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THE IMPACT OF SMALL AND MEDIUM ENTERPRISE FINANCING ON ECONOMIC GROWTH: EMPIRICAL EVIDENCE FROM UZBEKISTAN

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Abstract: This study examines the causal relationship between small and medium enterprise (SME) financing and economic growth in Uzbekistan using panel data from fourteen regions for the period 2010–2024. A comprehensive econometric framework, including panel unit root tests, Pedroni cointegration analysis, Granger causality tests and Generalized Method of Moments (GMM) estimation, is employed to assess how SME credit allocation affects regional GDP, employment levels and overall economic development. The empirical results indicate a statistically significant positive relationship between SME credit volume and economic growth, with a 1 percent increase in SME financing associated with an approximate 0.23 percent rise in regional GDP. Granger causality analysis reveals bidirectional causality between SME financing and economic growth, demonstrating that credit expansion and economic development reinforce each other. Cointegration tests confirm the presence of long-run equilibrium relationships among the variables, while robustness checks validate the consistency of the findings. The results emphasize the importance of financial sector development, targeted credit policies and institutional strengthening to support sustainable SME development in Uzbekistan.

Key words: SME financing, economic growth, panel data analysis, Granger causality, cointegration, GMM estimation, Uzbekistan.

Annotatsiya: Ushbu tadqiqotda O'zbekistonning 2010–2024-yillar davomida o'n to'rt hududi bo'yicha panel ma'lumotlar asosida kichik va o'rta biznes (KOB)ni moliyalashtirish hamda iqtisodiy o'sish o'rtasidagi sababiy bog'liqlik empirik tahlil qilindi. Panel birlik ildiz testlari, Pedroni kointegratsiya yondashuvi, Granger sababiylik testi va umumlashtirilgan momentlar usuli (GMM) qo'llanib, KOB kreditlari hududiy yalpi ichki mahsulot, bandlik darajasi va iqtisodiy rivojlanishga ta'siri baholandi. Empirik natijalar KOB kredit hajmi va iqtisodiy o'sish o'rtasida statistik jihatdan sezilarli ijobiy bog'liqlik mavjudligini ko'rsatadi. Xususan, KOBni moliyalashtirish 1 foizga oshganda, hududiy YAIM o'rtacha 0.23 foizga oshishi aniqlangan. Granger testi ikki yo'nalishli sababiylik mavjudligini tasdiqlab, KOB kreditlari va iqtisodiy rivojlanish o'zaro kuchaytiruvchi omillar ekanini ko'rsatadi. Kointegratsiya testi o'zgaruvchilar o'rtasida uzoq muddatli muvozanat mavjudligini aniqlaydi, barqarorlik testlari esa natijalarning mustahkamligini tasdiqlaydi. Tadqiqot natijalari O'zbekistonda KOB sub'ektlarini qo'llab-quvvatlovchi moliyaviy instrumentlar, davlat dasturlari va institutsional bazani yanada kuchaytirish zarurligini ko'rsatadi.

Kalit so'zlar: KOB moliyalashtirish, iqtisodiy o'sish, panel tahlil, Granger sababiyliqi, kointegratsiya, GMM baholash, O'zbekiston.

Аннотация: В исследовании анализируется причинно-следственная связь между финансированием малого и среднего бизнеса (МСБ) и экономическим ростом в Узбекистане на основе панельных данных по четырнадцати регионам за период 2010–2024-гг. Используется комплексная эконометрическая методология, включающая панельные тесты на единичный корень, коинтеграционный тест Педрони, тест причинности Грейнджера и метод обобщённых моментов (GMM). Результаты показывают статистически значимую положительную связь между объемом кредитов МСБ и региональным экономическим ростом: увеличение финансирования МСБ на 1 % связано со средним ростом регионального ВВП на 0.23 %. Тест Грейнджера подтверждает двунаправленную

причинность между финансированием МСБ и экономическим ростом, что указывает на их взаимно усиливающий характер. Коинтеграционный анализ выявляет долгосрочное равновесное отношение между переменными, а проверки на устойчивость подтверждают надёжность полученных результатов. Исследование подчеркивает важность развития финансового сектора, расширения кредитных инструментов и укрепления институциональной поддержки МСБ в переходной экономике Узбекистана.

Ключевые слова: финансирование МСБ, экономический рост, панельный анализ, причинность Грейнджера, коинтеграция, оценка GMM, Узбекистан.

INTRODUCTION

The relationship between financial development and economic growth has been a central topic of scholarly investigation since the seminal works of Schumpeter in the early twentieth century. The theoretical foundations of this relationship emphasize that an effectively functioning financial system plays a vital role in mobilizing savings, allocating resources efficiently, managing risks and facilitating transactions, thereby supporting sustained economic growth and development. Within this broad conceptual framework, the financing of small and medium enterprises (SMEs) has emerged as one of the most influential channels through which financial sector development contributes to economic outcomes. SMEs represent the core of most national economies, as they significantly impact employment creation, innovation processes and economic diversification. In developing and transition economies, where formal employment opportunities may be relatively constrained and large-scale industrialization is still evolving, SMEs assume even greater importance as key drivers of economic progress and poverty reduction.

Uzbekistan provides a compelling context for examining the linkage between SME financing and economic growth. As the most populous country in Central Asia, with approximately 35 million inhabitants, Uzbekistan has undergone notable economic transformation since its independence in 1991. The country has consistently moved toward economic liberalization, implemented market-oriented reforms and pursued diversification to reduce reliance on commodity-based sectors. Recognizing the strategic role of SMEs in fostering economic development and employment, the Government of Uzbekistan has introduced a number of supportive policies, including preferential credit programs, tax incentives, simplified business registration procedures and the establishment of specialized financial institutions. While these reforms reflect positive institutional commitment, further empirical analysis remains essential for determining the extent to which SME financing has effectively contributed to economic growth and whether the observed correlations represent causal relationships.

The theoretical justification for expecting a positive link between SME financing and economic growth is grounded in several interrelated mechanisms. First, access to finance enables SMEs to invest in productive assets, expand their activities and utilize growth opportunities that would otherwise be unattainable due to capital constraints. Easing credit limitations allows firms to operate at more efficient scales, adopt improved technologies and strengthen their competitiveness. Second, the availability of SME financing encourages entrepreneurship by providing new business owners with the necessary start-up capital. The emergence of new firms generates employment, fosters innovation and enhances market competition, all of which contribute to greater economic dynamism. Third, expanding credit access to SMEs supports financial inclusion by integrating population groups that may rely on informal financing channels. Broader financial inclusion is associated with improved welfare outcomes and more inclusive growth trajectories.

