Scientific Research Publishing

Applied Mathematics, 2026, 17(1), 26-38
https://www.scirp.org/journal/am
ISSN Online: 2152-7393
ISSN Print: 2152-7385

Methods for Enhancing Support Policies for Small and Medium-Sized Enterprises in Mongolia

Erdenesaikhan Yadamsuren[1], Burmaa Natsag[1], Uuganbayar Budjav[2*], Ariun-Erdene Dashjamts[2*], Bayasgalan Uuganbayar[3]

[1]Department of Public Administration, School of Political Science, International Relations, and Public Administration, National University of Mongolia
[2]Department of Mathematics, School of Applied Sciences, Mongolian University of Science and Technology, Ulaanbaatar, Mongolia
[3]Digital Oracle Mongolia LLC, Ulaanbaayar, Mongolia
Email: erdenesaikhan@sme.gov.mn, burmaan@num.edu.mn, *buuganaa@must.edu.mn, *daerdene@must.edu.mn, uuganbayrbaysgalan@gmail.com

How to cite this paper: Yadamsuren, E., Natsag, B., Budjav, U., Dashjamts, A.-E. and Uuganbayar, B. (2026) Methods for Enhancing Support Policies for Small and Medium-Sized Enterprises in Mongolia. *Applied Mathematics*, **17**, 26-38.
https://doi.org/10.4236/am.2026.171003

Received: December 8, 2025
Accepted: January 18, 2026
Published: January 21, 2026

Abstract

The objective of this study is to conduct a comprehensive analysis of the current status, challenges, and development opportunities for Small and Medium-Sized Enterprises (SMEs) in Mongolia, utilizing a system dynamics approach. The research employed a mixed-methods framework, integrating quantitative and qualitative methodologies. Data were gathered from diverse sources, including national statistics, surveys and interviews with SME owners, and studies conducted by government agencies. The findings confirm that SMEs constitute a vital sector for fostering local economic development, enhancing employment, and promoting innovation and technological adoption. Furthermore, the study identifies critical impediments to sustainable SME growth, including financial constraints, limited market access, insufficient human resource competencies, and technological deficiencies. The developed system dynamics model effectively illustrates the mechanisms of SME growth and limitation, mapping the interdependencies among finance, sales, and skills, thereby delineating both positive and negative feedback loops. This research aims to identify the predominant challenges facing Mongolia's SME sector, propose methods for their amelioration, and employ system dynamics modeling to forecast the potential outcomes of specific policy interventions.

Keywords

Small and Medium-Sized Enterprises, Experiment, Simulation

1. Introduction

Small and Medium-sized Enterprises (SMEs) constitute a cornerstone of the Mongolian economy, playing a crucial role in generating employment and bolstering domestic production. On the one hand, SMEs foster economic diversification, flexibility, and innovation. On the other hand, they grapple with pressing challenges such as limited capital, market access, human resources, and organizational deficiencies (Batjargal & Sainbayar, 2022). This article examines the current state, prevailing challenges, and developmental prospects of SMEs in Mongolia.

In Mongolia, SMEs are predominantly concentrated in sectors such as agriculture, food processing, handicrafts, textiles, and small-scale manufacturing. According to 2024 quantitative data, approximately 90% of all business entities are SMEs, accounting for over 70% of total employment [1]-[3].

Given that the sustainable development of economic sectors, job creation, and support for innovation are highly dependent on the growth of SMEs, it is imperative to analyze SME support policies in Mongolia at a strategic level by integrating theory and practice, and to formulate subsequent policy recommendations. Based on the findings of this research, the following measures are deemed essential for improving the implementation of SME policies:

- Reforming the financing system,
- Strengthening institutional capacity,
- Developing the innovation ecosystem,
- Integrating the principles of sustainable development into policy.

To assess the impact of these policy measures on various indicators within Mongolian society, the economy, and the SME sector itself, the methodology of system dynamics modeling was employed. For this model, the simulation period spans from 2014 to 2035. The model was developed using the Vensim software with a system dynamics approach, solved numerically using the 4th-order Runge-Kutta method, and was used to demonstrate the potential effects of implementing certain major projects and policy alternatives within the sector.

