Efficiency Evaluation and Influencing Factors Analysis of Urban Renewal Financial Expenditure in Liaoning Province

Yinghui Xiang, Yuhuan Meng and Zheng Liu*
School of Management, Shenyang Jianzhu University, Shenyang 110168, China

Keywords: Urban Renewal, Financial Expenditure Efficiency, Influencing Factors, DEA-Tobit Model.

Abstract: In recent years, many provinces and cities in China have invested a large number of financial funds to support urban renewal actions. Whether financial funds can be effectively used in urban renewal actions is related to the implementation effect of urban renewal work. This paper uses DEA model to calculate the financial expenditure efficiency of urban renewal in 14 cities of Liaoning Province, and further uses Tobit model to analyze the influencing factors of financial expenditure efficiency of urban renewal. The results show that Shenyang, Benxi, Liaoyang, Yingkou and Panjin have achieved DEA efficiency in the whole study period, and the other cities still have relatively large room for improvement. Urban population density and urbanization rate have a significant positive impact on the financial expenditure efficiency of urban renewal. Based on empirical analysis, some suggestions are put forward to improve the financial expenditure efficiency of urban renewal.

1 INTRODUCTION

To solve the problem of urban development in the stock age, urban renewal has become an important strategy of urban development in the new period. In 2021, the Ministry of Housing and Urban-Rural Development and the People's Government of Liaoning Province jointly issued the "Implementation Plan of Urban Renewal Pilot Area jointly built by ministries and provinces". The "Plan" proposes that by 2025, the system and mechanism of jointly building urban renewal pilot areas by the ministries and provinces will be initially established, and the vitality of the system will be initially shown. In recent years, Liaoning Province has made great achievements in urban renewal work, but it has also invested a large amount of financial funds to promote urban renewal. Financial support is crucial to urban renewal. Therefore, it has an important practical significance to scientifically evaluate the efficiency of financial expenditure in urban renewal in Liaoning Province and further explore the influence of different factors on the efficiency of financial expenditure.

At present, there are abundant achievements in the research of urban renewal evaluation and analysis of government expenditure efficiency at home and abroad. With regard to the evaluation of urban renewal, Grace K.L. Lee and Edwin H.W. Chan (2008) constructed an evaluation index system from the perspective of economic, social and environmental sustainability, and applied AHP to evaluate the urban renewal in Hong Kong, China. Wang Meng et al. (2011) took the former Xicheng District of Beijing as an example, and used the DEA method of multi-objective decision-making to evaluate the comprehensive performance of the old city reconstruction effect in this area. Liu Guiwen et al. (2017) analyzed the basic policy tools, categories and types of activities of urban renewal in Shenzhen, constructed an evaluation model of renewal policy to analyze the contradictions and shortcomings of policy tools, and put forward relevant suggestions for future policy formulation. Regarding the efficiency of government expenditure, Balague-Coll et al. (2007) took the local government of Valencia as an example, measured its government efficiency by two-stage DEA method and unbounded analysis method, and further used nonparametric smoothing technology to analyze the influencing factors. Afonso et al. (2008) firstly used DEA method to evaluate the financial expenditure efficiency of local governments in Portugal, and then explained the efficiency value through Tobit analysis, finding that increasing education input and per capita purchasing power is conducive to improving the efficiency of fiscal expenditure. Wang Qian et al. (2018) measured the efficiency of local financial expenditure under the restriction of public risk by SE-U-SBM-DEA model,

Xiang, Y., Meng, Y. and Liu, Z.
Efficiency Evaluation and Influencing Factors Analysis of Urban Renewal Financial Expenditure in Liaoning Province.
DOI: 10.5220/0012071000003624
In *Proceedings of the 2nd International Conference on Public Management and Big Data Analysis (PMBDA 2022)*, pages 127-133
ISBN: 978-989-758-658-3

and analyzed its influencing factors by random effect Tobit model.

In view of the shortcomings of the existing literature and learning from its experience, this paper intends to use DEA-Tobit two-stage method to analyse the financial expenditure efficiency and influencing factors in urban renewal in Liaoning Province, with a view to providing operational countermeasures and suggestions for promoting the high-quality implementation of urban renewal in Liaoning and even the whole country.

