

Study on the Influence Mechanism of New-type Urbanization on Air Pollution in China

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Abstract: *The new-type urbanization is an important carrier to promote China to build a well-off society. However, the exposed air pollution problem cannot be ignored with the rapid development of China's new-type urbanization. Based on the provincial panel data of China from 2013 to 2017, this paper empirically studies the mechanism of urbanization on air pollution through model construction by Eviews software. The results show that different dimensions of urbanization have different effects on the direction and transmission mechanism of air pollution. Based on this, some suggestions for air pollution control are put forward.*

Keywords: New-type urbanization; Air pollution; Mechanism; Intermediary effect

1. Introduction

With the economy stepping into the new normal, China's urbanization process is gradually accelerating. In 2019, the urbanization rate broke through 60% for the first time and entered a new stage of high-quality development. Due to the continuous accumulation of various resources to cities and towns, the new-type urbanization not only promotes the development of regional economy, but also brings the increase of energy consumption and the expansion of construction land, which intensifies the emission of harmful gases such as sulfur dioxide, makes the air pollution more serious and causes urban environmental problems. At the National Eco-Environmental Protection Conference held on May 18, 2018, Chinese President Xi Jinping first proposed the development concept of "Lucid waters and lush mountains are invaluable assets", which profoundly revealed the important truth that protecting the environment is developing productive forces. Nowadays, the extensive mode of economic development has been eliminated, and the new-type urbanization construction is gradually guided by green and sustainable development, aiming to build a new regional economic development mode with resource intensive, ecological livable and urban-rural co-ordination.

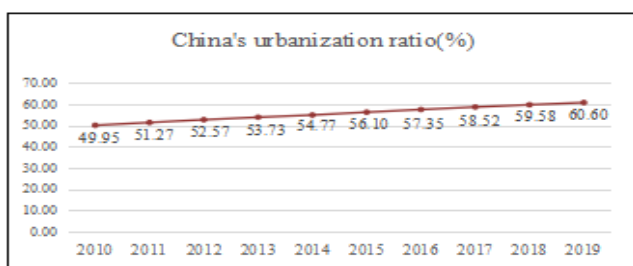


Figure 1: China's urbanization ratio in the past 10 years

Source: National Bureau of Statistics

All in all, the impact of new-type urbanization on the ecological environment is a double-edged sword. Reviewing the development of urbanization in China in recent years and studying the influence mechanism of urbanization on air pollution should be the focus of attention, which will help us better grasp the internal relationship between the two and explore an effective way to control air pollution.

2. Research Overview

2.1 Research status abroad

The study of urbanization in western developed countries is relatively early. Grossman and Krueger first concluded that economic growth will affect environmental quality by three ways: scale effect, technology effect and structure effect, and then put forward the famous curve called EKC. Muhammad Shahbaz et al (2015) used Granger causality test to explore the internal relationship between urbanization and energy consumption in Malaysia, the results show that urbanization can reduce the ecological quality by increasing energy consumption. Fan et al (2018) believed that the tighter the connection between cities, the less air pollution, because the dense urban form can effectively shorten the commuter distance of residents, thus easing the traffic pressure and reducing the exhaust emissions of motor vehicles.

2.2 Research status in China

Although the research on the relationship between urbanization and air pollution in China started late, it has received great attention. Li Jiajia (2020) drew the conclusion that there is an inverted "N-shaped" relationship between urbanization development and environmental pollution, and believed that strengthening regional environmental cooperation by institutional improvement and innovation can promote the harmonious development between urbanization and environment. Zhou Shaofu and Zhang Jiajun (2019) used the dynamic spatial Dubin model to verify the positive spatial synergy between new urbanization and air pollution, and believed that population aggregation brought by urbanization is the main cause of air pollution.

Looking at the above literature, it can be found that although scholars have studied the relationship between urbanization and air pollution before, few have taken the sub-dimension of new-type urbanization as a research object to study how it affects air pollution; In addition, the influence mechanism of new-type urbanization on air pollution has not yet reached a unified conclusion in academic circles. The new urbanization takes land urbanization as the carrier, ecological urbanization as the guarantee and economic

urbanization as the support. There may be different laws and transmission mechanisms for the impact of urbanization levels with different dimensions on urban air quality, which is the core of this paper and the supplement to the existing literature.

