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Evaluating the effectiveness of sustainable urban land use in China from the perspective of sustainable urbanization

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ABSTRACT

The Sustainable Urban Land Use Policy is a critical component of sustainable land use in China, aiming to improve the urban land use efficiency, increase land output, protect the land ecological environment and realize the sustainable utilization of urban land resources. As part of the strategy for sustainable urbanization, the Sustainable Urban Land Use Policy has been implemented in some cities for years. To evaluate the effectiveness and reveal the future direction of development of this policy, it is essential to analyze this policy in the framework of sustainable urbanization. It is possibly a reliable measure to evaluate the effectiveness of this policy by assessing the contribution of sustainable urban land use policies to sustainable urbanization strategies and the trend of contribution over time. This paper measured the degree of sustainable urbanization and sustainable urban land use with necessary Control Variables and Instrument Variables using panel data of 31 provincial capital cities from 2000 to 2008 and 2009 to 2014. The regression results showed that the Sustainable Urban Land Use Policy had a significant positive effect on China's sustainable urbanization and the effectiveness improved after 2008. From the aspect the mechanism, the contribution of this policy to sustainable urbanization was to promote economic growth, thereby, to improve the social welfare. In contrast, the role of promoting urban development potential and the decreasing urban resource consumption was not so significant. Therefore, while maintaining the existing achievements through macro-control, reducing resource consumption, increase land use intensity, improve urban development potential are the further goals of land use policy in the future.

1. Introduction

Since the Reforming and Opening-up, China made world-shaking achievements in economic growth, social progress, and urbanization development and so on. The UN predicted that the urbanized population in China would increase from 17.9% in 1978 to 50% by 2020 (UN, 2004). In fact, China reached an urbanization rate over 50% in 2012 while the urban built-up area has increased from 9386 km^2 in 1986–47855 km^2 in 2013 (NBS, 2001, 2011; Zhang & Lin, 2012). With the development of land and population urbanization, as well as the rapid growth of goods demands and consumption level, the resources and environment are under tremendous stress. Meanwhile, rapid urban population growth and decentralization have caused many problems, such as social inequalities, informal settlement, slums, land scarcity, and climate change, each of which has the negative impact on a city's sustainable development (Tan, Xu, & Zhang, 2016). It was proved that sustainable urban land use was an effective way to promote the sustainable development of China's urban areas facing the challenges of sustainable urbanization (Enserink & Koppenjan, 2007; Li et al., 2009; Ma, Liu, Fu, Li, & Ni, 2011; Zhao, Pu, & Zhang, 2011).

Many cities in China have implemented the sustainable urbanization policy and accumulated much experience these decades. Sustainable Urban Land Use Policy (SULUP) is one of the key policies, which performed as the policies of intensive use, low carbon emissions, environmental governance and economic development of the urban land (Zhang & Lin., 2012). Since Chinese government introduced the concept of sustainable urban land use in the late 1990s, the problems in the utilization of internal urban land had drawn more and more attention. On January 2008, The Bill of the State Council on Promoting Conservational and Intensive Land Use being issued, and on July 29, 2008, the People's Bank of China, China Bank Supervision Committee issuing Bill about Promoting the Conservational and Intensive Land Use with Finance, implied that Chinese government started regarding it as a national policy (Yuan, Zhang, and Lv., 2010). The document of The Ministry of Land and Resources Guidance about Promoting Land Conservational and Intensive Use marked the beginning of the second round of high tide of sustainable land use. Other land policies involved in low carbon, industrial emissions, and environmental protection had

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Sustainable development was firstly introduced in 1972 at the United Nations Conference. In 1992, the Agenda 21 was approved by the United Nations Conference on Environment and Development in Rio De Janeiro aiming to promote Sustainable Human Settlement Development (Tan et al., 2016). After the Brundtland Report, consequent debates pointed out that economic interests and environmental considerations are not the opposite or conflicting sides of development. In order to secure intergenerational equity, these sides should meet upon mutual interests (Holden, Roseland, Ferguson, & Perl, 2008). Sustainable urbanization is, through the mutual coordination and cooperation in regional economy, resources, society, and environment systems, to promote each other to achieve the goals of sustainable development. Sustainable urbanization points to a multidimensional framework of multi-objective and elastic development, including the systematic as well as coordinated development on the structure, the better performance and efficiency in the process, the health of the development and the improvement of urban residents' welfare on the function. The previous literatures of evaluating and strategy making on sustainable urbanization focused on eco-environmental protection (Wang, Ma, & Zhao., 2014; Zhou, Shi, Wang, Yu, & Gao, 2011), land development (Su, Jiang, Zhang, & Zhang, 2011; Wu, Zhang, & Shen, 2011), energy use (Yuan & Zuo, 2011; Zhao, Zuo, Fan, & Zillante, 2011) as well as population growth and migration (Lu & Song, 2006; Zhang & Song, 2003). In China, the industrial land accounts for about 30%, more than the United States (7.3%), Hong Kong SAR (6%), and many developing countries. Moreover, most of the urban land use patterns were extensive, and the output of the urban land use was quite low. Obviously, the sustainable land use is the basic condition and key component to urban sustainable development. The sustainable use of urban land suits the land economy rules and the sustainable development aims of our urban social economy. Only to use land effectively as well as intensively, can the goals of the sustainable development of urban economy and society be realized.