2. Research Basis

The share of Mongolia's SME sector in GDP is preliminarily estimated at 5.5% for 2024. Over the past decade, this indicator has fluctuated between 4.5% and 6.2%, reaching a peak of 6.2% in 2022. This demonstrates the stable, yet insufficiently growing, impact of SMEs on the economy. Although the number of SMEs and the size of their workforce are increasing, their performance must also be evaluated in terms of economic productivity. As of the end of 2023, a total of 76.6 thousand SME business entities were operational, employing 253.0 thousand people. This constitutes over 70% of the total labor market, with SMEs making up approximately 90% of all business enterprises and organizations. Mongolian SMEs face the following core challenges:

Financial Constraints: The majority of SMEs operate with limited capital, making it difficult to attract large-scale investment [4] [5].

Limited Market Access: Local markets are constrained, and opportunities for export are scarce.

Low Technological Level: Production equipment and automation are deficient, leading to inconsistent product quality [6].

Shortage of Skilled Human Resources: A lack of professionally skilled workers reduces production efficiency.

Contemporary development policy and planning demand a foundation in research and analysis, evidence-based design, and the scientific forecasting of policy decision outcomes prior to implementation. The methodology of system dynamics modeling fully aligns with this requirement [7].

2.1. Significance

SMEs are a primary driving force of the "soft system" within Mongolia's economy. Examining them through a holistic systems approach is crucial for identifying both positive and negative feedback loops and for playing a vital role in fostering sustainable growth.

2.2. Research Aim and Objectives

The aim of this research is to conduct a comprehensive analysis of the current status, critical challenges, and development opportunities for Small and Medium-sized Enterprises (SMEs) in Mongolia, utilizing a system dynamics approach. Through this study, we seek to clarify the interrelationships among key factors such as the sector's structure, finance, market, workforce, and technological level, with the goal of formulating policy recommendations to support the sector's sustainable growth.

2.3. Research Methodology

System dynamics is a methodology for modeling the behavior of complex systems that evolve over time and for evaluating the interrelationships within them. This theory, founded on the methodology developed by Jay Forrester in the 1950s, is widely used for forecasting the long-term consequences of policies [8].

System dynamics models are grounded in three primary sources of information: quantitative data, written documentation (reports, manuals, etc.), and the expert knowledge of key stakeholders within the system's sector. In this study, the system dynamics model was constructed and executed using the Vensim software. Vensim is a professional program for dynamic modeling that solves systems of ordinary differential equations with high numerical accuracy (using methods like Euler and Runge-Kutta) at each time step, presenting the results both numerically and graphically.

3. System Dynamics Modeling and Small and Medium-Sized Enterprises

Figure 1 shows a comparison between the historical production of small and me-

dium-sized enterprises (SMEs) for the period 2010-2024 and the production levels estimated based on the model. Correlation analysis indicates a strong relationship between the two datasets, with a correlation coefficient of R = 0.89. This high level of correlation demonstrates that the model's estimated production closely aligns with actual observed production, confirming the reliability and robustness of the model results.

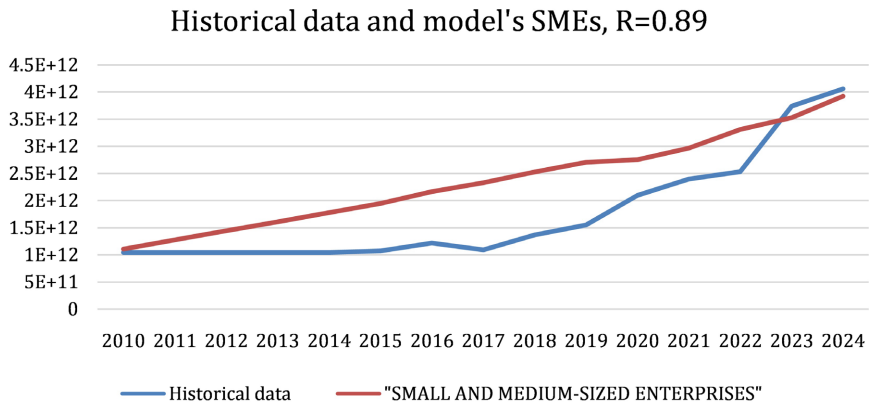


Figure 1. Historical data and model's SMEs.

Abbreviations and Acronyms

The article "System dynamics model of crises in small and medium enterprises" by Viktor Vojtko, Ladislav Rolínek, and Miroslav Plevný constitutes one of the pioneering attempts to systematically explain the causes, exit mechanisms, internal structure, and non-linear dynamics of crises occurring in small and medium-sized enterprises [9] [10].