2 RESEARCH METHODS

2.1 Data Envelopment Analysis

Data Envelopment Analysis (DEA) is a kind of non-parametric testing method developed on the basis of the concept of relative efficiency evaluation theory, It was firstly put forward by Charnes, Cooper and Rhodes in 1978. This method analyzes the input situation and output level data by selecting the decision unit (DMU), and uses the linear planning method to take the best input and output as the production frontier, so as to form the data envelope curve. Among them, the effective point has an efficiency value of 1 and lies on the front surface, while the ineffective point will be given a relative efficiency value between (0,1) and lies outside the front surface. According to the variability of returns to scale, DEA model also includes CCR model with fixed returns to scale and BCC model with variable returns to scale. For the government, the input variable is more controllable than the output variable. Therefore, after comprehensive consideration, this paper will select BCC model as the theoretical research model based on input orientation. The model description is as follows,

$$\min \theta$$

$$s.t.\begin{cases} \sum_{j=1}^{n} \lambda_j y_j + s^+ = \theta_{x_0} \\ \sum_{j=1}^{n} \lambda_j y_j - s^- = \theta_{y_0} \\ \sum_{j=1}^{n} \lambda_j = 1 \\ \lambda_j \geq 0, s^+ \geq 0, s^- \leq 0, j = 1,2,...,n \end{cases} \quad (1)$$

2.2 Panel Tobit Model

In order to deeply analyze the influencing factors and degree of financial expenditure efficiency of urban renewal in Liaoning Province, according to the efficiency value obtained by DEA model in the first stage, the influencing factors are analyzed and evaluated by panel Tobit model in the second stage. The basic form of the model is as follows,

$$Y_i = \begin{cases} \beta_0 + \beta_i X_i + \varepsilon_i, & Y_i > 0 \\ 0, & Y_i \leq 0 \end{cases} \quad (2)$$

In this paper, the financial expenditure efficiency of urban renewal in Liaoning Province measured in the first stage is taken as the dependent variable, and the objective factors that may affect this efficiency are selected as the independent variable to establish the panel Tobit model, and the maximum likelihood estimation (ML) method is used to estimate the variable parameters.

3 THE EFFICIENCY EVALUATION OF FINANCIAL EXPENDITURE FOR URBAN RENEWAL IN LIAONING PROVINCE

3.1 Index Selection and Data Sources

The research object of this paper is the financial expenditure efficiency of urban renewal in Liaoning Province, so 14 cities in Liaoning Province are selected as decision-making units. In view of the availability and completeness of data, 2016-2020 is selected as the research interval. The relevant data comes from the Statistical Yearbook of Liaoning Province, the Financial Yearbook of China from 2017 to 2021 and the statistical database of China Economic Net, and the evaluation index system of financial expenditure efficiency of urban renewal in Liaoning Province is constructed as shown in Table 1.

Table 1: Evaluation Index System of Urban Renewal Financial Expenditure Efficiency in Liaoning Province.

Target	Invest	Output
Index	Expenditure on shantytown renovation	Regional GDP per capita
	Expenditure on urban construction	Urban financial revenue
	Expenditure on technology research and development	Per capita residential floor area

	Expenditure on pollution prevention and control	Per capita urban road area
	Expenditure on community public facilities in urban and rural areas	Park green area per capita
	Expenditure on affordable housing projects	Heating area
	/	Length of urban drainage pipeline
	/	Daily treatment capacity of urban sewage
	/	Harmless treatment capacity of domestic garbage

3.2 Analysis of Empirical Results

This paper selects the VRS input-dominant model of DEA model, uses DEAP2.1 software to calculate the financial expenditure efficiency of urban renewal in 14 cities in Liaoning Province from 2016 to 2020, the calculation results are analyzed at the overall and regional levels in Liaoning Province.

Table 2: Scores of Urban Renewal Financial Expenditure Efficiency.

