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Article

Computer Simulation Analysis of the Impact of National Macro Policies on the Construction of Planned Key Projects in Lanzhou City during the "First Five-Year Plan" Period

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Abstract: This paper takes the key projects planned during the First Five-Year Plan period in Lanzhou City as the research object, and systematically analyzes the influence mechanism and heterogeneity characteristics of the national macro policies on the performance of engineering construction based on historical statistical data and computer simulation technology. The panel dataset is constructed, the double difference model is used to quantify the direct impact of policies, and the Heckman two-step method is utilized to conduct the robustness test. Construct the key engineering construction performance assessment system and evaluate the engineering construction performance level using hierarchical analysis. Combine the system dynamics simulation and mediation effect analysis to reveal the role path of macro policies. It is found that the national macro policy has a significant positive impact on the performance of key engineering construction in Lanzhou, and the performance of the projects supported by the policy focus is improved by 1.25 units on average (in terms of fuzzy evaluation value) compared with the similar projects not directly covered by the policy. The coefficient of the policy interaction term (DID) for the state-owned enterprise group is 1.50 and significant at the 1% level, while the coefficient of the policy interaction term for the non-state-owned enterprise group is only 0.30 and fails the significance test (t=0.85). Expansionary monetary policy and tight fiscal policy act on engineering construction through macro leverage ratio, economic growth rate and other intermediary variables, forming a differentiated transmission path.

Keywords: First Five-Year Plan; computer simulation technology; system dynamics; double difference model; intermediary effects

1. Introduction

High-quality development is development that effectively meets the growing needs of the people for a better life and embodies the new development philosophy. Currently, China's economy is transitioning from a stage of high-speed growth to one of high-quality development. The continued advancement of high-quality development will significantly promote the transformation of urban development models [1]. On the one hand, the construction of key urban projects will drive the rapid development of urban economies and societies. On the other hand, as urban economies and societies gradually develop, they will in turn impose higher demands on urban engineering projects [2-5]. The field of urban key engineering construction is an important aspect of promoting high-quality development. As a regional development pillar, competitive strength, and work focus, it not only determines the present but also concerns the future [6-8]. We should persist in placing urban key engineering construction work within the broader context of high-quality development, actively align with high-quality development requirements, further refine strategies and measures, and strive to achieve higher-quality and more sustainable development in urban key engineering construction [9-12].

The construction of urban key projects requires a highly responsible attitude toward history, the city, and the people, while also requiring an understanding and implementation of current national macro policies. Computer simulation is an important tool for analyzing the impact of national macro policies, and many scholars have conducted research in this area. Literature [13] designed the T21 model based on system dynamics modeling to simulate the impact of national policies on national development plans, while continuously improving the model's applicability to different issues and contexts, providing necessary information for decision-makers to formulate high-quality policies. Literature [14] utilized the MacroLab template for system dynamics modeling of the national economy. This model can be combined with specific behavioral equations input into it to analyze macro-level changes in the entire system, while also offering features such as ease of construction, understanding, critique, modification, and complete replacement. Literature [15] indicates that virtual simulation systems for urban spaces can enhance interaction between policymakers and real cities in terms of understanding, prediction, and design. Digital twin technology not only supports analysis of local areas but also enables simulation of large-scale urban systems, providing policymakers with important perspectives. Literature [16] argues that a single technology used for monitoring and controlling urban planning development cannot achieve the best expected results, proposing the use of appropriate technologies and models in combination to provide accurate predictive results for decision-makers to steer policies toward the optimal trajectory.

In this paper, we first construct a panel dataset containing 30 key programs for five consecutive years based on historical statistics and archival data. Define the core variables and put forward the hypothetical model. Design the project evaluation method based on the principle of system dynamics and computer simulation technology, and systematically elaborate the economic interpretation of IS-LM-BP model. Construct a multidimensional key project construction performance evaluation system, and use the fuzzy mathematical method and weighted synthesis method to quantitatively evaluate the project performance. Through regression results and mediation effect analysis, verify the ownership heterogeneity and transmission mechanism of macro policy effects.