In the article "Qualitative System Dynamics Model for Analyzing Behavior Patterns of SMEs," Ali Haji Gholam Saryazdi and Dariush Poursarrajian note that many SMEs tend to fail without reaching a growth stage, stabilizing their expansion, or maturing into sustainable businesses. This is not an isolated occurrence but a phenomenon observed in numerous organizations. The authors conclude that identifying the appropriate leverage points within the system can potentially influence the stable growth of SMEs and the stability of the entire system.

The article "System dynamics model of crises in small and medium enterprises" by Viktor Vojtko, Ladislav Rolínek, and Miroslav Plevný is one of the initial attempts to describe the causes of crises in SMEs, their underlying mechanisms, internal structure, and non-linear dynamics from a systems perspective, rather than simplifying a "crisis as a one-time shock." The authors of the research concluded that at the management and decision-making level, this simulation model can be used for "education, planning, risk assessment, control, and preventive management" [11].

To model the scale of small and medium-sized production, the Cobb-Douglas production function was utilized. The model includes variables such as the sector's fixed capital, capital depreciation, investment volume, production volume, sectoral employment, and sectoral labor productivity, which are subject to change

based on parameters representing the influence of human resource capacity, innovation, and technology [12].

The economic production variable represents the sector's annual value added. For its calculation, it was defined to be consistent with the Cobb-Douglas production function, $Y = AK^aL^{(1-a)}$ follows:

Production = Initial Production * (Relative Capital$^{\text{Capital Elasticity}}$) * (Labor Productivity$^{(1-\text{Capital Elasticity})}$) * (Productivity Impact) [13].

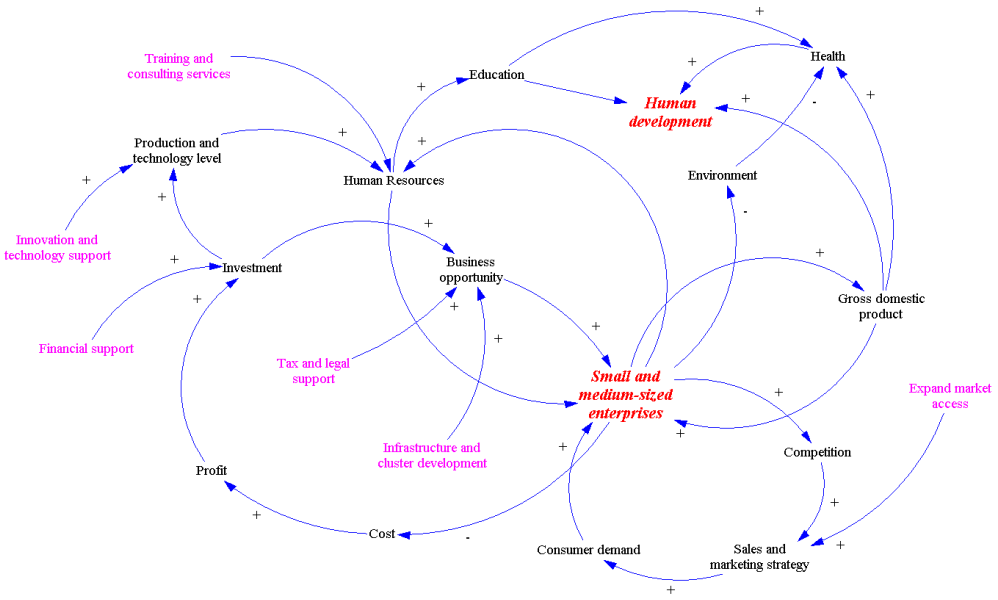
For the industrial sector of the national economy, we obtained data on production volume (Y), capital accumulation (K), and the number of economic units (L) in this sector from the National Statistics Office website (1212.mn) for the last 10 years.

To use the Cobb-Douglas production function, we determined the parameters A and α using regression analysis. To find these parameters in EXCEL, we made a slight transformation and linearized the equation: $Y/L = A(K/L)^{\alpha}$ $\ln Y/L = \ln A + \alpha \ln K/L$ We can understand this as a linear equation $y = a + \alpha x$. Here $A = e^a$ and $\alpha = \alpha$. Using regression analysis, we found these two parameters to be A = 8.9 and $\alpha = 0.27$.

We verified the reliability of these results using the coefficient of determination and Student's t-test. The coefficient of determination $R^2 = 0.68$ indicates that the form of the equation was appropriately selected.

The calculated values t = 7.55 and t = 3.82 are both greater than the table value $t_{(\alpha, k)} = 2.45$, which demonstrates that the coefficients A and α are reliable according to Student's t-test.