3. Mechanism Analysis and Research Hypothesis

3.1 Mechanism analysis of land urbanization on air pollution

One of the typical characteristics of the new-type urbanization is the expansion of urban land area, which will directly extend the commuting distance of residents. In order to save time, the mode of transportation of residents will gradually change from bicycle to private car, and the harmful gas emissions from automobile exhaust will have an adverse impact on urban air quality. At the same time, with the expansion of land, the government may blindly change the land use mode to a certain extent in order to pursue regional GDP, such as turning a large number of cultivated land into economic development zones, large-scale construction dust will also pose a serious threat to air quality. Therefore, the following assumptions are proposed: H1: land urbanization will not only directly increase air pollution, but also indirectly increase air pollution through changing the patterns of land use by the government

3.2 Mechanism analysis of ecological urbanization on air pollution

The new-type urbanization pays more attention to the coordination of regional economic construction and ecological environment, ecological urbanization is its highlight. In recent years, the government has brought a positive impact on air pollution control by increasing the per capita green space and other measures. In addition, with the increasing number of residents using clean energy, the emission of harmful gases should be less. Therefore, the following assumptions are proposed:

H2: ecological urbanization will not only directly alleviate air pollution, but also indirectly alleviate air pollution through changing the way of energy utilization by residents.

3.3 Mechanism analysis of economic urbanization on air pollution

The direct manifestation of economic urbanization is the rising income level of urban residents, meanwhile the primary industry is gradually transiting to non-agricultural industry. The transformation of industrial structure may be accompanied by the joining of high energy-consuming enterprises, which will damage the atmospheric environment. Besides, the growth of residents' wealth will inevitably lead to the increase of demand and the expansion of consumption desire, which will stimulate large-scale investment in urban real estate projects, and the harmful gases generated in the construction process can not be ignored. Therefore, the following assumptions are proposed:

H3: economic urbanization will not only directly increase air

pollution, but also indirectly increase air pollution through expanding of real estate investment scale by developers.

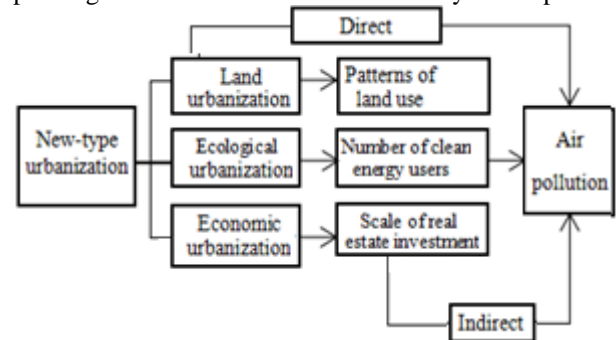


Figure 2: mechanism of new urbanization on air pollution

4. Model Design and Empirical Results

4.1 Variable selection

The air pollution intensity(A) is selected as the explained variable, which is composed by the emissions of sulfur dioxide, nitrogen oxide and smoke dust. The degree of land urbanization(LURB), ecological urbanization(EURB) and economic urbanization(FURB) are selected as the explained variables, which are respectively reflected by the built-up area, per capita green space and residents' disposable income. The area of construction land(S), the number of natural gas users(P) and the scale of real estate investment(I) are selected as three intermediary variables. (Data sources: National Bureau of Statistics)

4.2 Model design

This paper uses the panel data of China's 31 provinces and autonomous regions from 2013 to 2017 to conduct empirical research. It mainly judges whether the hypothesis is tenable through the test result of intermediary effect. In order to eliminate the influence of dimension and heteroscedasticity on the empirical results, logarithm is taken for each variable. Through Hausmann test, the panel data is suitable for fixed effect model, and the final models are designed as follows:

$$\ln A_{it} = \alpha + \beta_1 \ln LURB_{it} + \varepsilon_{it} \quad (1)$$

$$\ln A_{it} = \alpha + \beta_2 \ln EURB_{it} + \varepsilon_{it} \quad (2)$$

$$\ln A_{it} = \alpha + \beta_3 \ln FURB_{it} + \varepsilon_{it} \quad (3)$$

Among them, A_{it} is the explained variable, indicating the air pollution intensity of province i in year t ; $LURB_{it}$, $EURB_{it}$, $FURB_{it}$ is the explanatory variable, indicating the degree of land urbanization, ecological urbanization, and economic urbanization of province i in year t ; ε_{it} is the residual term.