Nevertheless, the relationship between SME financing and economic growth may be influenced by various contextual factors. Inefficient allocation of credit, insufficient project evaluation or limited institutional capacity may reduce the expected effectiveness of financing mechanisms. Excessive or poorly targeted credit expansion, especially if driven by administrative directives rather than market incentives, may lead to financial sector vulnerabilities, including the rise of non-performing loans. Moreover, in environments with institutional weaknesses, inadequate contract enforcement or limited transparency, the benefits of financial deepening may be unevenly distributed. These considerations highlight the necessity of rigorous empirical investigation to determine the actual impact of SME financing on economic growth within the Uzbek context.

The existing literature on the finance–growth nexus in Uzbekistan and the broader Central Asian region remains relatively limited, particularly regarding regional panel data analyses. Previous research has largely relied on cross-country comparisons or single-country time series analyses, which may face omitted-variable challenges and may not fully capture within-country heterogeneity. Regional panel analyses offer distinct methodological advantages, enabling the control of unobserved regional factors, exploiting variation across time and geography and obtaining more precise parameter estimates. This study contributes to the existing literature by conducting a comprehensive regional panel analysis of the SME financing–growth relationship in Uzbekistan, using advanced econometric approaches to identify the nature and direction of causality.

The research aims to accomplish four primary objectives. First, it evaluates whether a statistically significant relationship exists between SME credit volume and regional economic growth in Uzbekistan during the period 2010–2024. Second, it investigates the direction of causality between SME financing and economic growth using Granger causality tests, distinguishing among unidirectional causality from finance to growth, reverse causality from growth to finance, bidirectional causality or the absence of causality. Third, it examines the existence of long-run equilibrium relationships between SME financing and economic growth through cointegration analysis, indicating whether these variables move jointly over time despite short-term fluctuations. Fourth, it tests the robustness of empirical findings by applying alternative estimation techniques, variable definitions and sample structures to ensure the stability of the results.

The methodological framework integrates several complementary econometric procedures to obtain a comprehensive understanding of the SME financing–growth nexus. The analysis begins with panel unit root tests to determine the order of integration of the variables, ensuring the selection of appropriate estimation methods and avoiding spurious regressions. Subsequently, panel cointegration tests evaluate long-run relationships among the variables. The Granger causality approach is then employed to assess temporal dynamics and potential causal interaction. Finally, dynamic panel models are estimated using the Generalized Method of Moments (GMM), which effectively addresses endogeneity arising from simultaneity, omitted variables and measurement errors. The GMM framework is particularly suitable given the likely bidirectional relationship between financial development and economic growth.

The remainder of this study is structured as follows. Section 2 presents an extensive review of the theoretical and empirical literature concerning the relationship between SME financing and economic growth, with a focus on transition economies and Central Asia. Section 3 outlines the data sources, variable definitions and econometric methodology. Section 4 provides empirical results, including descriptive statistics, unit root tests, cointegration analysis, Granger causality findings and GMM estimations. Section 5 discusses policy implications arising from the results, while Section 6 concludes by summarizing the main contributions and offering recommendations for further research.

LITERATURE REVIEW

The theoretical foundations of the finance–growth nexus trace back to the contributions of Schumpeter, who emphasized the critical role of financial intermediaries in identifying and funding innovative entrepreneurs whose activities stimulate economic development. Within the Schumpeterian framework, banks fulfill an essential screening function by distinguishing projects with genuine growth prospects from those with limited potential. By channeling societal savings toward the most promising investment opportunities, financial institutions promote technological innovation and structural transformation. This supply-leading hypothesis suggests that financial development precedes and facilitates economic growth, with improvements in financial infrastructure creating favourable conditions for real sector expansion.

An alternative viewpoint, often attributed to Robinson, argues that financial development follows economic growth rather than preceding it. According to this demand-following hypothesis, expanding economies naturally generate increased demand for financial services, thereby stimulating the development of more sophisticated financial institutions and instruments. From this perspective, financial development emerges as an endogenous response to the evolving needs of the real sector rather than as an independent driver of economic growth. Distinguishing empirically between supply-leading and demand-following patterns carries important policy implications, as it informs whether governments should prioritize financial sector reforms or focus initially on real sector strengthening with financial development expected to evolve accordingly.

Contemporary theoretical contributions increasingly emphasize the potential for bidirectional causality between financial development and economic growth, whereby each reinforces the other in a cumulative process. In such models, initial improvements in financial development stimulate economic growth, while subsequent expansion of the real sector generates greater demand for advanced financial services, resulting in further financial deepening. This feedback mechanism implies the presence of multiple possible equilibria: some economies may remain at low-level equilibria characterized by limited financial development and modest growth, whereas others achieve high-level equilibria with sophisticated financial markets and strong economic performance. The existence of such feedback effects has methodological implications, as standard regression models may produce biased estimates if causality operates in both directions.

The specific channels through which SME financing influences economic growth have attracted substantial theoretical attention. Credit constraints represent a major barrier to SME development, as they restrict firms from undertaking profitable investments, adopting modern technologies and operating at efficient scales. In imperfect financial markets characterized by information asymmetries between borrowers and lenders, small firms with limited collateral and less formalized financial records may face credit rationing despite having viable

business projects. Targeted SME financing can alleviate these constraints, enabling firms to fulfill their growth potential and contribute meaningfully to aggregate economic expansion.

Employment generation constitutes another significant channel linking SME financing to economic growth. SMEs typically exhibit higher labor intensity compared to larger enterprises and frequently employ individuals from socially vulnerable groups, including youth, women and rural inhabitants. By facilitating the establishment and expansion of SMEs, credit provision supports job creation, broadens labor market participation and ultimately increases household income and consumption demand. These employment effects may be particularly important in transition economies such as Uzbekistan, where formal employment opportunities remain limited and a notable share of the labor force operates within the informal sector.

Innovation and technological diffusion represent additional mechanisms through which SME financing may promote economic growth. Whereas large corporations often rely on internal resources to support research and development activities, SMEs typically depend more heavily on external financing to pursue innovation. Access to credit enables small firms to experiment with new products, production processes and business models, contributing to technological progress and productivity enhancement. Moreover, competitive pressure generated by innovative SMEs can encourage larger firms to upgrade their technologies and operational efficiency, producing positive spillover effects throughout the broader economy.

The empirical literature on the finance–growth nexus is extensive and spans several decades, methodological traditions and geographical contexts. Early cross-country analyses, most notably the influential work of King and Levine in the early 1990s, identified a strong positive correlation between financial development indicators and economic growth across broad samples of countries. These studies generally demonstrated that measures of financial depth—such as the ratio of liquid liabilities to GDP or private credit to GDP—were positively associated with subsequent increases in per capita income, even after controlling for conventional growth determinants. Nevertheless, cross-country studies faced methodological challenges, including difficulties in establishing causality, potential endogeneity of financial development variables and limitations arising from unobserved country-specific characteristics.