Figure 2 presents the Causal Loop Diagram for Small and Medium-Sized Enterprises, illustrating the interconnections between various factors affecting SME development.



Source: Developed by the researchers.

Figure 2. Causal loop diagram for small and medium-sized enterprises.

Figure 3 shows the trends in small and medium-sized enterprises over the analyzed period.

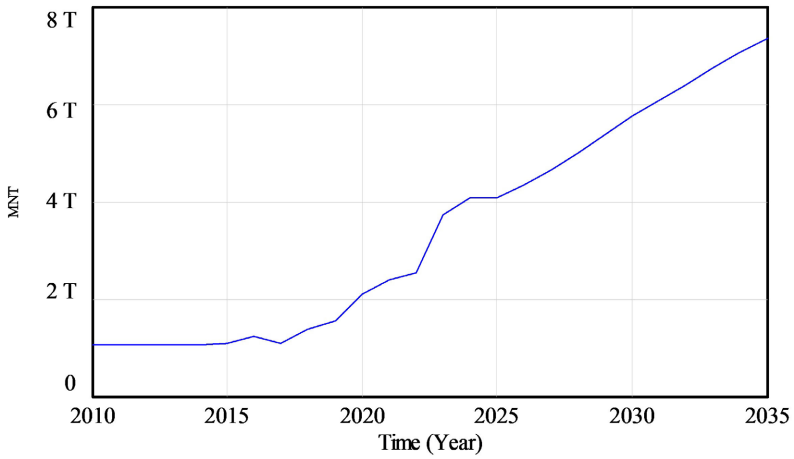


Figure 3. Small and medium-sized enterprises.

Figure 4 displays the Number of Legal Entities Classified under the Small and Medium-Sized Enterprise category. As of 2024, approximately 82 thousand business entities are engaged in small and medium-sized manufacturing and services. This number is projected to increase to 107 thousand by 2035. In terms of production value, the sector generated 4 trillion MNT in 2024. With an estimated average annual growth rate of 8.2%, it is projected to create an added value of 9.7 trillion MNT by 2035.

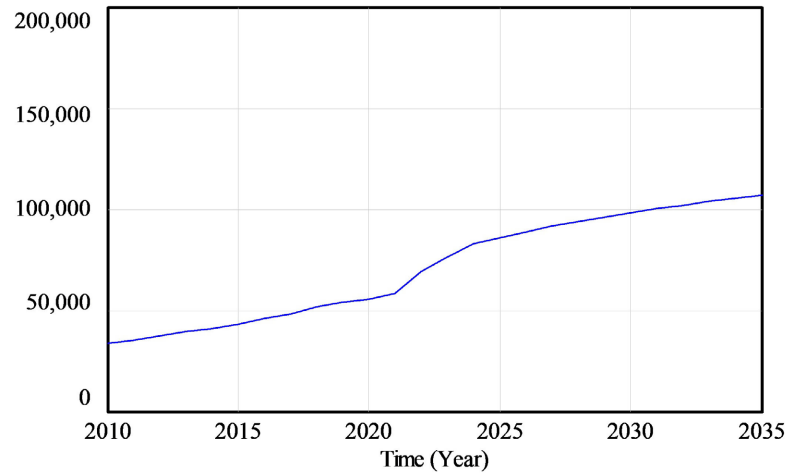
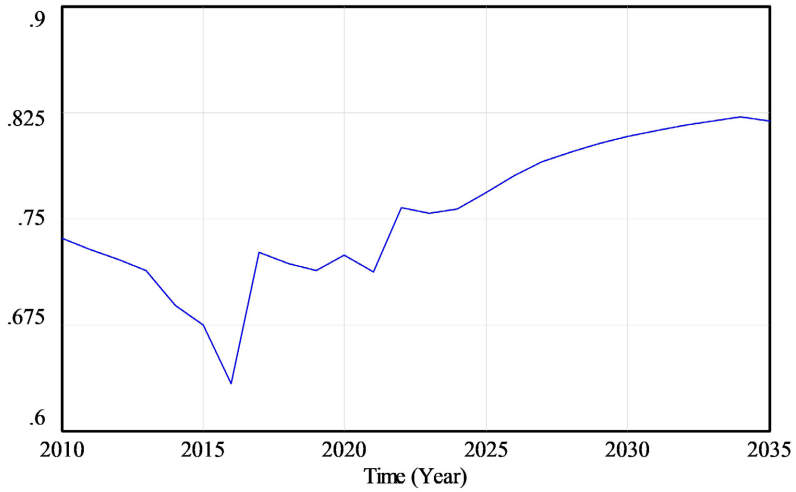


Figure 4. Number of legal entities classified under the small and medium-sized enterprises.