CITY	TIME	CRSTE	VRSTE	SCALE		RANK
Shenyang	2016	1	1	1	-	1
	2017	1	1	1	-	
	2018	1	1	1	-	
	2019	1	1	1	-	
	2020	1	1	1	-	
Dalian	2016	0.965	1	0.965	drs	3
	2017	0.947	1	0.947	drs	
	2018	0.954	1	0.954	drs	
	2019	0.986	1	0.986	drs	
	2020	1	1	1	-	
Anshan	2016	0.907	0.908	0.999	irs	4
	2017	0.994	0.997	0.997	drs	
	2018	1	1	1	-	
	2019	0.99	1	0.99	drs	
	2020	0.949	1	0.949	drs	
Fushun	2016	1	1	1	-	2
	2017	0.946	0.946	1	-	
	2018	0.946	0.949	0.997	drs	
	2019	1	1	1	-	
	2020	1	1	1	-	
Benxi	2016	1	1	1	-	1
	2017	1	1	1	-	
	2018	1	1	1	-	
	2019	1	1	1	-	
	2020	1	1	1	-	
Dandong	2016	0.758	0.759	0.999	drs	8
	2017	0.804	one	0.804	drs	
	2018	0.789	0.834	0.946	drs	
	2019	0.859	0.907	0.947	drs	
	2020	0.789	0.795	0.993	irs	
	2016	0.828	0.97	0.854	drs	9
	2017	0.724	0.746	0.97	drs	
Jinzhou	2018	0.71	0.727	0.977	drs	
	2019	0.593	0.622	0.953	drs	
	2020	0.766	0.77	0.995	irs	
Yingkou	2016	1	1	1	-	1
	2017	1	1	1	-	
	2018	1	1	1	-	
	2019	1	1	1	-	
	2020	1	1	1	-	
Fuxin	2016	1	1	1	-	5
	2017	0.939	0.972	0.965	irs	
	2018	0.915	0.962	0.951	irs	
	2019	0.926	0.972	0.953	irs	
	2020	0.888	0.963	0.922	irs	
Liaoyang	2016	1	1	1	-	1
	2017	1	1	1	-	
	2018	1	1	1	-	
	2019	1	1	1	-	
	2020	1	1	1	-	
CITY	TIME	CRSTE	VRSTE	SCALE		RANK
Panjin	2016	1	1	1	-	1
	2017	1	1	1	-	
	2018	1	1	1	-	
	2019	1	1	1	-	
	2020	1	1	1	-	
Tieling	2016	0.732	0.747	0.98	irs	6
	2017	0.733	0.788	0.931	irs	
	2018	1	1	1	-	
	2019	0.846	0.858	0.986	irs	
	2020	0.81	0.838	0.967	irs	
Chaoyang	2016	0.704	0.732	0.962	irs	10
	2017	0.734	0.753	0.975	drs	
	2018	0.738	0.741	0.997	drs	
	2019	0.723	0.86	0.841	drs	
	2020	0.701	0.813	0.863	drs	
Huludao	2016	0.91	1	0.91	drs	7
	2017	0.946	0.946	1	-	
	2018	0.946	0.949	0.997	drs	
	2019	1	1	1	-	
	2020	1	1	1	-	

3.2.1 Overall Analysis

According to the results calculated by DEA, the trend chart of average values of three efficiency scores of 14 cities in Liaoning Province from 2016 to 2020 was

drawn, as shown in Figure 1. As can be seen from Figure 1, the overall efficiency of financial expenditure for urban renewal in Liaoning Province decreased first and then increased, with little fluctuation, and the efficiency values were all above 0.9; the trend of scale efficiency is similar to the overall comprehensive efficiency, and the technical efficiency curve is below the scale efficiency curve in the whole stage, which indicates that the low technical efficiency is the main reason why the financial expenditure efficiency of urban renewal in Liaoning Province cannot be greatly improved, and the key to improving the efficiency lies in improving the backward technology of financial capital utilization. Therefore, the government should pay more attention to the technical innovation and management efficiency of urban renewal expenditure funds, and lay emphasis on improving the use level of urban renewal related funds.

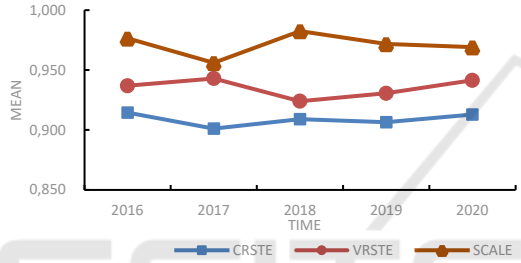

Figure 1: Trends of the overall urban renewal financial expenditure efficiency.

3.2.2 Regional Level Analysis

From the perspective of comprehensive efficiency, the cities with effective comprehensive efficiency in the whole stage include Shenyang, Benxi, Liaoyang, Yingkou and Panjin (comprehensive efficiency value is 1), followed by Fushun, and Chaoyang has the lowest comprehensive efficiency, with an average value of only 0.720, By consulting and analyzing the original data, it is found that there is obvious input redundancy and diminishing returns to scale in this city. From the perspective of technical efficiency, Shenyang, Dalian, Benxi, Liaoyang, Yingkou and Panjin have reached the effective level (the technical efficiency value is 1), and Jinzhou has the lowest technical efficiency, with an average value of only 0.767, which is relatively backward. From the perspective of scale efficiency, Shenyang, Benxi, Liaoyang, Yingkou and Panjin have reached an effective level (the scale efficiency value is 1), which shows that the scale and structure of urban renewal financial expenditure in these cities are gradually becoming reasonable, while the rest of the regions have not reached the optimal efficiency level, and the scale of financial expenditure needs to be adjusted. From the perspective of returns to scale, except Shenyang, Benxi, Liaoyang, Yingkou and Panjin, the financial input of urban renewal in other cities generally deviated from the optimal scale during the whole inspection period, and most cities suffered from diminishing returns to scale, while Fuxin and Tieling were in an increasing state in most years. From the analysis of Table 2, it can be seen that there is no direct relationship between the financial expenditure efficiency of urban renewal and the degree of economic development, and the high-efficiency output may not come from high input, which may be due to the different economic development modes and financial expenditure structures in different places. Blindly expanding investment is not a wise move. It is necessary for local governments to optimize and adjust the supply structure and improve the investment mode according to the urban development.