2. Research and Design on the Impact of National Macro Policies on the Construction of Key Projects

2.1 Study Design

2.1.1. Sample and Data

This study takes the key projects planned during the First Five-Year Plan period (1953-1957) in Lanzhou City as the research object, and the sample selection closely follows the characteristics of the national key projects under the planned economy, focusing on the core projects in the fields of industry, energy, transportation and so on, which are included in the outline of the First Five-Year Plan of Lanzhou City. The sample selection follows the characteristics of the national key projects under the planned economy, focusing on the core projects in the fields of industry, energy, transportation and so on, which were included in the outline of the “First Five-Year Plan” of Lanzhou. Considering the strategic positioning of Lanzhou as a national key industrial base during the “First Five-Year Plan” period, the sample covers 30 key projects with large investment scale, long construction period, and significant role in driving the regional economy at that time, and the panel data of five consecutive years from 1953-1957 are selected for each project, which finally form 300 valid observations. To address the problem of missing data in some of the early years, linear interpolation or mean values of neighboring years were used to supplement the data to ensure data completeness. In the data preprocessing stage, items with incomplete information or obvious anomalies are excluded, and the final 300 observations cover the main areas of key projects in Lanzhou during the First Five-Year Plan period, with good industry representativeness and time continuity.

2.1.2. Definition of Variables

The core variables revolve around the impact of national macro policies on key project construction, combining the characteristics of the planned economy system with the needs of computer simulation and analysis, defined as shown in Table 1. The explanatory variable is the performance of key project construction (Con), the explanatory variable is economic policy uncertainty (Epu), and the mediating variables include: the nature of property rights (SOE), the macro leverage ratio (Lev), the macroeconomic growth rate (GDPZ), and the ternary margin of import and export trade (Exp). The measurement of each variable is based on historical statistics and academic norms to ensure the traceability of the data and the scientificity of the measurement.

Table 1. Variable Definitions.

Type	Name	Symbol	Definition
Explained variable	Key project construction	Con	Performance of key project construction
Explanatory variable	Macroeconomic policy uncertainty	Epu	The natural logarithm of China's annual economic policy uncertainty index
Mediating variable	Nature of property rights	SOE	If the actual controller is a state-owned enterprise, an administrative organ, a public institution, a central institution or a local institution, then SOE=1. Otherwise,SOE=0.
	Leverage ratio	Lev	Macro leverage ratio
	Economic growth rate	GDPZ	Macroeconomic growth rate
	Import and export trade	Exp	The ternary margin of trade

2.1.3. Model construction

All the models below are built controlling for year and industry effects, and model (1) is constructed to test hypothesis 1.

$$Vio_{it} = \alpha_0 + \alpha_1 \times Epu_{it} + \alpha_2 \times \sum control_{it} + \sum Year + \sum Ind + \varepsilon_{it} \tag{1}$$

To test hypothesis 2, model (2) and model (3) were first constructed to determine the moderating effect of internal control.

$$Vio_{it} = \beta_0 + \beta_1 \times Ic_{it} + \beta_2 \times \sum control_{it} + \sum Year + \sum Ind + \varepsilon_{it} \tag{2}$$

$$\begin{aligned} Vio_{it} = \gamma_0 + \gamma_1 \times Epu_{it} + \gamma_2 \times Epu_{it} \times Ic_{it} + \gamma_3 \times Ic_{it} + \gamma_4 \\ \times \sum control_{it} + \sum Year + \sum Ind + \varepsilon_{it} \end{aligned} \tag{3}$$

2.2. Project Evaluation Methods Based on System Dynamics Principles and Computer Simulation Techniques

System dynamics, which is mainly used to analyze and study a series of complex and its composite systems such as social, economic, ecological and biological, the process of analyzing complex problems is shown in Figure 1.

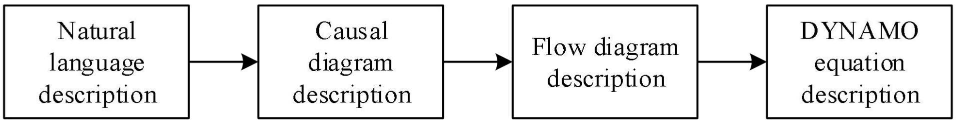


Figure 1. Process of system dynamics analysis of complex problems.

Firstly, the complex problem is described by using natural language, and then the causal analysis method is used to draw a causal diagram for it, next, the flow diagram is drawn according to the causal diagram, reflecting the data and information relationship between the factors in the problem, and finally, the DYNAMO equation is used to describe the complex problem, and further simulation experiments are carried out.

Using the principle and method of system dynamics, computer simulation simulation research on project evaluation methods, the basic idea is to transform the variables in the cash flow statement into a structural flow diagram of mutual influence and feedback accumulation. On this basis, the DYNAMO equation is conceived, the simulation program is prepared in computer language and simulation simulation analysis is carried out to arrive at the results of project evaluation.

Net Present Value (NPV) is the cumulative value of the cash flows occurring each year over the life of the project discounted to the same point (usually the beginning of the period) at a certain discount rate. The NPV method considers all NPV's greater than zero as good options that will bring benefits to shareholders (investors), and the option with the largest NPV is optimal, which maximizes shareholder wealth. The formula for calculating net cash flow is

$$NPV = \sum_{t=0}^{n} (CI - CO)_t (1 + I)^{-t} \tag{4}$$

where: CI_t is the cash inflow in year t; CO_t is the cash outflow in year t; I is the discount rate; n is the project life cycle.