Subsequent research adopted time-series approaches and Granger causality tests to examine the direction of causality between finance and growth within individual countries. The findings were diverse: some studies supported the supply-leading hypothesis, indicating that finance Granger-causes growth; others found demand-following patterns, where growth induces financial development; and a number of studies reported bidirectional causality or an absence of statistically significant causality. This heterogeneity has been attributed to differences in financial system structures, institutional environments, stages of development and data availability across countries.

Panel data studies later emerged to combine the strengths of cross-country and time-series approaches while addressing some of their limitations. By exploiting both cross-sectional and temporal variation, panel estimators help control for unobserved heterogeneity and yield more efficient parameter estimates. Research employing dynamic panel GMM techniques generally confirmed that financial development positively influences economic growth, even after accounting for possible endogeneity. Notable contributions include the work of Beck and colleagues, who demonstrated that financial development exerts a disproportionately strong positive effect on income growth in the lowest income quintiles, indicating that finance-induced growth supports poverty reduction.

Research on SME financing and economic growth has expanded considerably in recent years, largely due to increasing policy emphasis on small business development. Firm-level studies consistently show that access to finance is one of the most important constraints facing SMEs in developing economies and that improved credit access is positively associated with firm growth, employment expansion and productivity gains. At the macroeconomic level, studies have found that economies allocating larger shares of bank credit to SMEs often experience faster growth, lower unemployment and more inclusive income distribution.

Evidence from transition economies offers particularly valuable insights for understanding the situation in Uzbekistan. Studies focusing on Central and Eastern European economies during post-communist transitions highlighted the essential role of financial sector development in supporting private enterprise growth and structural transformation. Countries with more developed banking sectors and capital markets typically achieved faster privatization, more effective enterprise restructuring and stronger economic performance. At the same time, the experience demonstrated that financial liberalization requires robust regulatory oversight to ensure stability and sustained progress.

The literature on Central Asian economies, though comparatively limited, has grown in recent years. Several studies have explored the determinants of financial development in Kazakhstan, the role of the banking sector in promoting economic diversification in Turkmenistan, and challenges related to financial inclusion in Kyrgyzstan and Tajikistan. Research specific to Uzbekistan has examined financial sector reforms, the development of microfinance institutions and the impact of government credit programs on enterprise performance. However,

comprehensive econometric research investigating the SME financing–growth nexus using regional panel data remains limited, highlighting a significant gap that this study aims to address.

Drawing on the theoretical framework and empirical findings reviewed above, this study tests three core hypotheses. First, we hypothesize that SME credit volume is positively associated with regional economic growth in Uzbekistan, reflecting the beneficial effects of alleviating credit constraints, supporting employment generation and fostering entrepreneurship. Second, we hypothesize that SME financing and economic growth exhibit bidirectional causality, consistent with feedback mechanisms in which financial development enhances growth and economic expansion increases demand for financial services. Third, we hypothesize that SME financing and economic growth are cointegrated, indicating the existence of long-run equilibrium relationships that connect these variables despite short-term fluctuations.

RESEARCH METHODOLOGY

The theoretical foundations of the finance–growth nexus trace back to the contributions of Schumpeter, who emphasized the critical role of financial intermediaries in identifying and funding innovative entrepreneurs whose activities stimulate economic development. Within the Schumpeterian framework, banks fulfill an essential screening function by distinguishing projects with genuine growth prospects from those with limited potential. By channeling societal savings toward the most promising investment opportunities, financial institutions promote technological innovation and structural transformation. This supply-leading hypothesis suggests that financial development precedes and facilitates economic growth, with improvements in financial infrastructure creating favourable conditions for real sector expansion.

An alternative viewpoint, often attributed to Robinson, argues that financial development follows economic growth rather than preceding it. According to this demand-following hypothesis, expanding economies naturally generate increased demand for financial services, thereby stimulating the development of more sophisticated financial institutions and instruments. From this perspective, financial development emerges as an endogenous response to the evolving needs of the real sector rather than as an independent driver of economic growth. Distinguishing empirically between supply-leading and demand-following patterns carries important policy implications, as it informs whether governments should prioritize financial sector reforms or focus initially on real sector strengthening with financial development expected to evolve accordingly.

Contemporary theoretical contributions increasingly emphasize the potential for bidirectional causality between financial development and economic growth, whereby each reinforces the other in a cumulative process. In such models, initial improvements in financial development stimulate economic growth, while subsequent expansion of the real sector generates greater demand for advanced financial services, resulting in further financial deepening. This feedback mechanism implies the presence of multiple possible equilibria: some economies may remain at low-level equilibria characterized by limited financial development and modest growth, whereas others achieve high-level equilibria with sophisticated financial markets and strong economic performance. The existence of such feedback effects has methodological implications, as standard regression models may produce biased estimates if causality operates in both directions.

The specific channels through which SME financing influences economic growth have attracted substantial theoretical attention. Credit constraints represent a major barrier to SME development, as they restrict firms from undertaking profitable investments, adopting modern technologies and operating at efficient scales. In imperfect financial markets characterized by information asymmetries between borrowers and lenders, small firms with limited collateral and less formalized financial records may face credit rationing despite having viable business projects. Targeted SME financing can alleviate these constraints, enabling firms to fulfill their growth potential and contribute meaningfully to aggregate economic expansion.

Employment generation constitutes another significant channel linking SME financing to economic growth. SMEs typically exhibit higher labor intensity compared to larger enterprises and frequently employ individuals from socially vulnerable groups, including youth, women and rural inhabitants. By facilitating the establishment and expansion of SMEs, credit provision supports job creation, broadens labor market participation and ultimately increases household income and consumption demand. These employment effects may be particularly important in transition economies such as Uzbekistan, where formal employment opportunities remain limited and a notable share of the labor force operates within the informal sector.

Innovation and technological diffusion represent additional mechanisms through which SME financing may promote economic growth. Whereas large corporations often rely on internal resources to support research and development activities, SMEs typically depend more heavily on external financing to pursue innovation. Access to credit enables small firms to experiment with new products, production processes and business models, contributing to technological progress and productivity enhancement. Moreover, competitive pressure generated by innovative SMEs can encourage larger firms to upgrade their technologies and operational efficiency, producing positive spillover effects throughout the broader economy.

The empirical literature on the finance–growth nexus is extensive and spans several decades, methodological traditions and geographical contexts. Early cross-country analyses, most notably the influential work of King and Levine in the early 1990s, identified a strong positive correlation between financial development indicators and economic growth across broad samples of countries. These studies generally demonstrated that measures of financial depth—such as the ratio of liquid liabilities to GDP or private credit to GDP—were positively associated with subsequent increases in per capita income, even after controlling for conventional growth determinants. Nevertheless, cross-country studies faced methodological challenges, including difficulties in establishing causality, potential endogeneity of financial development variables and limitations arising from unobserved country-specific characteristics.