As of 2022, businesses operating as small and medium-sized manufacturing and service enterprises accounted for 75.7% of all active legal entities, while contributing 5.5% of the total value added.

Figure 5 illustrates the Share of SME Business Entities within the Total Number of Enterprises.



Source: National Statistics Office of Mongolia, "Small and Medium-Sized Enterprises (2022 Profile)".

Figure 5. Share of SME business entities within the total number of enterprises.

Figure 6 shows the Share of SMEs in GDP. While the value added by SMEs has shown an increasing trend in recent years, their share of GDP remains relatively stable. According to the Business Registry database, as of the end of 2022, out of 91.8 thousand active legal entities, 69.5 thousand (75.7%) were small and medium-sized enterprises engaged in manufacturing and services.

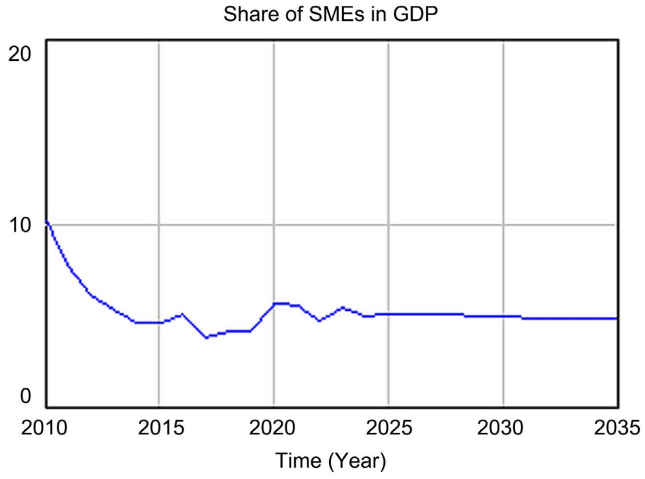


Figure 6. Share of SMEs in GDP.

4. Research Findings

According to our research, the SME sector in Mongolia faces major obstacles such as financing and investment issues, human resource challenges, and technological deficiencies. Therefore, to overcome these challenges, we proposed and calculated scenarios for measures including innovation support, subsidized loans, and interest subsidies, which demonstrated the most significant impact on SMEs.

The study concluded that developing the innovation ecosystem is essential for

improving the implementation of SME policies. Therefore, let us test a policy alternative involving measures to increase innovation and research and development (R&D) to implement this strategy.

Simulation Experiment 1.

Innovation and economic growth are intricately interconnected and mutually influential, which is why innovation is a leading direction in state policy.

Although patents cannot directly measure innovation, patent applications are considered an indicator of the pace of innovation activity within an economy. However, recent perspectives emphasize that the quality of patents, specifically core technology patents, is more important than their quantity. Core technology sectors include energy, mobility, health, food/nutrition, manufacturing, digital manufacturing, materials science, infrastructure, security, and the environment. At the national level, a 10% increase in basic research volume leads to an average productivity increase of 0.3%; a 1% increase in core technology patents leads to a 0.108% increase in GDP per capita; and a 1% increase in the patent stock leads to a 0.04% increase in labor productivity per worker (Hu & Png, 2009; Gulmez and Yardımcıoğlu, F., 2012).

Based on this calculation, the SME sector in Mongolia would increase by 0.6 trillion MNT, and production per business entity would increase by 26.6 million MNT.

Figure 7 illustrates the projected growth of small and medium-sized enterprises under the innovation scenario.