For the purpose of simulation modeling and analysis, a cash flow statement of an investment project is assumed. The most important influences on the NPV are sales revenue $\left(a_1 \sim a_{n_2}, b_1 \sim b_{n_3}\right)$ and operating costs $\left(e_1 \sim e_{n_2}\right)$. At present, the forecast estimation of sales revenue generally adopts the two indicators of commissioning and reaching production, of which the commissioning indicator accounts for about 50%~70% of the output value of reaching the designed production capacity, and the evaluation of the project with this method ignores the fact that the sales revenue after the commissioning of the project is affected by such factors as the rise and fall of the price, the increase and decrease of the demand, and the restriction of the resources and energy in the conditions of the market economy. Its evaluation results are estimates derived under ideal conditions. For the impact of uncertainty factors such as cost, price and market, although they are considered and analyzed accordingly in uncertainty analysis and risk analysis, the analysis is cumbersome and requires a lot of manpower to calculate. In addition, this method is also difficult to be directly applied to computer simulation research, which to a certain extent affects the application of computer technology in project evaluation.

2.3. Economic Interpretation of IS-LM-BP Models

Considering that in reality, China's short-term exchange rate is relatively stable, the following economic model including firms, consumers, the government and the external sector of the economy is given.

2.3.1. Equation of the IS Curve under Open Economy Conditions

The constant equation for aggregate demand or GNI in an open economy becomes:

$$Y(t) = C(t) + I(t) + G(t) + NX(t) \tag{5}$$

where $C(t)$ is consumption demand, $I(t)$ is investment demand, $G(t)$ is government expenditure demand, and $NX(t)$ is net export demand.

The investment demand equation is:

$$I(t+1) = I(Y(t), r(t)) \tag{6}$$

where $r(t)$ is the level of the interest rate at the t th time period, while the level of investment depends on the level of income, and the interest rate is inversely proportional to the quantity of investment demanded. For simplicity, the following linear equation is used to express the relationship between the terms of equation (6):

$$I(t+1) = aY(t) - br(t) \tag{7}$$

where $a, b > 0$.

The relationship between consumption and GNI is:

$$C(t) = \alpha + \beta(1-u)Y(t) \tag{8}$$

where: $u > 0$ is the tax rate, which is the total share of total taxes in GNI; $\alpha > 0$ is the spontaneous consumption component; and $\beta > 0$ is the marginal propensity to consume.

Macroeconomics lists the exchange rate and the level of domestic income as the two most important factors affecting net exports, and thus the net export function is often expressed simplistically as:

$$NX(t) = q - \gamma Y(t) + n\frac{EP_f}{P} \tag{9}$$

where $q, \gamma, n > 0$, γ is the marginal propensity to import; E is the nominal exchange rate; and P and P_f are the domestic and foreign price indices, respectively.

Bringing Eqs. (7), (8), and (9) into the income constancy equation (5), we have:

$$Y(t) = \frac{\alpha + q + n\frac{EP_f}{P}}{1-\beta(1-u)-a+\gamma} - \frac{br(t)-G(t)}{1-\beta(1-u)-a+\gamma} \tag{10}$$

That is, it is the equation for the resulting IS curve, which represents the combination of interest rates and income levels at the current exchange rate when total expenditures are equal to total income.

2.3.2. LM Curve Equations in An Open Economy

The aggregate demand for money in an open economy is the sum of the population's precautionary motive, transaction demand and speculative demand for money. It is relatively unlikely that the exchange rate affects the demand for money; income is directly proportional to the transaction demand for money, while the interest rate is inversely proportional to the speculative demand. Thus the aggregate demand function for money can be expressed as follows:

$$L(t) = L_1 + L_2 = L_1(Y) + L_2(r) = e + kY(t) - hr(t) \tag{11}$$

where M, m and P denote the nominal quantity of money, the real quantity of money and the price index, respectively, the money supply equation can be described as:

$$m(t) = \frac{M(t)}{P} \tag{12}$$

Interest rate adjustment equations:

$$r(t+1) = r(t) + \varepsilon(L(t) - m(t)) \tag{13}$$

where $\varepsilon > 0$ is the interest rate adjustment factor. When the money supply $m(t)$ is less than the money demand $L(t)$, the interest rate $r(t+1)$ rises at the $t+1$ th time period. Conversely, it falls.