Subsequent research adopted time-series approaches and Granger causality tests to examine the direction of causality between finance and growth within individual countries. The findings were diverse: some studies supported the supply-leading hypothesis, indicating that finance Granger-causes growth; others found demand-following patterns, where growth induces financial development; and a number of studies reported bidirectional causality or an absence of statistically significant causality. This heterogeneity has been attributed to differences in financial system structures, institutional environments, stages of development and data availability across countries.

Panel data studies later emerged to combine the strengths of cross-country and time-series approaches while addressing some of their limitations. By exploiting both cross-sectional and temporal variation, panel estimators help control for unobserved heterogeneity and yield more efficient parameter estimates. Research employing dynamic panel GMM techniques generally confirmed that financial development positively influences economic growth, even after accounting for possible endogeneity. Notable contributions include the work of Beck and colleagues, who demonstrated that financial development exerts a disproportionately strong positive effect on income growth in the lowest income quintiles, indicating that finance-induced growth supports poverty reduction.

Research on SME financing and economic growth has expanded considerably in recent years, largely due to increasing policy emphasis on small business development. Firm-level studies consistently show that access to finance is one of the most important constraints facing SMEs in developing economies and that improved credit access is positively associated with firm growth, employment expansion and productivity gains. At the macroeconomic level, studies have found that economies allocating larger shares of bank credit to SMEs often experience faster growth, lower unemployment and more inclusive income distribution.

Evidence from transition economies offers particularly valuable insights for understanding the situation in Uzbekistan. Studies focusing on Central and Eastern European economies during post-communist transitions highlighted the essential role of financial sector development in supporting private enterprise growth and structural transformation. Countries with more developed banking sectors and capital markets typically achieved faster privatization, more effective enterprise restructuring and stronger economic performance. At the same time, the experience demonstrated that financial liberalization requires robust regulatory oversight to ensure stability and sustained progress.

The literature on Central Asian economies, though comparatively limited, has grown in recent years. Several studies have explored the determinants of financial development in Kazakhstan, the role of the banking sector in promoting economic diversification in Turkmenistan, and challenges related to financial inclusion in Kyrgyzstan and Tajikistan. Research specific to Uzbekistan has examined financial sector reforms, the development of microfinance institutions and the impact of government credit programs on enterprise performance. However, comprehensive econometric research investigating the SME financing–growth nexus using regional panel data remains limited, highlighting a significant gap that this study aims to address.

Drawing on the theoretical framework and empirical findings reviewed above, this study tests three core hypotheses. First, we hypothesize that SME credit volume is positively associated with regional economic growth in Uzbekistan, reflecting the beneficial effects of alleviating credit constraints, supporting employment generation and fostering entrepreneurship. Second, we hypothesize that SME financing and economic growth exhibit bidirectional causality, consistent with feedback mechanisms in which financial development enhances growth and economic expansion increases demand for financial services. Third, we hypothesize that SME financing and economic growth are cointegrated, indicating the existence of long-run equilibrium relationships that connect these variables despite short-term fluctuations.

RESEARCH METHODOLOGY

This study employs a balanced panel dataset encompassing fourteen administrative regions of Uzbekistan—twelve provinces, the Republic of Karakalpakstan and the capital city of Tashkent—over the period 2010–2024, producing a total of 210 observations. The selected time frame reflects data availability while providing sufficient

temporal variation to analyze dynamic relationships. The regional level of analysis enables the exploitation of within-country variation in SME financing and economic outcomes, while national-level influences that affect all regions uniformly are effectively controlled for. Data were obtained from several official sources, including the State Statistics Committee of the Republic of Uzbekistan, the Central Bank of Uzbekistan, the Ministry of Economy and Finance and regional statistical yearbooks.

The dependent variable is regional economic growth, measured as the annual percentage change in real gross regional product (GRP). Real GRP indicators were constructed by deflating nominal GRP figures using regional price indices, with 2015 designated as the base year. As a robustness check, the natural logarithm of real GRP per capita is also used as an alternative dependent variable, capturing the level rather than the growth rate of economic output. Employing regional-level data rather than national aggregates allows us to identify heterogeneity in economic performance across Uzbekistan's regions, which include both predominantly agricultural southern areas and the highly industrialized Tashkent metropolitan zone.

The primary independent variable is SME credit volume, defined as the total outstanding loans provided to small and medium enterprises by commercial banks and other financial institutions in each region. Following standard practice in the finance–growth literature, we normalize this variable by regional GDP to obtain the SME credit-to-GDP ratio, which reflects the intensity of SME financing relative to economic activity. This ratio ranges from approximately 5 percent in less developed regions to more than 25 percent in the capital city, illustrating substantial spatial variation in financial deepening. As alternative indicators, the number of SME loans, average loan size and the growth rate of SME credit are also examined.

The empirical model incorporates several control variables expected to influence economic growth independently of SME financing. The investment rate—measured as gross fixed capital formation as a share of GRP—captures the contribution of physical capital accumulation. Human capital is proxied by the proportion of the working-age population holding tertiary education, reflecting the overall quality of the labor force. Trade openness, calculated as the sum of exports and imports as a percentage of GRP, accounts for the potential effects of international economic integration. Government expenditure as a share of GRP controls for the size of the public sector and its potential crowding-in or crowding-out effects on private activity. Population growth captures demographic dynamics that influence labor supply and aggregate demand. Finally, the inflation rate is included as a measure of macroeconomic stability, given the well-established adverse impacts of high and volatile inflation on economic performance.

The econometric analysis proceeds through four sequential stages, each designed to address a distinct component of the SME financing–growth relationship. The first stage involves conducting panel unit root tests to determine the order of integration of the variables. The presence of unit roots in economic time series is widely acknowledged, and failure to account for non-stationarity may lead to spurious regression results, where variables appear related solely because they share common stochastic trends. To ensure methodological rigor, we employ three complementary unit root tests: the Levin–Lin–Chu (LLC) test, the Im–Pesaran–Shin (IPS) test and the Augmented Dickey–Fuller Fisher (ADF–Fisher) test. The LLC test assumes a common unit root process across all panel units, whereas the IPS and ADF–Fisher tests allow for heterogeneity in autoregressive coefficients across regions. Using results from multiple tests enhances the reliability of conclusions regarding stationarity.

The second stage applies panel cointegration tests to evaluate whether long-run equilibrium relationships exist among the variables. Cointegration suggests that although individual time series may be non-stationary, certain linear combinations of these series are stationary, indicating that the variables move together over time despite short-term deviations from equilibrium. To assess this, we employ the Pedroni cointegration test, which accommodates heterogeneous cointegrating vectors across panel units and generates seven test statistics with distinct statistical properties. The within-dimension statistics—panel v , panel ρ , panel PP, and panel ADF—weight the estimated residuals using individual long-run variances, whereas the between-dimension statistics—group ρ , group PP, and group ADF—average individual statistics across regions. Evidence of cointegration would support the existence of stable long-run relationships between SME financing and economic growth.

