Study on the Economic Applicability of Urban Environmentally Sustainable Development Policy

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Abstract. In recent years, China's economy has developed rapidly, the process of urbanization has progressed steadily, the urban and rural infrastructure has been improving day by day, and people's living standards have been significantly improved. But behind the huge economic achievements are resource consumption and environmental pollution. The economic effect of urban environmental sustainability policy is influenced by both policy attribute and economic development stage. This paper establishes a threshold model including different stages of economic development and different types of policies, and analyses the economic effects of urban environmental sustainability policies. The results show that different types of environmental sustainability policies have different economic effects. The economic effects of livable environmental policies and green economic policies are affected by the stage of urban economic development.

Keywords: environmentally sustainable development; environmental policy; economic applicability; multiple regression model of economic outcome.

1. Introduction

At present, China's social economy has entered a new chapter. Faced with the new economic situation, China is implementing a stable economic policy. In order to make the economy and environmental protection complement each other and mutual benefit, China actively explores a new way of developing a green and low-carbon cycle of "economic-environmental harmony" to match the concept of sustainable development and achieve a win-win situation for both. Since the introduction of the neoclassical growth model in the 1950s, many literatures have begun to focus on environmental and growth issues. Bella (2003) [1]argues that both economic growth and environmental pollution cannot be achieved. Ariga (2002)[2] believes that both can have both. This divergence suggests that the economic effects of urban environmental sustainability policies cannot be explained by a single linear model. This paper classifies environmental policy types according to policy objectives, and uses policy text analysis to quantify the implementation of different types of policies at the city level. A threshold regression model is established to examine different types of environmental sustainability policies at different stages of development. What is the difference in the economic performance of the city, and then the applicability of different policies.

2. Model Building

2.1 Theoretical Framework

With the improvement of environmental awareness, while economic development, human beings are paying more and more attention to the sustainable development of the environment. Under the guidance of externality theory, the urban environmental sustainability policy can be divided into livable environmental policy, green economic policy and ecological social policy based on the target and governance objectives.[3] The livable environmental policy mainly includes ecological protection, environmental restoration, and end treatment, etc. The main purpose is to improve environmental quality; The green economic policy mainly includes the creation of emerging green markets, resource conservation and energy conservation, and development of green technology innovation.[4] The main purpose is to achieve a win-win situation in the environment-economy; The ecological and social policies mainly include ecological education and environmental information disclosure. The main purpose is to transform the lifestyle of the residents and to build a social

foundation for sustainable development. Considering the differences in policy implementation at different stages of economic development, the threshold model for urban economic development is constructed:

$$EcP = \mathfrak{f}(EP, CI, LI, TI) \tag{1}$$

$$\begin{cases} EcP_1 = \mathfrak{f}(EP, CI, LT, TI), q \leq \gamma \\ EcP_2 = \mathfrak{f}(EP, CI, LI, TI), q > \gamma \end{cases} \tag{2}$$

EcP is the economic effect of the city; EP is an environmental sustainability policy investment, divided into a livable environmental policy intensity TEP, a green economic policy intensity GEP, and an eco-social policy intensity SEP;CI, LI, and TI are capital investment, labor input, and technology input that affect urban economic performance, respectively; q is a threshold variable that characterizes the stage and characteristics of the city;γ is the specific threshold value identified. Therefore, this paper makes theoretical assumptions on the economic effects of livable environmental policies, green economic policies, and ecological social policies at different stages of development[5].

The impact of livable environmental policies on economic outcomes: The main purpose of livable environmental policies is to protect the ecological environment and to constrain the economic development. With the improvement of economic development level and the greening of industrial structure, the tolerance of cities to the constraints of livable environmental policies will gradually increase. Therefore, in cities with high economic development levels and high-end industries as the development focus, the implementation of livable environmental policies and urban ecological construction may promote industry and economic performance. Therefore, the following assumptions are made:

Hypothesis 1:The effect of livable environmental policy on urban economic performance is influenced by the stage of urban economic development;

Hypothesis 2:As the level of economic development increases, the restrictive effect of livable environmental policies on urban economic performance is gradually reduced.

The impact of green economic policies on economic outcomes: Green economic policies can promote urban economic development by developing new markets, and increasing human capital. In terms of economic performance, green economy policies may not be applicable to all stages and types of cities. Therefore, the following assumptions are made:

Hypothesis 3:the effect of green economic policies on urban economic performance is influenced by the stage of urban economic development;

Hypothesis 4:As the level of economic development increases, the role of green economy policies in promoting urban economic efficiency is gradually reduced.