Combining the equations of aggregate demand for money, aggregate supply and interest rate regulation, the equilibrium equation of the money market can be obtained under the conditions of an open economy:

$$Y(t) = \frac{hr(t)}{k} + \frac{1}{k}\left(\frac{M(t)}{P} - e\right) \tag{14}$$

That is, the equation for the resulting LM curve, which describes the combination of interest rates and income levels in an open economy when the demand for money is equal to the supply.

2.3.3. BP Curve equations in An Open Economy

In an open economy, if the foreign interest rate is lower than the home interest rate, foreign investment and loans will flow into the home country leading to a decrease in net capital outflow and vice versa. In general, the net capital outflow is represented by a function of the difference between home and foreign interest rates and is often used as a linear function, the net capital outflow function is:

$$F = \sigma(r_w - r(t)) \tag{15}$$

where r_w denotes the foreign interest rate, $r(t)$ denotes the home interest rate, and $\sigma > 0$ is a constant.

The balance of payments balance, which is embodied in the difference between net exports and net capital outflows and is denoted by BP, has:

$$BP = NX(t) - F \tag{16}$$

In macroeconomics, a country with a zero balance of payments is defined as being in external equilibrium, i.e., $BP = 0$. Then when the balance of payments is in equilibrium, there is:

$$NX(t) = F \tag{17}$$

Substituting Eq. (9) and Eq. (15) into Eq. (17) yields:

$$Y(t) = \frac{1}{\gamma}\left[q + n\frac{EP_f}{P}\right] - \frac{\sigma}{\gamma}\left[r_w - r(t)\right] \tag{18}$$

That is, it is the equation of the BP curve, which represents the combination of interest rates and incomes when the balance of payments is aligned at a given exchange rate.

3. Evaluation of the Construction of Key Projects Planned during the “First Five-Year Plan” in Lanzhou City

3.1. Construction of a Performance Evaluation System for Key Construction Projects

In order to ensure that the performance evaluation system can comprehensively and scientifically reflect the actual project situation, suitable evaluation indexes should be selected from various aspects. This paper gives full consideration to the geographical characteristics of Lanzhou city, through talks and visits with project decision makers and experts and scholars, and finally gives the indicators applicable to the performance evaluation of key construction projects in Lanzhou city after many optimization adjustments. The assessment system is established after correction and testing as shown in Table 2, and the guideline level is divided into four dimensions, namely, project implementation and planning, policy effect and formulation, project efficiency and quality, and project operation sustainability and management, covering 15 first-level indicators.

Table 2. Engineering Performance Evaluation System.

Target layer	Criterion layer	Indicator layer
Performance of key construction projects(A)	Engineering implementation and planning(B1)	Engineering construction planning(C1)
		Project initiation decision(C2)
		Preliminary work(C3)
		Implementation status(C4)
	Policy effects and formulation(B2)	The degree of establishment of the development mechanism(C5)
		Policy implementation effect(C6)
		Project Public Notice(C7)
		Quota management(C8)

	Engineering benefits and quality(B3)	Project integrity rate(C9)
		Engineering utilization rate(C10)
		Provincial engineering degree(C11)
		Resource utilization coefficient(C12)
	Engineering operation sustainability and management(B4)	Ecological and environmental impact(C13)
		Safeguard measures and operation management level(C14)
		Public acceptance(C15)

3.2. Steps for Calculating Indicator Weights

(1) Construct judgment matrix

Performance evaluation of key construction projects is a "multi-objective" and "multi-factor" evaluation process. In the hierarchical structure of key project construction performance evaluation, due to the importance of each factor in each level is different, and the decision makers or experts have different subjective perceptions of the comparison between the two factors. In order to reduce the bias of evaluation results caused by personal subjective cognition, this paper consults and invites relevant experts to compare the indicators in the index system and assign values to the importance of the indicators, so as to clarify the relative importance of each factor and ensure the rationality of the evaluation process. Among them, the judgment matrix obtained after the assignment is shown in Table 3.

Table 3. Nth-order Judgment Matrix.

A	B_1	B_2	...	B_n
B_1	B_{11}	B_{12}	...	B_{1n}
B_2	B_{21}	B_{22}	...	B_{2n}
...	...	...	...	...
B_n	B_{n1}	B_{n2}	...	B_{nn}

Matrix representation compared to A , B_{ij} for the indicator B_i on the relative importance of B_j , usually using the number 1 ~ 9 and its reciprocal as a scale, matrix factors two by two comparison of the importance of the importance of the value and the assignment of the specific meaning of Table 4 shows.

Table 4. Nine-point Scale and Its Meaning.