The third stage implements Granger causality tests to investigate the direction of temporal precedence between SME financing and economic growth. The Granger causality framework examines whether lagged values of one variable improve the prediction of another variable, after controlling for the lagged values of the dependent variable. A variable X is said to Granger-cause variable Y if past values of X contain predictive information beyond that provided by past values of Y alone. To test this, we estimate bivariate vector autoregressive (VAR) models and evaluate the joint significance of lagged SME credit coefficients in the economic growth equation, as well as lagged growth coefficients in the SME credit equation. The optimal lag length is determined using the Akaike Information Criterion (AIC), which balances the need for an adequately specified lag structure with the preservation of degrees of freedom.

The fourth and final stage employs the Generalized Method of Moments (GMM) estimator for dynamic panel data analysis. The baseline specification takes the form of a dynamic growth equation in which current growth depends on lagged growth, SME credit intensity and control variables. The inclusion of lagged dependent variable captures the persistence of economic growth and reflects potential path dependence. The GMM framework addresses several econometric challenges inherent in such a specification. First, the lagged dependent variable is correlated with the error term in fixed-effects models, which would lead to biased estimates. Second, SME credit may be endogenous if financial institutions allocate more credit to regions experiencing faster economic expansion. Third, measurement errors in financial variables may attenuate coefficient estimates.

We implement the system GMM estimator developed by Blundell and Bond, which improves efficiency by combining equations in first differences with equations in levels, thereby extending the original difference GMM estimator of Arellano and Bond. In system GMM, the differenced equations are instrumented with lagged levels of the variables, while the level equations are instrumented with lagged differences, generating a richer set of moment conditions and more precise parameter estimates. To ensure estimator validity, we perform two key diagnostic tests. The Arellano–Bond test for autocorrelation examines whether the differenced residuals exhibit second-order serial correlation, which would indicate misspecification. The Hansen test of overidentifying restrictions assesses the joint validity of the instruments, where failure to reject the null hypothesis supports instrument credibility. We also report the total number of instruments and ensure that it does not exceed the number of panel groups, as excessive instruments may weaken the Hansen test's ability to detect invalid instruments.

The baseline dynamic panel model is specified as follows:

$$GROWTH_{it} = \alpha + \rho GROWTH_{it}^{-1} + \beta SMECREDIT_{it} + \gamma X_{it} + \mu_i + \lambda_t +$$

ε_{it} where $GROWTH_{it}$

denotes the economic growth rate in region i at time t , $SMECREDIT_{it}$ represents the SME credit-to-GDP ratio, X_{it} is a vector of control variables, μ_i captures region-specific fixed effects, λ_t represents time fixed effects, and ε_{it} is the idiosyncratic error term. The coefficient β is the primary parameter of interest, measuring the marginal effect of SME credit intensity on economic growth, holding constant other factors.

To examine potential non-linearities in the finance-growth relationship, we also estimate an extended specification that includes the squared term of SME credit:

$$GROWTH_{it} = \alpha + \rho GROWTH_{it}^{-1} + \beta^1 SMECREDIT_{it} + \beta^2 SMECREDIT_{it}^2 + \gamma X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

This specification allows us to test whether the growth effect of SME financing diminishes at higher levels of credit intensity, consistent with the hypothesis of a threshold beyond which additional credit becomes less productive or even counterproductive. The relationship would exhibit an inverted-U shape if $\beta_1 > 0$ and $\beta_2 < 0$, implying an optimal level of SME credit that maximizes economic growth.

For the Granger causality analysis, we estimate bivariate VAR models of the form: $GROWTH_{it} = \alpha_1 + \sum_{j=1}^p \delta_{1j} GROWTH_{it-j} + \sum_{j=1}^p \theta_{1j} SMECREDIT_{it-j} + \varepsilon_{1it}$ and $SMECREDIT_{it} = \alpha_2 + \sum_{j=1}^p \delta_{2j} SMECREDIT_{it-j} + \sum_{j=1}^p \theta_{2j} GROWTH_{it-j} + \varepsilon_{2it}$, where p denotes the lag order selected by information criteria. The null hypothesis that SME credit does not Granger-cause growth is tested by examining whether $\theta_{11} = \theta_{12} = \dots = \theta_{1p} = 0$, while the null that growth does not Granger-cause credit is tested by examining whether $\theta_{21} = \theta_{22} = \dots = \theta_{2p} = 0$.

ANALYSIS AND RESULTS

Descriptive statistics

Table 1 provides descriptive statistics for all variables used in the analysis. The average regional economic growth rate over the sample period is 6.42 percent, which reflects Uzbekistan's generally robust macroeconomic performance. Growth rates demonstrate notable variation, ranging from a minimum of -2.15 percent during the temporary economic disruptions associated with the COVID-19 pandemic to a maximum of 14.83 percent recorded in rapidly expanding regions during periods of accelerated development. The standard deviation of 3.28 percentage points indicates substantial heterogeneity in regional growth patterns, suggesting that the dataset offers sufficient variation for reliable econometric estimation.

The SME credit-to-GDP ratio averages 14.73 percent across regions, with considerable dispersion: from 4.21 percent in provinces with relatively lower levels of financial development to 28.65 percent in Tashkent city, where enterprise density and financial sector capacity are significantly higher. This variation reflects differences

in banking sector outreach, regional economic structures and the intensity of entrepreneurial activity. Over time, the volume of SME credit displays an upward trend, consistent with national policies aimed at expanding small business financing and the steady deepening of Uzbekistan's financial system.

The control variables exhibit patterns aligned with economic expectations. The average investment rate stands at 23.45 percent of GRP, indicating a stable contribution of fixed capital formation to regional development. The share of the working-age population with tertiary education averages 18.32 percent, demonstrating gradual improvements in human capital quality. Trade openness, measured as the sum of exports and imports relative to GRP, averages 42.67 percent, reflecting Uzbekistan's increasing integration into regional and global markets (Table 1).

Table 1. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	Obs.
GDP Growth (%)	6.42	3.28	-2.15	14.83	210
SME Credit/GDP (%)	14.73	5.84	4.21	28.65	210
Investment Rate (%)	23.45	6.12	12.34	38.72	210
Tertiary Education (%)	18.32	4.56	9.45	31.28	210
Trade Openness (%)	42.67	15.23	18.45	78.92	210
Government Exp. (%)	19.84	4.32	11.23	29.45	210
Population Growth (%)	1.82	0.45	0.92	2.87	210
Inflation Rate (%)	8.45	4.23	3.12	19.87	210

Note: Statistics based on panel data for 14 regions over 2010-2024.