4.3 Empirical results

(1) The relationship between the degree of land urbanization and the intensity of air pollution is shown in Table 1.

Table 1: Regression of land urbanization on air pollution

Variable	A	S	LURB
LURB	0.37*	0.31***	-0.36
S			0.52***
R-squared	0.99	0.99	0.99

(***, **, * represent the significance level of 1%, 5%, 10%)

The data shows that the intensity of air pollution will be increased by 0.37 units for every 1 unit increase of land urbanization level, that is to say, the effect of land urbanization can directly increase the intensity of air pollution, and it can indirectly promote the emission of harmful gases through the expansion of construction land area (meet the test conditions of simple intermediary effect), so the first assumption is valid.

(2) The relationship between the degree of ecological urbanization and the intensity of air pollution is shown in Table 2.

Table 2: Regression of ecological urbanization on air pollution

Variable	A	P	EURB
EURB	-0.26**	-0.05*	-0.17
P			0.19***
R-squared	0.99	0.92	0.99

The data shows that the intensity of air pollution will be reduced by 0.26 units for every 1 unit increase in the level of ecological urbanization, that is to say, the effect of ecological urbanization can directly alleviate the intensity of air pollution, and it can indirectly reduce the emission of harmful gases through the increase in the number of people using natural gas (meet the test conditions of simple intermediary effect), so the second assumption is valid.

(3) The relationship between the degree of economic urbanization and the intensity of air pollution is shown in Table 3.

Table 3: Regression of economic urbanization on air pollution

Variable	A	I	FURB
FURB	1.99***	0.03***	1.93***
I			0.01
R-squared	0.99	0.92	0.99

The data shows that the intensity of air pollution will be increased by 1.99 units for every 1 unit increase in the level of economic urbanization, that is to say, the economic urbanization effect can directly increase the intensity of air pollution, but it can not indirectly promote the emission of harmful gases through the expansion of real estate investment scale (does not meet the test conditions of simple intermediary effect), so the third assumption is untenable.

5. Conclusions and Recommendations

5.1 Conclusions

Following the research theme of the mechanism and path of new-type urbanization affecting air pollution, the empirical results show that:

1) Both land urbanization and economic urbanization have direct negative effects on air pollution control, while

ecological urbanization has direct positive effects on air pollution control.

2) Land urbanization can indirectly damage air quality through the expansion of construction land area, and ecological urbanization can indirectly improve air quality through the increase of clean energy users. However, economic urbanization will not indirectly aggravate air pollution through the expansion of real estate investment scale, there is no transmission path of intermediary effect, it probably because China has gradually begun to pay attention to the environmental protection in the process of real estate development, and achieved certain results.

5.2 Recommendations

Firstly, China must take green and sustainable development as the goal in the process of promoting urban economic agglomeration, and strive to build a new-type urbanization system with resource intensive and ecological livable as the core, which requires the state to pay special attention to ecological construction.

Secondly, the government should strengthen the rational utilization and planning of land resources in the process of land urbanization, and appropriately adopt the "compact" expansion mode, so as to reduce the damage to air quality caused by the disordered spread of land.

Finally, high-energy-consuming industries should make use of the "forced mechanism" of industrial structure upgrading to reduce air pollution to the maximum extent, residents should also further enhance their awareness of environmental protection, and jointly realize the unity of individual economic benefits and environmental regulations.

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Author Profile

Qi Miao received bachelor's degree in economics in 2018 and began to study for master's degree in School of Economics and Management of Xidian University in the same year. Now she is a graduate student in grade two majoring in finance, and her main research direction is regional economic development and management.