Scale	Meaning
1	The two elements are equally important
3	Compared with the two elements, the former is slightly more important than the latter
5	Compared with the two elements, the former is obviously more important than the latter
7	Compared with the two elements, the former is very important than the latter

9	Compared with the two elements,the former is absolutely more important than the latter
2,4,6,8	The median value of two adjacent judgments
Countdown	Take the opposite case of the corresponding meaning above

(2) Calculation of indicator weights and consistency test

1) Calculation of maximum characteristic root and eigenvector

(A) Regularization of the columns of the judgment matrix

$$\overline{b}_{ij} = \frac{b_{ij}}{\sum_{k=1}^{m} b_{kj}} \tag{19}$$

where $i, j, k = 1, 2, \ldots, n$

(B) Summing the judgment matrix by rows

$$\overline{\omega}_i = \sum_{j=0}^{n} \overline{b}_{ij} \tag{20}$$

(C) Feature vector $\overline{\omega} = \left[\overline{\omega}_1, \overline{\omega}_2, \overline{\omega}_3, \ldots, \overline{\omega}_n\right]^i$

(D) Calculate the maximum feature root $\lambda_{\max}$

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{(AW)_i}{nW_i} \tag{21}$$

(2) Judgment matrix consistency test

(A) Calculate the consistency indicator CI

$$\mathrm{CI} = \frac{\lambda_{\max} - n}{n-1} \tag{22}$$

(B) Finding the corresponding randomized consistency indicator RI

(C) Calculate the coherence ratio CR

$$CR = \frac{CI}{RI} \tag{23}$$

(D) determine whether the matrix has consistency

When $CR < 0.10$, then the matrix has consistency; when $CR \geq 0.10$, then the matrix does not have consistency, then you need to adjust the value of the judgment matrix indicators and re-calculate and test until the result meets $CR < 0.10$.

(3) Calculate the weights of indicators at all levels

According to the above steps to get the weight vector and judgment matrix of each level of indicators, to find the final key project construction performance evaluation indicators of the integrated weight.

3.3. Calculation of Indicator Weights

Based on the 3.2 method, the finalized results of the weight distribution of the key project performance assessment index system in Lanzhou City are shown in Table 5. In the guideline layer, the weight of project implementation and planning is the highest, reaching 0.3826, followed by project effectiveness and quality, which together account for nearly 70%. The weight of policy effect and formulation is relatively low, and the weight of project operation sustainability and management is the lowest.

Table 5. Weights of the Evaluated Indicators.

Criterion layer	Weight	Indicator layer	Weight	Comprehensive weight
B1	0.3826	C1	0.2858	0.1093
		C2	0.3197	0.1223
		C3	0.1942	0.0743
		C4	0.2003	0.0766
B2	0.1763	C5	0.2974	0.0524
		C6	0.1781	0.0314
		C7	0.3542	0.0624
		C8	0.1703	0.0300
B3	0.2985	C9	0.3627	0.1083
		C10	0.2238	0.0668
		C11	0.1093	0.0326
		C12	0.3042	0.0908
B4	0.1426	C13	0.3785	0.0540
		C14	0.2944	0.0420
		C15	0.3271	0.0466

3.4. Evaluation Analysis

In this paper, the fuzzy mathematical method is chosen to quantify the qualitative indicators, which are divided into five levels: very poor (V), poor (IV), general (III), good (II), and very good (I), and the level of each indicator is determined with reference to the maximum affiliation criterion. According to the index evaluation table and weight value, the weighted synthesis method is used to determine the performance evaluation value of key projects in Lanzhou City, and the evaluation results are shown in Table 6. From the distribution of the index levels, all the indexes reach the better and above levels, among which C1, C2 and other evaluations reach the I level.

Table 6. Evaluation Results.

Indicator	V	IV	III	II	I	Evaluation level
C1	0.00	0.00	0.02	0.68	0.30	I
C2	0.00	0.00	0.15	0.62	0.23	I
C3	0.00	0.03	0.26	0.57	0.14	II
C4	0.00	0.00	0.23	0.60	0.17	II
C5	0.00	0.00	0.17	0.58	0.25	I
C6	0.02	0.00	0.19	0.55	0.24	II
C7	0.00	0.00	0.28	0.72	0.00	II
C8	0.00	0.00	0.15	0.60	0.25	I
C9	0.00	0.00	0.07	0.55	0.38	I
C10	0.00	0.00	0.03	0.62	0.35	I
C11	0.01	0.00	0.16	0.67	0.16	II

C12	0.00	0.05	0.22	0.63	0.10	II
C13	0.00	0.00	0.06	0.52	0.42	I
C14	0.00	0.00	0.27	0.64	0.09	II
C15	0.00	0.00	0.15	0.66	0.19	I