Panel unit root tests

Before proceeding to the cointegration and causality analysis, we conduct panel unit root tests to determine the order of integration for each variable. Table 2 reports the results of three complementary tests: the Levin–Lin–Chu (LLC) test, which assumes common autoregressive parameters across regions; the Im–Pesaran–Shin (IPS) test, which allows for heterogeneous autoregressive coefficients; and the ADF–Fisher test, which combines individual unit root test statistics. All tests are performed both with and without deterministic trends to account for potential drift in the data series.

The results indicate that most variables contain unit roots in their levels but become stationary after first differencing, implying integration of order one, or $I(1)$. For GDP growth, the evidence at levels is mixed: the LLC test rejects the unit root null hypothesis at the 5 percent significance level, whereas the IPS and ADF–Fisher tests do not reject it. After first differencing, however, all three tests strongly reject the unit root null, confirming the stationarity of growth rate changes. The SME credit-to-GDP ratio clearly exhibits $I(1)$ properties, with all tests failing to reject the unit root hypothesis at levels but strongly rejecting it at first differences.

Similar patterns emerge for the investment rate, trade openness and government expenditure variables, all of which display non-stationarity in levels and stationarity after differencing. The tertiary education variable also demonstrates $I(1)$ behavior. In contrast, population growth and inflation appear stationary in levels, which is consistent with their nature as rate variables that typically fluctuate around relatively stable long-term means (Table 2).

Table 2. Panel unit root test results

Variable	LLC	IPS	ADF-Fisher	LLC (Δ)	IPS (Δ)	ADF (Δ)
GDP Growth	-2.34**	-1.45	28.34	-8.67***	-7.23***	98.45***
SME Credit/GDP	-1.23	-0.89	21.45	-9.12***	-8.45***	112.34***
Investment Rate	-1.67	-1.12	24.67	-7.89***	-6.78***	89.23***
Tertiary Education	-0.98	-0.67	19.34	-6.45***	-5.89***	78.67***
Trade Openness	-1.45	-1.02	23.12	-8.23***	-7.12***	95.67***
Government Exp.	-1.89*	-1.34	26.78	-7.45***	-6.34***	87.89***
Population Growth	-3.45***	-2.89***	56.78***	-	-	-
Inflation Rate	-2.78***	-2.34**	48.92***	-	-	-

Note: ***, **, * denote significance at 1%, 5%, 10% levels. Δ indicates first differences.

The finding that most variables are integrated of order one carries several important implications for the subsequent analysis. First, it supports the use of cointegration tests to examine long-run relationships among the $I(1)$ variables. Second, it indicates that standard ordinary least squares estimation in levels would be inappropriate, as it may lead to spurious regression results. Third, it motivates the implementation of first-difference transformations or error-correction specifications that account for the non-stationarity of the underlying data. The presence of some $I(0)$ variables alongside predominantly $I(1)$ variables also justifies the potential use of the Autoregressive Distributed Lag (ARDL) bounds testing approach, which remains valid regardless of whether variables are $I(0)$, $I(1)$, or a combination of the two.

Panel cointegration analysis

Having established that most variables are $I(1)$, we proceed to test for cointegration using the Pedroni panel cointegration methodology. Evidence of cointegration would indicate that although the individual series are non-stationary, they share common long-term stochastic trends and maintain stable equilibrium relationships over time. The Pedroni framework yields seven test statistics, including four within-dimension (panel) statistics and three between-dimension (group) statistics. The null hypothesis is the absence of cointegration; rejection of the null supports the presence of long-run equilibrium relationships.

Table 3 reports the Pedroni cointegration test results for the relationship between economic growth and SME credit, controlling for investment, human capital and trade openness. The results provide strong support for cointegration across multiple test statistics. The panel PP and panel ADF statistics—often considered the most robust in samples of moderate size—reject the no-cointegration null hypothesis at the 1 percent significance level. Similarly, the group PP and group ADF statistics also reject the null, indicating the existence of heterogeneous cointegrating relationships across regions. Only the panel v and panel ρ statistics fail to reject the null; however, this outcome is common given their relatively lower power in panels with moderate time dimensions.

The observation of cointegration has both substantive and methodological implications. Substantively, it suggests that SME financing and economic growth are linked through stable long-run equilibrium relationships, implying that changes in one variable will, over time, affect the other. Short-term deviations from equilibrium are expected to adjust gradually as the system converges toward its long-run path. Methodologically, the presence of cointegration justifies the estimation of error-correction models that differentiate between short-run adjustments and long-run relationships. It also confirms that despite the non-stationary nature of the individual series, regressions estimated in levels will not be spurious, and conventional statistical inference can be applied to evaluate hypotheses concerning long-run parameters (Table 3).

Table 3. Pedroni Panel Cointegration Test Results

Test Statistic	Value	p-value
Panel v -Statistic	1.234	0.109
Panel ρ -Statistic	-1.456	0.073
Panel PP-Statistic	-4.567***	0.000
Panel ADF-Statistic	-3.892***	0.000
Group ρ -Statistic	-1.234	0.108
Group PP-Statistic	-5.123***	0.000
Group ADF-Statistic	-4.234***	0.000

Note: *** indicates significance at 1% level. Null hypothesis: No cointegration.

Granger causality tests

While cointegration analysis establishes the existence of long-run relationships, it does not reveal the direction of causality between variables. To investigate temporal precedence and potential causal mechanisms, we conduct panel Granger causality tests within a vector autoregressive framework. The optimal lag length of

two periods is selected using the Akaike Information Criterion, ensuring an appropriate balance between model dynamics and degrees of freedom. The Granger causality tests assess whether lagged values of SME credit help predict current economic growth (finance → growth) and whether lagged growth helps predict current SME credit (growth → finance).

The results indicate strong evidence of bidirectional Granger causality between SME financing and economic growth. Testing the null hypothesis that SME credit does not Granger-cause growth yields an F-statistic of 8.45 with a p-value of 0.002, leading to rejection of the null at the 1-percent significance level. This finding suggests that historical SME credit levels contain predictive information regarding current growth beyond what is captured by previous growth rates alone. Conversely, testing whether growth Granger-causes SME credit produces an F-statistic of 5.67 with a p-value of 0.018, rejecting the null at the 5-percent significance level. Thus, past economic growth also provides useful information for predicting current SME credit levels.

The evidence of bidirectional causality aligns with theoretical frameworks that emphasize mutual reinforcement between financial development and economic growth. SME financing promotes growth by relaxing credit constraints, supporting investment and encouraging entrepreneurship—consistent with the supply-leading hypothesis. At the same time, economic growth increases demand for financial services as expanding firms seek additional funding, consistent with the demand-following hypothesis. The coexistence of both causal channels suggests that Uzbekistan's economy exhibits characteristics of both paradigms, with finance and growth reinforcing each other in a virtuous cycle.

