cycles. Such firms may benefit from dedicated financial products and tailored regulatory support to mitigate sector-specific constraints.

While this study focuses on financial indicators, the documented patterns align with preconditions identified in prior research for SME innovation and SDG engagement. Firms with superior liquidity/profitability are better positioned to invest in digital tools and green technologies supporting SDGs 8, 9, and 12. In Montenegro, strengthening cash buffers could thus enable the sustainable innovation pathways evidenced in the recent literature.

Institutionally, Montenegro has implemented several programs aimed at enhancing SME access to finance, such as COSME and EU-backed initiatives. However, persistent bureaucratic hurdles, credit demand criteria, and inadequate financial literacy impede optimal utilization. Strengthening the policy focus on removing administrative bottlenecks and providing financial education could enhance SME creditworthiness and liquidity management capability.

Digitalization has emerged as an enabler of improved financial processes and market expansion [48]. Encouraging the adoption of digital accounting tools and e-commerce platforms may further strengthen SME performance and resilience.

To enhance SME liquidity management and address sector-specific challenges, policymakers should prioritize improving access to affordable and flexible financing options tailored to SME needs. Regulators can encourage banks to adopt more inclusive credit evaluation frameworks that consider SMEs' operational realities and reduce collateral requirements. Specific efforts to streamline administrative procedures and reduce bureaucratic barriers would facilitate greater uptake of credit programs. COSME and EU initiatives could better support SME liquidity by expanding guarantee schemes that mitigate lender risk, providing targeted grants for liquidity management training, and fostering platforms for digital financial service adoption. These programs should also emphasize financial literacy education and mentoring to increase SME capacity in proactive cash flow and debt management. Banks and financial institutions can enhance liquidity support by designing sector-sensitive loan products, extending credit repayment terms strategically, and leveraging fintech innovations to offer real-time liquidity monitoring tools. SME owners are encouraged to strengthen financial planning, diversify funding sources, and adopt digital accounting and e-commerce solutions to improve liquidity resilience. Such coordinated interventions will help sustain SME growth and stability and contribute to the Montenegrin economy amid evolving economic conditions.

This study complements the dynamic capabilities view and institutional theories of by showing how, in a transitional institutional environment, effective liquidity management becomes a core capability that enables SMEs to adapt, innovate, and sustain performance over time [24,49–51]. This study's findings on financial resilience in SMEs complement the growing literature on sustainable business models and SDG engagement, showing that sound liquidity and profitability are foundational for SMEs to adopt green innovation and responsible practices [52–57]. By linking financial performance with sustainability-oriented innovation, the results align with recent evidence that SMEs in emerging economies can achieve both economic and environmental goals through improved access to finance, digitalization, and institutional support [58–62]. In this way, the paper contributes to the broader agenda of turning SMEs into drivers of sustainable development by strengthening their core financial capabilities.

6. Conclusions

This study empirically examines how financial indicators shape liquidity and profitability among Montenegrin SMEs, addressing the core research question: how do cash position, capital structure, and working capital influence financial resilience in a transition economy? Key findings confirm H1 and H2: healthy cash ratios and moderate leverage enhance both solvency and returns, while manufacturing/construction sectors face distinct capital intensity challenges.

Theoretical contributions refine liquidity–profitability trade-offs for transition SMEs, while practical implications include: (1) expanding COSME/EU guarantee schemes for liquidity support; (2) financial literacy programs targeting working capital management; and (3) sector-specific credit products for capital-intensive industries. These measures build financial resilience, the foundation for innovation-driven sustainable development aligned with the 2030 Agenda.

From a sustainability and innovation perspective, the results suggest that financial health is not only a condition for firm survival but also an enabler of sustainable development. SMEs with stronger liquidity and profitability are better positioned to invest in digital tools, green technologies, and responsible business practices, thereby contributing to Sustainable Development Goals 8 (decent work and economic growth), 9 (industry, innovation, and infrastructure), and 12 (responsible consumption and production). Improving access to affordable financing, enhancing financial literacy, and accelerating digital adoption thus emerge as essential strategies to strengthen SME competitiveness and long-term sustainability.

Despite these insights, this study is limited by the exclusion of microenterprises and nonfinancial factors such as managerial capabilities, innovation capacity, and ESG practices. Future research should incorporate these dimensions and consider longitudinal analyses to capture dynamic effects over time. Expanding the scope to include emerging financial technologies, circular economy practices, and institutional reforms could further inform evidence-based SME development policies in Montenegro and similar emerging economies.

By advancing the understanding of liquidity–profitability dynamics, this research contributes valuable knowledge to support the growth and stability of SMEs, reinforcing their role as engines of economic development, employment generation, and sustainable innovation in the 2030 Agenda.

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