4. Computer Simulation Analysis of the Impact of National Macro Policies on the Construction of Key Projects

4.1. Sample Variability Test

The results of descriptive statistical analysis of each variable are shown in Table 7. The mean value of the construction performance of key projects is 78.62, indicating that the overall construction performance of the sample projects is at a high level. The mean value of economic policy uncertainty is 5.12, indicating that the overall stability of national macro policies during the First Five-Year Plan period is high, but there are still some fluctuations in the policies due to the deployment of resources in the early stage of industrialization, the international environment and other factors. As a dummy variable, the mean value of property rights is as high as 0.94, indicating that 94% of the sample projects are dominated by state-owned enterprises or government agencies, and only 6% involve other ownership subjects. The mean value of macro leverage is 0.37 and the mean value of macroeconomic growth rate is 10.85%. The overall trade balance is in deficit, a feature consistent with the background of the national key industrial projects during the First Five-Year Plan, which prioritized heavy industry and relied on equipment imports.

On the whole, the descriptive statistics of the variables are highly consistent with the macro background of the key projects in Lanzhou during the First Five-Year Plan period and the characteristics of the planned economic system, and the samples have good representativeness, which provide reliable data support for the subsequent computer simulation analysis based on system dynamics.

Table 7. Results of descriptive Statistical Analysis.

Variable	Observation value	Mean value	Standard deviation	Minimum value	Median	Maximum value
Con	300	78.62	9.23	55.30	79.10	92.45
Epu	300	5.12	0.87	3.98	5.05	6.72
SOE	300	0.94	0.11	0.79	0.95	1.00
Lev	300	0.37	0.08	0.25	0.36	0.51
GDPZ	300	10.85	1.24	8.92	10.70	12.50
Exp	300	-2.13	1.86	-5.20	-1.90	1.30

4.2. Analysis of Regression Results

4.2.1. Analysis of Results

The estimation results of the double difference model are shown in Table 8. The t-statistics are in parentheses, where “*”, “**” and “***” indicate that they are significant at the 10%, 5% and 1% significance levels, respectively. The coefficient of the policy interaction term is 1.25 and significant at the 1% level, indicating that the national macro policy during the “First Five-Year Plan” period has a significant positive impact on the performance of key projects in Lanzhou City. That is to say, compared with similar projects not directly covered by the policy, the performance of projects supported by the policy is improved by 1.25 units on average (in terms of fuzzy evaluation value). The regression results of the control variables further reveal the specific mechanism affecting performance, and the coefficient of the nature of property rights is 0.92 and significant at the 5% level, indicating that the performance of projects led by state-owned enterprises or the government is significantly higher than that of other subjects of ownership, which is consistent with the absolute control of the state-owned economy over the key areas under the planned economic system. The overall goodness of fit of the model (R^2=0.78) is high, indicating that the baseline model can effectively explain the source of variation in the performance of key projects in Lanzhou City during the First Five-Year Plan period, and the conclusion is statistically reliable.

Table 8. Estimation results of the difference-in-differences model.

Variable	Con
DID	1.25*** (3.65)
SOE	0.92** (2.16)
Lev	-0.56* (-2.17)
GDPZ	0.67*** (3.78)
Exp	-0.45 (-1.45)
Constant	55.47*** (13.64)
Observations	300
R-squared	0.78

4.2.2. Subgroup Analysis

The estimation results of the double difference model for enterprises with different property rights are shown in Table 9. The coefficient of the policy interaction term (DID) for the SOE group is 1.50 and is significant at the 1% level, indicating that the performance of key projects of SOEs supported by the policy focuses on average improves by 1.50 units compared to similar SOEs not directly covered by the policy. Combined with the historical background, during the First Five-Year Plan period, China practiced a highly centralized planned economic system, and SOEs, as the main body of the national economy, were the main carriers of key projects, and policy resources were prioritized in favor of SOEs, resulting in stronger policy responsiveness and greater performance improvement. The coefficient of the policy interaction term for the non-state-owned enterprise group is only 0.30 and fails the significance test (t=0.85), indicating that the policy does not have a significant positive effect on the performance of key projects of non-state-owned enterprises. This phenomenon is closely related to the ownership structure under the planned economy: non-state-owned enterprises accounted for a very low proportion of the national economy during the First Five-Year Plan period (only 6% in the sample), and policy making and resource allocation were highly concentrated on state-owned enterprises, which made it difficult for non-state-owned enterprises to obtain the same policy support as state-owned enterprises. In addition, because of their small size and weak technological base, non-state enterprises faced higher implementation thresholds when undertaking key national projects, further undermining the release of policy effects.

Table 9. Model Estimation Results of different property Rights natures.