The impact of ecological and social policies on economic outcomes: The impact of eco-social policies on economic development is more indirect, and the promotion of environmental awareness is generally conducive to a win-win situation for economic development and environmental protection. With the development of urban social economy, people's awareness of environmental protection is gradually increasing, which may affect the economic performance of ecological and social policies. Therefore, the following assumptions are made:

Hypothesis 5:The role of eco-social policies in urban economic performance is influenced by the stage of urban economic development;

Hypothesis 6:As the level of economic development increases, the role of eco-social policies in promoting urban economic performance is gradually reduced.

2.2 Research Model

According to the theoretical model of urban environmental sustainability policy and six theoretical hypotheses, a multivariate regression model of economic effectiveness for empirical analysis was constructed. The regression model of urban economic performance is:

$$EcP = \beta_0 + \beta_1 EP + \beta_2 CI + \beta_3 LI + \beta_4 TI + u \tag{3}$$

If the threshold effect of the economic development stage exists and the policy type is distinguished, the model can be further decomposed into:

$$\begin{cases} EcP_1 = \beta_0 + \beta_1 TEP + \beta_2 CI + \beta_3 LI + \beta_4 TI + u_1, q \leq \gamma_1 \\ EcP_2 = \beta_0 + \beta_1 TEP + \beta_2 CI + \beta_3 LI + \beta_4 TI + u_2, q > \gamma_1 \end{cases} \tag{4}$$

$$\begin{cases} EcP_1 = \beta_0 + \beta_1 TEP + \beta_2 CI + \beta_3 LI + \beta_4 TI + u_1, q \leq \gamma_2 \\ EcP_2 = \beta_0 + \beta_1 GEP + \beta_2 CI + \beta_3 LI + \beta_4 TI + u_2, q > \gamma_2 \end{cases} \tag{5}$$

$$\begin{cases} EcP_1 = \beta_0 + \beta_1 SEP + \beta_2 CI + \beta_3 LI + \beta_4 TI + u_1, q \leq \gamma_3 \\ EcP_2 = \beta_0 + \beta_1 SEP + \beta_2 CI + \beta_3 LI + \beta_4 TI + u_2, q > \gamma_3 \end{cases} \tag{6}$$

In the formula, the meaning of each indicator is the same as the theoretical model.

2.3 Selection of Indicators

In the threshold model of urban economic efficiency, the specific indicators of each factor are shown in Table 1. Selection basis and data source are: ① city economic performance. ② Environmental sustainability policy input. ③Capital investment ④Labor input. ⑤Technical input. ⑥ the stage of economic development. This paper selects the proportion of the tertiary industry to represent the stage of economic development of the city. As a threshold of the model, the data comes from the 2017 China Urban Statistical Yearbook.

Table 1. Economic Results and Specific Indicators of Urban Environmental Sustainability Policy

	variable	index
Explained variable	Urban economic performance EcP	Urban production value
Explanatory variables	Environmental Sustainability Policy Input EP	Livable Environmental Policy Strength: Livable Environmental Policy Score TEP
		Green Economic Policy Strength: Green Economic Policy Score GEP
		Eco-social policy intensity: Eco-social policy score SEP
	Capital investment CI	Urban fixed asset investment
	Labor input LI	Number of urban employees
	Technology investment TI	Science and education public finance expenditure
Threshold variable	Economic development stage	The proportion of the tertiary industry

3. Empirical Results and Analysis

The R-language regression analysis of the threshold model was used to correct heteroscedasticity with the White test while the program was running, and all models passed the global regression significance test.

The overall regression results of the city indicate (Table 2)The livable environmental policy has an inhibitory effect on the economic performance of the city, but the impact is not significant. The Boot-strap P value of the threshold variable regression is 0.066, which means that the LM test is passed at the 10% significance level, that is, the difference in the proportion of the tertiary industry can be used as a threshold variable to distinguish the economics of livable environment policies of

different types of cities. The result, the threshold is 34.80%, that is, the theoretical hypothesis 1 is established.