In general, the impact of urban land sustainable use on sustainable urbanization is mainly manifested in land intensive use, energy consumption efficiency, and environmental protection, economic and social development. Intensive land use is key to sustainable urbanization. On the one hand, sustainable urban land supply is the foundation and necessary condition of sustainable urbanization. The intensive use of urban land focus on the goal of maxing the comprehensive benefits, including economic benefits, social benefits and ecological and environmental benefits, through the control of land use intensity, the optimization of land use spatial structure, the improvement of environmental protection investment and the enterprise environmental access threshold (Ma, Zhou and Zhao, 2014). On the other hand, intensive land use is an effective measure to reduce carbon emissions. The effect of the intensive land use on carbon emissions is to reduce the conversion of land for agricultural land use as a carbon sink, thereby slowing down land use and carbon emissions. On the other hand, the use of factors such as increased labor capital has contributed to the construction of carbon sources Carbon emissions, which is conducive to sustainable urban development (Wu, Ren, & Chen, 2017; Zhang, Gan, & Chen, 2015).

In fact, energy is the driving force of urbanization, energy efficient and sustainable use is an important guarantee for sustainable urban development. At present, low-carbon urbanization is an important part of sustainable urbanization. During the rapid urbanization, the surging growth of energy consumption owes to production consumption, residential consumption, and urban construction. Urbanization always steps forward along with instruction at the cost of energy consumption (Zhang & Lin, 2012). Urbanized cities attract more and more workers and residents, which means higher-level life and more energy consumption. And urbanization accompanied by large-scale urban construction, cement, steel and other material demand surge, bringing a substantial increase in resources and energy consumption (Tan & Chen, 2011). Based on the natural link between energy and land use, it is an important and feasible means to adjust the scale and structure of energy utilization in industrial, population and urban construction with reasonable land use.

History of urban development in Europe and the United States shows that urbanization at the expense of the environmental destruction is unsustainable. According to the general rule of global urbanization, urbanization level between 30% and 70% is likely to indicate accelerated development (Northam, 1975). During such periods, the required support of money, resources, and population transfer may greatly reduce the environmental carrying capacity and lead directly to tremendous pressure on the urban environment (Chen, 2007; Wang, Da, & Song, 2008). In a sense, the transition to sustainable urbanization is the result of the development of endogeneity. The economic growth and the more sustainable development model brought about by the urbanization process have the same effect as the “Kuznets Curve”. The limited resources and the carrying capacity of the environment will promote the transition from the resource-environment-consuming development model to Resource-saving, environment-friendly urbanization model. The implicit risk of urbanization is that endogenous transformation does not necessarily occur. The realization of transformation requires certain conditions and system construction. If there is enough investment and reform to realize this endogenous transformation, economic and social development. It is likely to collapse in an unsustainable urbanization path (Ren, 2017; Wei, 1998). Sustainable urbanization and environmental protection are inherently integrated. In a sense, the city is an ecological functional area that develops under strong population pressure. In other words, in order to make other creatures have a reasonable living space and effective conservation of biodiversity, the population must be concentrated as much as possible in the city (Chen, 2007; Song, 2007). Thus, an environmental investment and more effective environmental governance are supposed to protect urban ecosystem during urban land use for sustainable urbanization.

The sustainably growing economy provides supports of capital and technology for urbanization. The goal of sustainable urbanization is to realize the common development of man and society and ecology. The city absorbing more labor, and then residents' higher living standards, environmental governance, infrastructure construction, scientific and technological updating require sustained economic growth and strong capital support. Therefore, we should give full play to the economic growth function of the land when using the urban land. From the land of economic growth function, the first is the quantitative effect. Under the total production function structure of land capital, physical capital, and labor, the government continues to increase land investment, right shifting the Production Possibility Curve, and promote the cities' overall capital formation and economic growth (CASS, 2011). The second one is the price effect. In the urbanization stage, the real capital output will be financially diminishing without considering innovation. However, the marginal output of the land is on the rise when the land price rises, and thus the dominant structure from the formation of industrial capital to urban capital. In the transition, economic growth can not only maintain, or even show the rising trend (Liu & Yang, 2011). In addition, the social effect brought about by land economic growth such as residential income growth, educational years upward, and life expectancy extending are the goals of sustainable urbanization.

China is in the stage of rapid urbanization, where urban development is dependent on land supply, and the sustainable use of urban land may have significant impacts on the sustainable development of the city. Based on the analysis of the relationship of sustainable urbanization and sustainable urban land use above, it could be a reliable measure to test the effectiveness of SULUP through evaluating the quantitative relation between sustainable urban land use and sustainable urbanization.

There is little literature highlighted the relationship of sustainable land use and sustainable urbanization even they are closely linked.