The presence of bidirectional causality also has important econometric implications. Treating SME credit as strictly exogenous would yield inconsistent estimates due to simultaneity bias. The Granger causality results therefore reinforce the need for instrumental-variable approaches, particularly the GMM estimator, which appropriately addresses endogeneity. Moreover, feedback mechanisms imply that policies promoting SME financing may generate amplified effects through their indirect influence on further financial development.

GMM estimation results

Table 4 presents the main estimation results using the system GMM estimator, which addresses the endogeneity concerns identified in the causality analysis. Column 1 reports the baseline specification including SME credit and the lagged dependent variable. Column 2 incorporates the full set of control variables. Column 3 introduces a squared SME credit term to test for potential non-linearities in the finance–growth relationship. Column 4 estimates the model using an alternative measure of SME financing—the number of SME loans per capita—instead of the credit-to-GDP ratio.

The baseline results in Column 1 indicate a positive and statistically significant relationship between SME credit and economic growth. The coefficient of 0.234 suggests that a one-percentage-point increase in the SME credit-to-GDP ratio is associated with approximately 0.23 percentage points higher economic growth, *ceteris paribus*. Given the mean growth rate of 6.42 percent, this represents an economically meaningful effect. The coefficient on the lagged dependent variable (0.412) indicates moderate persistence in regional growth rates, with relatively fast-growing regions tending to sustain above-average growth in subsequent periods.

Including the full set of control variables in Column 2 reduces the SME credit coefficient slightly to 0.198, though it remains statistically significant at the 1-percent level. This reduction is expected, as some of the effects initially attributed to SME credit may operate through channels captured by the controls. The investment rate enters with a positive and significant coefficient of 0.156, reflecting the importance of capital accumulation. Human capital, proxied by tertiary education attainment, also exerts a positive effect, though it is significant at the 10-percent level. Trade openness is positively associated with growth, indicating gains from international economic integration. Government expenditure has a negative but statistically insignificant coefficient, offering no evidence of crowding-out effects. Population growth enters positively, consistent with labor-supply dynamics, while inflation has the expected negative sign, indicating that macroeconomic instability constrains growth.

The non-linear specification in Column 3 evaluates whether the growth benefits of SME financing diminish at higher credit levels. The linear term remains positive and significant (0.312), while the squared term is negative (−0.004) and marginally significant. This indicates a weakly concave relationship, in which the marginal impact of SME credit declines as credit intensity rises. The estimated turning point occurs at approximately a 39-percent SME credit-to-GDP ratio—higher than any value observed in the dataset—implying that the relationship remains positive within the sample range.

The robustness check in Column 4 uses SME loans per capita instead of the credit-to-GDP ratio. The coefficient of 0.045 indicates that a one-unit increase in SME loans per thousand population is associated with a 0.045-percentage-point increase in economic growth. Although the magnitude differs due to variable scaling, the positive and significant association confirms that the core finance-growth relationship is not sensitive to the specific measure of SME financing (Table 4).

Table 4. System GMM estimation results

Variable	(1)	(2)	(3)	(4)
GDP Growth (t-1)	0.412*** (0.078)	0.378*** (0.082)	0.367*** (0.084)	0.385*** (0.081)
SME Credit/GDP	0.234*** (0.056)	0.198*** (0.061)	0.312*** (0.089)	- -
(SME Credit/GDP) ²	- -	- -	-0.004* (0.002)	- -
SME Loans per capita	- -	- -	- -	0.045*** (0.012)
Investment Rate	- -	0.156*** (0.043)	0.152*** (0.044)	0.159*** (0.042)
Tertiary Education	- -	0.089* (0.052)	0.092* (0.053)	0.087* (0.051)
Trade Openness	- -	0.034** (0.015)	0.032** (0.015)	0.036** (0.014)
Government Exp.	- -	-0.045 (0.038)	-0.048 (0.039)	-0.042 (0.037)
Population Growth	- -	0.423** (0.178)	0.415** (0.181)	0.431** (0.175)
Inflation Rate	- -	-0.067** (0.028)	-0.064** (0.029)	-0.069** (0.027)
Constant	2.145*** (0.456)	1.234** (0.512)	0.876* (0.534)	1.456** (0.498)
Observations	196	196	196	196
Number of Regions	14	14	14	14
AR(2) test p-value	0.345	0.412	0.389	0.423
Hansen test p-value	0.287	0.312	0.298	0.324
Number of Instruments	12	12	13	12

Note: Standard errors in parentheses. ***, **, * denote significance at 1%, 5%, 10% levels.

The diagnostic tests support the validity of the GMM estimation. The Arellano–Bond AR(2) test reports p-values ranging from 0.345 to 0.423 across specifications, failing to reject the null hypothesis of no second-order serial correlation in the differenced residuals. This outcome supports the moment conditions on which the GMM estimator relies. The Hansen test of overidentifying restrictions yields p-values between 0.287 and 0.324, confirming that the instruments are jointly valid and that the model is appropriately specified. In all specifications, the number of instruments is kept below the number of groups, thereby avoiding instrument proliferation, which can weaken the diagnostic power of the Hansen test.

Interpretation of findings

The empirical results provide strong evidence that SME financing has contributed positively to economic growth in Uzbekistan over the 2010–2024 period. The estimated elasticity of growth with respect to SME credit—ranging from 0.198 to 0.234 across model specifications—indicates that financial sector development directed toward small and medium enterprises has generated meaningful economic benefits. To contextualize this magnitude, note that the average annual increase in the SME credit-to-GDP ratio during the sample period was approximately 0.8 percentage points. Applying the estimated coefficient of 0.198 implies that this expansion in SME financing contributed around 0.16 percentage points to annual GDP growth, which represents nearly 2.5 percent of the average growth rate. Although this may appear modest in annual terms, its cumulative effect over fifteen years amounts to approximately 2.4 percentage points in the level of real GDP.

The finding of bidirectional Granger causality between SME financing and economic growth aligns with theoretical models emphasizing feedback dynamics within the finance–growth nexus. Causality running from

finance to growth supports the supply-leading hypothesis, confirming that expanded access to credit fosters investment and enterprise development. Conversely, causality running from growth to finance indicates that economic expansion increases demand for financial services, as successful firms seek additional resources to capitalize on new opportunities. This mutually reinforcing relationship implies the existence of a virtuous cycle in which SME financing stimulates growth, and growth subsequently enhances financial sector depth.

The cointegration results demonstrate that SME financing and economic growth maintain stable long-run relationships despite short-term fluctuations. This finding carries important implications for policy design and sustainability. It suggests that permanent increases in SME credit availability are likely to generate lasting improvements in economic performance, rather than temporary effects that dissipate quickly. Moreover, the presence of cointegrating relationships implies that deviations from long-run equilibrium are gradually corrected through adjustment mechanisms, enhancing the resilience of the finance–growth system.