Variable	State-owned enterprises	Non-state-owned enterprises
DID	1.50*** (3.20)	0.30 (0.85)
SOE	-	0.45 (1.23)
Lev	-0.62** (-2.35)	-0.41 (-1.12)

GDPZ	0.72*** (3.85)	0.58** (2.14)
Exp	-0.50 (-1.62)	-0.38 (-0.95)
Constant	62.35*** (4.12)	58.12** (2.28)
Observations	282	18
R-squared	0.75	0.68

4.2.3. Robustness Analysis

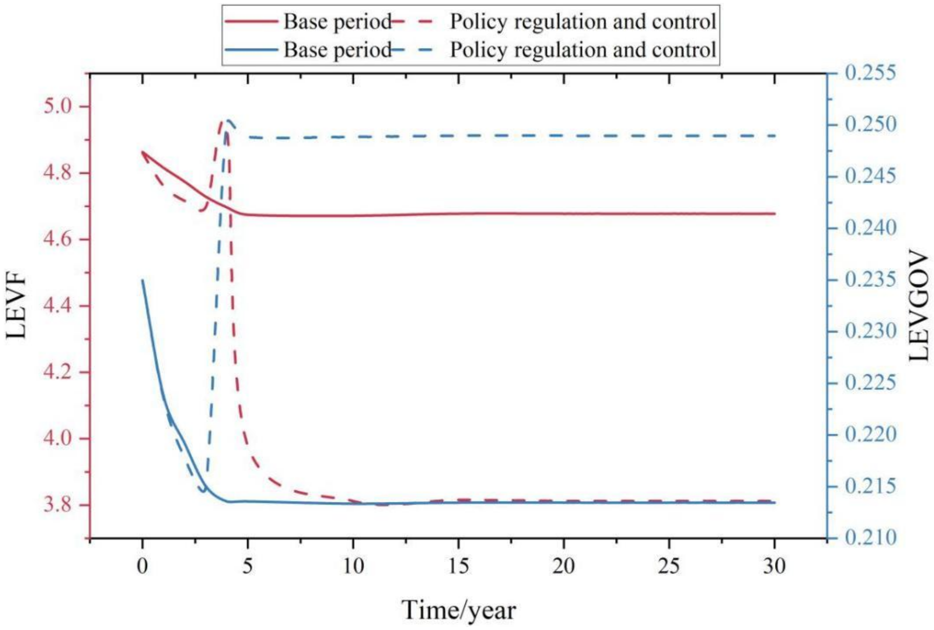
Robustness analysis was conducted using double difference and Heckman two-step regression, and the results of the Heckman two-stage model regression are shown in Table 10.The variables selected for the first stage of the Heckman regression regression model include project size, industry type, and policy coverage dummy variables, and the selection equations are well-fitted, and the core selection variables are all significant in affecting the probability of sample inclusion. The coefficient of the inverse Mills ratio (IMR) in the regression equation is 0.35 and significant at the 5% level ($p<0.05$), indicating that there is a significant selection bias in the sample. After adding IMR, the coefficient of policy uncertainty is still significant at 1.18 ($p<0.01$) and the coefficient of property rights nature is 0.89 ($p<0.05$), which are basically consistent with the sign, significance, and magnitude of the value of the benchmark regression, suggesting that the research findings are robust to sample selection bias.

Table 10. Regression Results of Heckman's two-stage model.

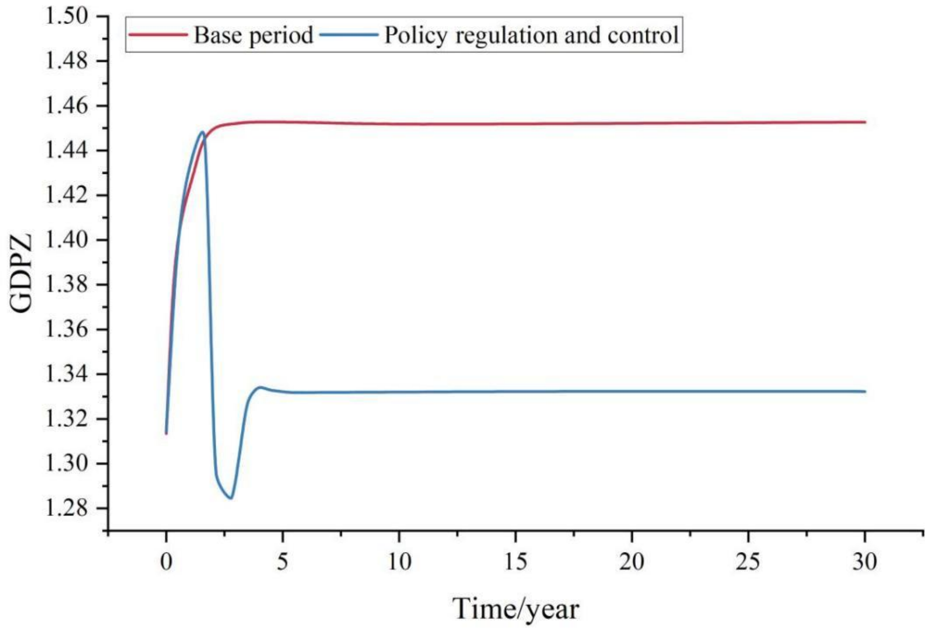
Variable	Con
Epu	1.18*** (3.27)
SOE	0.89** (2.05)
Lev	-0.52* (-1.98)
GDPZ	0.64*** (3.41)
Exp	-0.41 (-1.32)
IMR	0.35** (2.14)
Observations	0.76
R-squared	300