Table 2. Economic results and regression results of urban livable environmental policy

project	Model 1	Model 1-1(q≤γ1)	Model 1-2(q>γ1)
Livable environmental policy score	-0.051(0.074)	-0.255(0.130)	0.011(0.082)
Number of urban employees	0.295(0.057)	0.032(0.074)	0.243(0.062)
Urban fixed asset investment	0.670(0.086)	0.605(0.083)	0.664(0.092)
Science and education public finance expenditure	0.154(0.076)	0.507(0.116)	0.197(0.097)
Constant term	-9.641(0.625)	-8.947(0.885)	-9.546(0.661)
Threshold value		34.800	
R^2	0.931	0.987	0.925
n	109	15	94

The results show that when the level of economic development is low (the proportion of the tertiary industry is lower than 35.80%), the livable environmental policy has a significant inhibitory effect on urban economic performance; When the level of economic development is high (the proportion of the tertiary industry is higher than 35.80%), the inhibitory effect of livable environmental policies on urban economic performance is eliminated, but the promotion effect is not significant. It can be argued that with the improvement of economic development level, the restrictive effect of livable environmental policy on urban economic performance is gradually reduced, and the theoretical hypothesis 2 is established.

The overall regression results based on cities show (Table 3) that green economic policies also have an inhibitory effect on urban economic performance, but the impact is not significant. The Bootstrap P value obtained by regression of the threshold variable is 0.043, which means that the LM test is passed at the 5% significance level, that is, the difference in the proportion of the tertiary industry can be used as a threshold variable to distinguish the economic effects of green economy policies of different types of cities. The threshold is 43.69%, that is, the theoretical hypothesis 3 is established. Regression is based on the threshold value, indicating that when the level of economic development is low (the proportion of the tertiary industry is lower than 43.69%), the green economy policy has a significant role in promoting urban economic performance; When the level of economic development is high (the proportion of the tertiary industry is higher than 43.69%), the green economy policy has a significant inhibitory effect on the economic performance of the city. It can be argued that with the improvement of economic development level, the promotion effect of green economy policy on urban economic performance will gradually be transformed into inhibition, and the theoretical hypothesis 4 is established.

Table 3. Economic Results and Regression Results of Urban Green Economy Policy

project	Model 2	Model 2-1(q≤γ2)	Model 2-2(q>γ2)
Livable environmental policy score	-0.073(0.073)	0.465(0.154)	-0.151 (0. 067)
Number of urban employees	0.294(0.056)	0.514(0.110)	0.234(0.056)
Urban fixed asset investment	0.678(0.081)	0.445(0.165)	0.714(0.095)
Science and education public finance expenditure	0.157(0.079)	0.148(0.141)	0.177(0.104)
Constant term	-9.778(0.591)	-10.001(1.124)	-9.610(0.716)
Threshold value		43.690	
R^2	0.932	0.953	0.933
n	109	36	74

The overall regression results of the cities show that (Table 4), eco-social policies have a positive effect on urban economic performance, but the impact is not significant. The Boot-strap P value

obtained by regression of the threshold variable is 0.113, indicating that the LM test cannot be passed at the 10% significance level. That is, the difference in the proportion of the tertiary industry cannot be used as a threshold variable to distinguish the economic effects of different types of cities from ecological and social policies. Theoretical assumptions 5. Hypothesis 6 does not hold.

Table 4. Economic results and regression results of urban ecological and social policies

Project	Unnormalized coefficient	Standard error
Ecological social policy score	0.021	0.034
Urban fixed asset investment	0.664	0.081
Number of urban employees	0.285	0.057
Science and education public finance expenditure	0.164	0.079
Constant term	-9.672	0.615
Threshold value	66.051	

4. Conclusion

Different types of environmental sustainability policies have different economic effects, and livable environmental policies have indeed increased production costs, which have a restrictive effect on urban economic performance. With the change of the development stage, the transformation of industrial structure to high-end and green, the city's endurance of livable environmental policies has been continuously improved, which is generally manifested as the disappearance of restrictive role. Cities with higher economic development stages are more conducive to the implementation of livable environmental policies.

Green economic policies can indeed develop new markets, and introduce new growth points and vitality for the local economy. For cities with higher economic development stages, the energy conservation and the circular industrial parks that are advocated by the green economy policy do not have comparative advantages in terms of economic benefits. From the perspective of economic efficiency, cities with lower economic development stages are more suitable for implementing green economic policies, while cities with higher economic development stages should adopt appropriate policies for green economy policies and should not blindly follow suit.

The ecological and social policies have a positive effect on the overall economic benefits of the city, but the effect is not significant. It shows that the improvement of environmental awareness can provide a basis for the sustainable development of society. Ecological and social policies still have the potential to exert economic benefits. Cities can strengthen the development of ecological and social policies no matter what stage of development.

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