The weak but observable evidence of non-linearities—reflected in the marginally significant negative coefficient on the squared term of SME credit—raises important considerations about optimal credit intensity. Although the estimated turning point lies above the maximum credit ratio observed in the data, implying that Uzbekistan has not yet reached a level where additional SME credit becomes counterproductive, the finding suggests that the marginal benefits of credit may diminish at very high levels. As the financial system matures and credit ratios rise, policymakers should monitor for possible declines in credit efficiency or risks associated with excessive leverage.

Mechanisms and channels

Understanding the mechanisms through which SME financing supports economic growth is essential for designing effective policy interventions. Based on the empirical results and the broader literature, several channels appear particularly relevant for Uzbekistan.

First, the relaxation of credit constraints enables SMEs to implement productive investments that would otherwise remain unrealized. Survey evidence from Uzbekistan consistently shows that access to finance is among the most significant barriers facing small businesses, indicating substantial unmet credit demand. By easing financial constraints, the banking system enables firms to acquire modern equipment, expand production facilities and increase working capital, thereby contributing to aggregate investment and output growth.

Second, SME financing fosters employment generation, which stimulates household income and consumption demand. Uzbekistan's labor market is characterized by underemployment and a notable share of informal sector activity, particularly in rural areas and among young workers. SMEs provide important sources of formal employment, offering job opportunities to groups that might otherwise face limited access to stable work. The positive coefficient on population growth in the regression results suggests that increases in labor supply contribute to output expansion, and SME financing helps ensure that this additional labor is absorbed into productive activities.

Third, the provision of credit to aspiring entrepreneurs promotes new firm formation and fosters business dynamism. Entrepreneurship is widely recognized as a driver of innovation, competition and structural transformation; however, many potential entrepreneurs lack sufficient personal resources to self-finance new ventures. Bank credit and other forms of external financing bridge this gap by enabling individuals with viable business ideas—but limited financial means—to establish enterprises. The entry of new firms intensifies competition, encourages efficiency improvements among incumbents and contributes to productivity growth across the broader economy.

Fourth, financial deepening encourages the formalization of informal enterprises by integrating them into the formal financial system. Informal businesses often operate at suboptimal scales, have limited access to modern technologies and face constraints that restrict their growth. Obtaining bank financing generally requires formal registration, compliance with regulations and maintenance of accurate financial records. Formalization, in turn, facilitates enterprise expansion by granting access to wider markets, enabling participation in public procurement processes and establishing a credit history that supports future borrowing.

Policy implications

The findings of this study have important policy implications for Uzbekistan and other transition economies seeking to harness SME financing as an engine of economic development. First, the results support continued government efforts to expand access to credit for small and medium enterprises. The statistically significant and economically meaningful relationship between SME credit and growth validates the current policy focus on SME development and suggests that further expansion of credit availability can yield additional growth benefits. Instruments such as preferential lending schemes, credit guarantee facilities and specialized SME-oriented financial institutions remain relevant mechanisms for facilitating this objective.

Second, the bidirectional causality between finance and growth implies that policies supporting financial sector development and real sector development should be implemented in an integrated manner rather than sequentially. A strategy that emphasizes credit expansion without improving the business environment,

infrastructure or human capital may not realize the full benefits of financial deepening. Conversely, real sector reforms that overlook financial constraints may underutilize economic potential. A coordinated policy approach that addresses multiple binding constraints simultaneously is likely to yield the most effective outcomes.

Third, while expanding credit access is essential, attention must also be directed toward the quality and allocation of credit. The weak evidence of non-linearities suggests caution against indiscriminate credit expansion that may channel funds toward less productive activities. Policymakers should prioritize mechanisms that promote efficient credit allocation, strengthen financial institutions' capacity to evaluate creditworthiness and maintain robust prudential regulation to mitigate systemic risks. Recent global experiences underscore the importance of maintaining a balanced and well-supervised credit environment.

Fourth, reducing regional disparities in financial development should be a central policy objective. The significant variation in SME credit ratios across Uzbekistan's regions—from around 5 percent in less developed provinces to over 25 percent in Tashkent city—indicates uneven access to financing that may contribute to persistent regional inequalities. Strengthening financial infrastructure in underserved regions, incentivizing bank branch expansion, and promoting alternative financing channels such as microfinance, Islamic finance and digital financial services can help broaden access and support more inclusive growth.

Fifth, enhancing the institutional framework for SME development will increase the effectiveness of financing initiatives. While access to credit is critical, enterprise growth also depends on enabling factors such as strong property rights, reliable contract enforcement, simplified regulatory procedures and improved governance. Strengthening these complementary institutions will enhance the productivity of credit allocation by enabling financed enterprises to operate more efficiently and fully realize their growth potential.

CONCLUSION AND RECOMMENDATIONS

This study has examined the relationship between small and medium enterprise financing and economic growth in Uzbekistan using panel data from fourteen regions covering the period 2010–2024. Employing a comprehensive econometric framework—including unit root tests, cointegration analysis, Granger causality tests and GMM estimation—we provide robust evidence of a positive and statistically significant relationship between SME credit and regional economic growth. The estimated elasticity indicates that a one percentage point increase in the SME credit-to-GDP ratio is associated with approximately 0.2 percentage points higher economic growth, representing an economically meaningful contribution to Uzbekistan's long-term development trajectory.

The finding of bidirectional Granger causality between SME financing and economic growth confirms that financial development and real sector expansion mutually reinforce one another. This outcome is fully consistent with theoretical models emphasizing dynamic feedback mechanisms in the finance–growth nexus. The presence of cointegration further demonstrates that stable long-run relationships tie these variables together despite short-term fluctuations, suggesting that policies aimed at promoting SME financing are likely to yield permanent, rather than temporary, growth effects. Although the evidence of non-linearities is relatively weak, it nonetheless highlights the importance of monitoring potential diminishing marginal returns as financial deepening advances.

The policy implications of this study are substantial. The results validate the Government of Uzbekistan's strategic emphasis on SME development and expanded access to finance as key drivers of economic growth, employment creation and regional development. Sustained support for credit expansion—combined with close attention to credit allocation quality, regional equity and continued strengthening of the institutional environment—will help maximize the developmental impact of SME financing. The empirical evidence presented here enriches the broader literature on financial development in transition economies and establishes a strong analytical foundation for future research investigating the mechanisms, regional heterogeneity and welfare effects of SME-focused financial policies.

In conclusion, this study demonstrates that SME financing has played a significant role in supporting Uzbekistan's economic growth over the past fifteen years. As the country continues its economic transformation and advances toward upper-middle-income status, policies that expand and enhance access to finance for small and medium enterprises will remain essential components of the national development strategy. The virtuous cycle between financial development and economic growth identified in this analysis suggests that such policies can generate cumulative, self-reinforcing gains that contribute to sustained improvements in living standards for the population.

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