4 ANALYSIS OF INFLUENCING FACTORS OF FINANCIAL EXPENDITURE EFFICIENCY OF URBAN RENEWAL IN LIAONING PROVINCE

4.1 Selection of Influencing Factors

At present, there are few research results about the influencing factors of financial expenditure efficiency in urban renewal, but there are many in-depth research results. Therefore, based on a large number of literatures, this paper summarizes various influencing factors that are often selected in the existing results. Combined with the attributes and development characteristics of urban renewal, and taking into account the availability of data, this paper selects five factors: regional economic development level, urban population density, urbanization rate, urban renewal financial investment scale and education level of residents to examine their impact on urban renewal financial expenditure efficiency.

Table 3: Description of influencing factors variables.

Statistical variable	Variable name	Variable Symbol	Variable Explanation
Dependent Variable	Financial expenditure efficiency in urban renewal	eff	Comprehensive efficiency value
Independent Variable	Regional economic development level	gdp	Urban per capita GDP
	Urban population density	pd	Total urban population/Regional area
	Urbanization rate	urban	Number of permanent urban residents/Total permanent population of the region
	Urban renewal financial investment scale	scale	Financial expenditure on urban renewal/Total expenditure of city finance
	Education level of residents	edu	Number of students enrolled in various schools/Total regional population

4.2 Establishment of Tobit Regression Model

Based on the calculation of the financial expenditure efficiency of urban renewal in Liaoning Province from 2016 to 2020 by using the DEA-BCC model, the Tobit model is constructed to further explore the factors affecting the financial expenditure efficiency of urban renewal. In order to smooth the data, the regional economic development level(gdp) and urban population density(pd) are logized to improve the stationarity of explanatory variables. The Tobit model in this paper is set as follows,

$$eff_{it} = \beta_0 + \beta_1 \ln(gdp_{it}) + \beta_2 \ln(pd_{it}) + \beta_3 urban_{it} + \beta_4 scale_{it} + \beta_5 edu_{it} + \mu_i + \varepsilon_{it} \quad (3)$$

4.3 Analysis of Tobit Regression Results

Eviews10.0 software is used to make regression analysis on the influencing factors of financial expenditure efficiency of urban renewal in Liaoning Province. The Tobit regression results are summarized in Table 4.

Table 4: Tobit regression results of influencing factors.

Influencing Factor	Coef	Std. Err	Z	Significant Level (P>Z)
Regional economic development level	-0.069443	0.049795	-1.39	0.1631
Urban population density	0.072085**	0.035836	2.01151	0.0443
Urbanization rate	0.007834***	0.001476	5.30631	0
Urban renewal financial investment scale	0.022026	0.022737	0.968746	0.3327
Education level of residents	0.035552	0.024021	1.480059	0.1389

Note: * * *, * * and * are significant at the levels of 1%, 5% and 10% respectively.

The regression coefficient of regional economic development level (gdp) to urban renewal financial expenditure efficiency is negative, indicating that there is a negative relationship between them, but it is not significant, which means that regional economic development level will not have a significant impact on urban renewal fiscal expenditure efficiency. It may be because some areas with higher level of economic development pay more attention to the urban environment, which can promote the implementation of urban renewal. However, there are also some areas that unilaterally pursue economic benefits, ignoring the necessary transformation actions for urban adverse environmental areas, to some extent, it weakens the efficiency of urban renewal financial expenditure.

The regression coefficient of urban population density (pd) to urban renewal financial expenditure efficiency is significantly positive, which indicates that the increase of urban population density can improve agglomeration economic benefits and financial

expenditure efficiency. The reason may be that the higher the population density, the higher the public's requirements for living conditions, which is conducive to improving the efficiency of urban renewal financial expenditure.