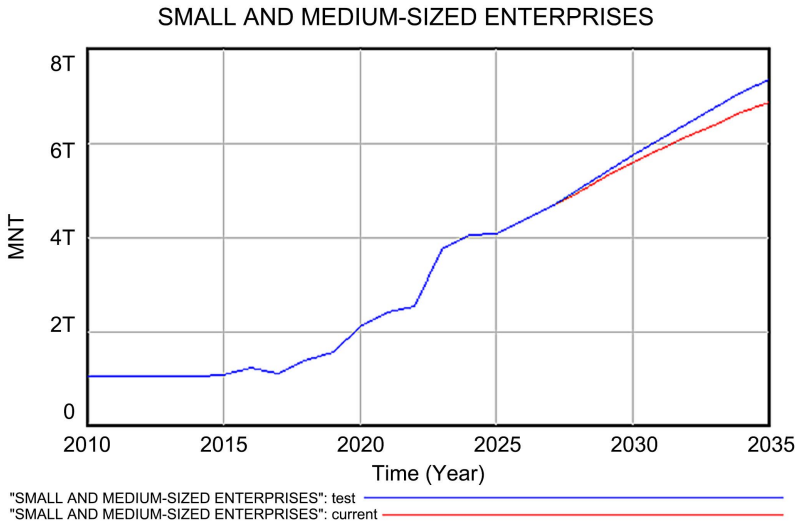


Figure 7. Small and medium-sized enterprises.

Figure 8 shows the projected Production of Single Business Unit under the innovation scenario.

The study also concluded that reforming the financing system is necessary to improve the implementation of SME policies. Therefore, to implement this strategy, we tested the following two alternatives for providing stable funding to the SME Development Fund.

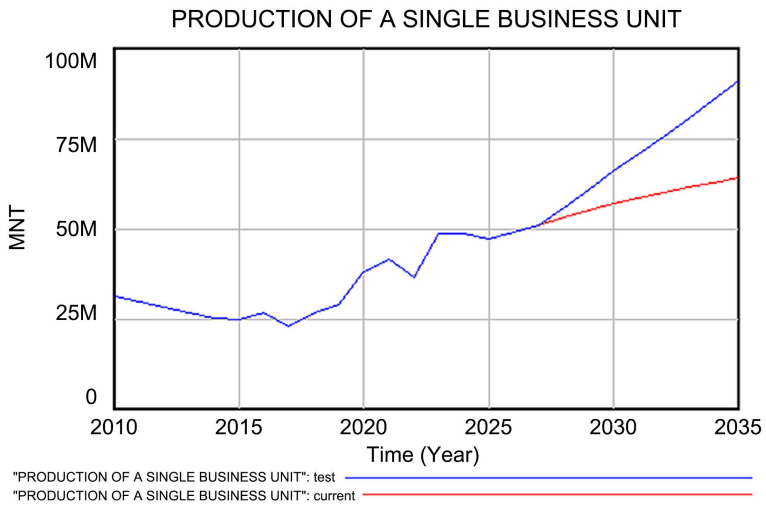


Figure 8. Production of single business unit.

Simulation Experiment 2.

Providing Subsidized Loans: If a budget of 10.0 billion MNT is allocated annually to the SME Development Fund and disbursed as subsidized loans, with the assumption of full loan repayment, the initially provided capital can be reused through the repayment of principal and interest income.

Providing Interest Subsidies: If the 10.0 billion MNT is provided as an interest subsidy, it can support a relatively larger number of businesses in the short term, but has the drawback of being a one-time program.

Testing these alternatives across economic sectors yielded the following results:

Agricultural SMEs: Providing subsidized loans would increase production by 102.5 billion MNT and create 17,500 jobs. Providing an interest subsidy would increase production by 19.7 billion MNT and create 2000 jobs.

Figure 9 shows the Increased production through agricultural projects under both scenarios.

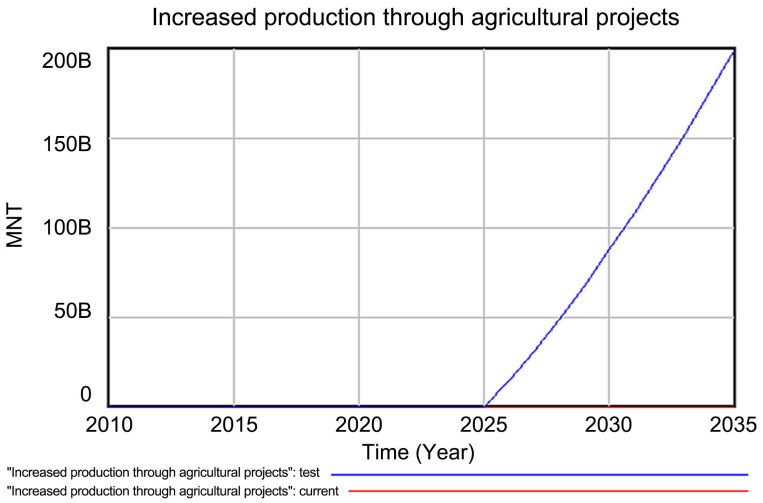


Figure 9. Increased production through agricultural projects.