4.3. Analysis of Intermediation Effects

The impacts of expansionary monetary policy and tight fiscal policy on macro leverage and economic growth are shown in Figure 2 (a~b), where expansionary monetary policy is simulated by reducing both the reserve requirement ratio and the benchmark deposit interest rate by 20 percentage points, and tight fiscal policy is simulated by decreasing government spending and the personal income tax rate by 20 percentage points. It can be seen that government sector leverage rises significantly when the economy is hit by expansionary monetary policy and tight fiscal policy. Leverage in the financial corporate sector rises first and then falls immediately. Economic growth declines and then rises for five years before reaching a steady state.



(a) Lev



(b) GDPZ

Figure 2. Comparison of the impact effects of different policies.

On the basis of the previous study, two sub-samples divided into two state-owned enterprises and non-state-owned enterprises are analyzed to analyze the effects of stable economic policies on the ternary margins of import and export trade, i.e., the quantity margin, the price margin and the expansion margin. The results of the sub-sample regression are shown in Table 11. For SOEs, the coefficients of the quantity margin and expansion margin are 0.85 and 1.20, respectively, both significant at the 1% level, indicating that the stabilization policy significantly enhances the export quantity and trade expansion capacity of SOEs, which is consistent with the historical background of SOEs as the main undertaker of the policy. The marginal coefficient of price for non-state-owned enterprises is 0.30 (t=1.22), which does not pass the strict significance test, but still shows that non-state-owned enterprises have some flexibility in price adjustment. The coefficients of quantity margin and expansion margin are not significant, indicating that the export promotion effect of stabilization policy on non-state enterprises is weak, which is in line with the institutional characteristics of the "First Five-Year Plan" period that non-state enterprises accounted for a low proportion of non-state enterprises and the policy coverage is insufficient. Overall, table 11 verifies the ownership heterogeneity of macroeconomic policy effects and provides micro evidence for understanding the policy transmission mechanism during the planned economy.

Table 11. Regression results of sub-samples.

Variable	State-owned enterprises	Non-state-owned enterprises
Quantity margin	0.85*** (2.15)	0.12 (0.35)
Price margin	0.05 (0.15)	0.30 (1.22)
Expand margin	1.20*** (2.83)	0.08 (0.21)

5. Conclusion

This paper takes the key projects planned during the "First Five-Year Plan" period in Lanzhou City as a sample, systematically explores the influence mechanism of national macro-policy on the performance of project construction, and draws the following main conclusions.

First, national macro policy has a significant positive role in promoting the construction performance of key projects in Lanzhou. "The overall stability of policies during the First Five-Year Plan period is high, and the average value of economic policy uncertainty index is 5.12. The coefficient of the policy interaction term is 1.25 and is significant at the 1% level, which means that the performance of the projects supported by the policy focuses on average improves by 1.25 units (in terms of fuzzy evaluation value), compared with similar projects not directly covered by the policy. .

Second, ownership structure is a key factor in the heterogeneity of policy effects. Ninety-four percent of the sample projects are led by state-owned enterprises (SOEs) or government agencies, and only 6% involve other ownership subjects. The coefficient of the policy interaction term (DID) for the SOE group is 1.50 and significant at the 1% level, while the coefficient of the policy interaction term for the non-SOE group is only 0.30 and fails the significance test (t=0.85).

Third, policy instruments act on engineering and construction through multiple intermediation paths. Expansionary monetary policy and tight fiscal policy form a dynamic transmission chain by affecting intermediary variables such as macro leverage ratio and economic growth rate. The group regression of the ternary margin of import and export trade further shows that the stabilization policy promotes the export quantity and expansion capacity of SOEs significantly stronger than that of non-SOEs. For SOEs, the coefficients of the quantity margin and expansion margin are 0.85 and 1.20 respectively, both significant at the 1% level, while the coefficient of the price margin for non-SOEs is 0.30 (t=1.22), which does not pass the strict significance test.

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