The regression coefficient of urbanization rate (urban) to the efficiency of urban renewal financial expenditure is significantly positive, which indicates that the increase of urbanization rate can obviously improve the efficiency of urban renewal financial expenditure. On the one hand, the improvement of urbanization level means that a large number of rural people gather in cities, resulting in scale effect,on the other hand, with the gradual improvement of urban spatial layout and functional structure, the relative environment of urban financial input and output becomes better, which is more conducive to the rational allocation of urban financial resources by the government and the promotion of urban financial expenditure efficiency.

The regression coefficient of urban renewal financial investment scale (scale) to urban renewal financial expenditure efficiency is positive, indicating that there is a positive relationship between them, but it is not significant. It may be because the funds invested in some areas have not been effectively allocated, and there are unreasonable or wasteful phenomena, which leads to low efficiency of financial expenditure. Therefore, local governments should determine the scale of financial investment in urban renewal according to local conditions.

The regression coefficient of education level of residents (edu) to the efficiency of urban renewal financial expenditure is positive, indicating that there is a positive relationship between them, but it is not significant. Generally speaking, the higher the education level of residents, the higher their support and enthusiasm for urban renewal, and they can play a better role under the local reasonable public participation mechanism of urban renewal. However, some urban public participation mechanisms are imperfect, the implementation effect is not in place, and they fail to play an effective role, thus restricting the efficiency of urban renewal financial expenditure to some extent.

5 CONCLUSIONS AND SUGGESTIONS

According to the results of empirical analysis in this paper, and by comparing the average calculation results of comprehensive efficiency, technical efficiency and scale efficiency of cities in Liaoning province during the whole research period, it can be seen that there are significant differences among different cities, and Shenyang, Benxi, Liaoyang, Yingkou and Panjin are DEA efficient, meanwhile, they are both technically efficient and scale efficient. The scale efficiency values of Dalian, Fuxin and Huludao are lower than the technical efficiency values, which indicates that the scale efficiency leads to the low level of comprehensive efficiency in these cities, and the investment scale should be adjusted reasonably. Anshan, Fushun, Dandong, Jinzhou, Tieling and Chaoyang have low comprehensive efficiency because the technical efficiency is lower than the scale efficiency. Therefore, should be made to adjust and improve the government management structure or level. Through further analysis of influencing factors, it is found that urban population density and urbanization rate play a significant role in promoting urban renewal, There is a positive but not significant relationship between urban renewal financial investment scale and education level of residents, while there is an insignificant negative relationship between regional economic development level and urban renewal financial expenditure efficiency. In view of this, this paper puts forward the following countermeasures and suggestions:

Optimize the structure of government financial expenditure and determine the scale of urban renewal financial expenditure according to local conditions.

Give full play to the role of human capital and encourage the development of innovative and high-tech enterprises.

Accelerate the formation of regional economic layout with complementary advantages and high-quality development, and promote the high-quality development of cities.

REFERENCES

Afonso C, Fernandes E. Assessing and explaining the relative efficiency of local government [J]. The Journal of Socio-Economics, 2008, 27(5).

CHARNES A，COOPER W W，RHODES E. Measuring the efficiency of decision making units [J]. European Journal of Operational Research, 1978, 2(6): 429-444.

Liaoning Provincial People's Government. "Implementation Plan of Urban Renewal Pilot Area Jointly Built by the Ministry and the Province" .2021-08-02.

Lee G K L, Chan E H W. The Analytic Hierarchy Process (AHP) Approach for Assessment of Urban Renewal Proposals. Social Indicators Research.2008.89(1).

Liu Guiwen, Zhiyong Yi, Wei Lizhen, Hu Xinyu. Research on urban renewal policy based on the perspective of policy tools: taking Shenzhen as an example [J]. Urban Development Research, 2017,24 (03): 47-53.

Maria Teresa Balaguer-Coll, Diego Prior, Emili Tortosa-Ausina. On the determinants of local government performance: A two-stage nonparametric approach[J]. European Economic Review, 2007, 51(2): 425-451.

Wang Qian, Dong Yanling. Evaluation of the efficiency of local fiscal expenditure in China under the constraint of public risk and analysis of influencing factors [J]. Financial Research, 2018, (11): 46-61+70.

Wei Quanling. Data Envelopment Analysis (DEA)[M]. Beijing: Science Press, 2015.

Wang Meng, Li Yan, Zhang Wenxin, He Cenhui. Performance evaluation of urban renewal based on DEA method-taking the former Xicheng District of Beijing as an example [J]. Urban Development Research, 2011 (10): 90-96.