Processing/Manufacturing Sector SMEs: Providing subsidized loans would increase production by 32.3 billion MNT and create 14,000 jobs. Providing an interest subsidy would increase production by 6.2 billion MNT and create 1500 jobs.

Figure 10 illustrates the Production to increase through processing industry projects under both scenarios.

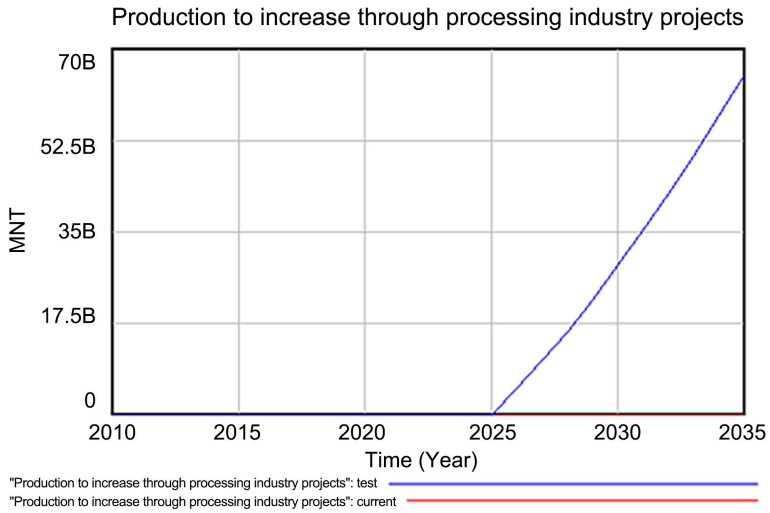


Figure 10. Production to increase through processing industry projects.

Service Sector SMEs: Providing subsidized loans would increase production by 1.1 trillion MNT and create 23,000 jobs. Providing an interest subsidy would increase production by 224 billion MNT and create 2600 jobs.

Figure 11 displays the Production to increase through service sector projects under both scenarios.

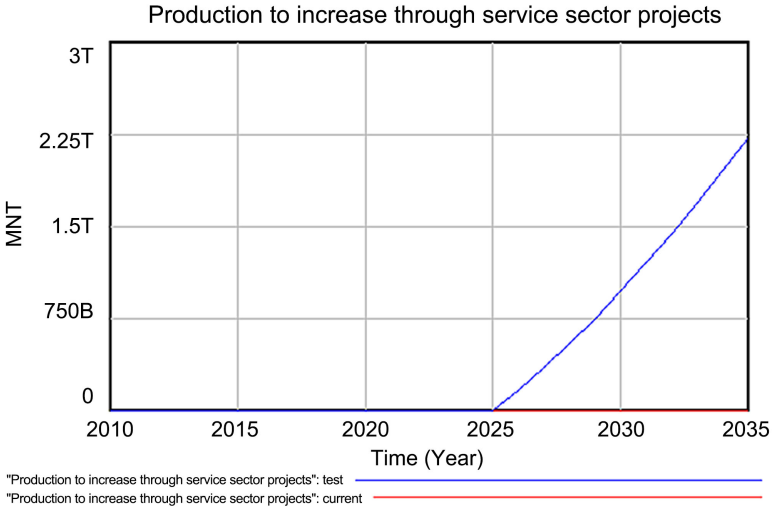


Figure 11. Production to increase through service sector projects.

In other words, providing subsidized loans leads to stable growth in both production and employment across all sectors. However, the level of production

achieved under the interest subsidy scenario is 5 to 10 times lower than that under the subsidized loan scenario.

Simulation Experiment 3.

Policy measures to develop SMEs were introduced as exogenous shocks into the Cobb-Douglas function to simulate their impact. For example, production volume increases through the effects of expanding market capacity and increasing purchases. Fixed capital increases through the effect of capital loans, which in turn increases the scale of small and medium-sized production. The labor productivity variable is increased by parameters representing human resource capacity, innovation, and technological influence, which in turn increases the scale of small and medium-sized production. This improves the variables for employment and poverty levels.

If 1000 projects are implemented in each sector, the service sector yields the highest overall return, while the construction sector shows a particular advantage in reducing unemployment. However, if a 200.0 billion MNT investment is made in each sector, the service sector delivers the greatest socio-economic return, whereas construction, while good at increasing production, has a weaker impact on reducing poverty and unemployment.

Table 1 presents Selected Results from the Simulation Experiments for the scenario of implementing 1000 projects in each sector.

Table 2 shows Selected Results from the Simulation Experiments for the scenario of investing 200.0 billion MNT in each sector.

Table 1. Selected results from the simulation experiments.

Sector	Number of Projects	Investment (Billion MNT)	Jobs Created	Additional Production (2030-2035, Billion MNT)	Poverty Rate in 2035	Unemployment Rate in 2035
Agricultural Sector	1000	129.3	18,000	2058.1	0.1979 - 0.1934	0.1513 - 0.1435
Construction Sector	1000	315.2	29,000	5958.8	0.1979 - 0.1905	0.1513 - 0.1388
Processing Sector	1000	217.8	24,000	1096.5	0.1979 - 0.1904	0.1513 - 0.1409
Service Sector	1000	108.3	20,000	19,526.0	0.1979 - 0.1871	0.1513 - 0.1427

Source: Developed by the researchers.

Table 2. Selected results from the simulation experiments.

Sector	Number of Projects	Investment (Billion MNT)	Jobs Created	Additional Production (2030-2035, Billion MNT)	Poverty Rate in 2035	Unemployment Rate in 2035
Agricultural Sector	1550	200.0	27,900	3190.0	0.1979 - 0.1910	0.1513 - 0.1392
Construction Sector	635	200.0	18,420	3783.9	0.1979 - 0.1932	0.1513 - 0.1434
Processing Sector	920	200.0	22,080	1008.8	0.1979 - 0.1910	0.1513 - 0.1418
Service Sector	1850	200.0	37,000	36,123.1	0.1979 - 0.1783	0.1513 - 0.1353

Source: Developed by the researchers.

5. Conclusion

It is evident that Small and Medium-sized Enterprises (SMEs) constitute a strategically vital sector for diversifying the economic structure, generating new employment opportunities, and fostering the development of an innovation ecosystem. The study of SME development in Mongolia clearly demonstrates that multiple, interconnected factors exert influence, including state intervention to address market failures, institutional quality, the innovation system, and resource-based perspectives. The findings indicate that supporting SME policies within a broader framework encompassing innovation, R&D, green production, and technological renewal holds greater significance than focusing solely on financing. Furthermore, it was shown that the full implementation of such measures could enable SMEs to become a primary driving force of the economy. This underscores the necessity for SME support policies to be multidimensional, interconnected, and systemic in nature.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] National Statistical Office of Mongolia, 1212.mn.

[2] The Contribution of Small and Medium-Sized Enterprises to Economic Development (2020, 2022).

[3] Research Bulletin of the Bank of Mongolia (2016) Development and Financing Status of Small and Medium-Sized Enterprises, No. 8.

[4] Bolormaa, T.S., Ononchimeg, C.H. and Khaliun, D. (2016) The Current State of Development Policies and Legislation for Small and Medium-Sized Industries in Mongolia: Critical Issues.

[5] Development Solutions NGO (2024) Study on the Competitiveness of Small and Medium Businesses in Mongolia.

[6] Batsaikhan, O. (2023) A Study on Clusters of Small and Medium-Sized Industries. Dissertation, Mongolian Academic University.

[7] Badarch, D., Ochirbat, B. and Enkh-Amgalan, B. (2003) Fundamentals of System Dynamics Modeling. Ulaanbaatar.

[8] Sterman, J.D. (2000) Systems Thinking and Modeling for a Complex World.

[9] Tama, I.P., Nugroho, W.S., Mahmudy, W.F. and Purnami, P. (2022) The Evaluation of Technology Startup Role on Indonesian SMEs Industry 4.0 Adoption Using CLD-ABM Integrated Model.

[10] Subroto, A. and Bivona, E. (2009) Supporting Small Medium Enterprises Planning through the Use of a Step-by-Step System Dynamics Model Building Process: A Case Study from Leather Handicraft at Tanggulangin, Sidoharjo, East Java, Indonesia.

[11] Saryazdi, A.H.G. and Poursarrajian, D. (2021) Qualitative System Dynamics Model for Analyzing of Behavior Patterns of SMEs.

[12] Vojtko, V., Rolínek, L. and Plevný, M. (2019) System Dynamics Model of Crises in Small and Medium Enterprises.

[13] Gantogoo, B., Burmaa, N., Uuganbayar, B. and Bayasgalan, U. (2025) Labour Market of Khovd in Mongolia. *Journal of Human Resource and Sustainability Studies*, **13**, 113-130. https://doi.org/10.4236/jhrss.2025.131007