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Does the Expansion of Urban Construction Land Promote Regional Economic Growth in China? Evidence from 108 Cities in the Yangtze River Economic Belt

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Abstract: Since the reform and opening up, China's economy has maintained rapid growth. At the same time, the process of urbanization in China has been accelerating and the scale of urban construction land has expanded accordingly. The purpose of the research is to explore whether there is an inevitable connection between the expansion of urban construction land and economic growth. This study uses 108 prefecture-level cities in the Yangtze River Economic Belt as an example. Considering panel data from 2005 to 2015, the spatial econometric model was used to explore the impact of urban construction land expansion on regional economic growth. The results are as follows: (1) The expansion of construction land in cities in the Yangtze River Economic Belt has a significant impact on economic growth but the extent of the impact is not as great as that of capital stock. (2) In the Yangtze River Economic Belt, the expansion of urban construction land in a certain area has not only a positive effect on the local economic growth but also a certain spillover effect and it can promote the economic development level of the adjacent areas in the economic belt. (3) Although the expansion of urban construction land along the Yangtze River Economic Belt promotes economic growth, there are obvious differences between regions. The expansion of urban construction land in the central region of the Yangtze River Economic Belt has a significant driving effect on economic growth. However, the expansion of urban construction land in the eastern and western regions has no significant effect on the economic growth of the respective regions. Finally, based on the above conclusions, this paper proposes corresponding policy recommendations for economic development in different regions. These research conclusions will also facilitate the follow-up of other researchers to further explore the driving factors of the economic development of many prefecture-level cities in the Yangtze River Economic Belt and the related mechanisms for the expansion of construction land to promote economic growth.

Keywords: urban construction land; regional economic growth; land policy; spatial econometric model; spillover effect; Yangtze River Economic Belt

1. Introduction

Since the reform and opening up, China's economy has maintained a rapid growth rate of more than 6% and its gross domestic product has increased by more than 20 times, from 4.04 trillion in 1979 to 82.71 trillion in 2017. With this rapid economic growth, the scale of urban construction land in China has also continuously expanded, from 74,00 square kilometers in 1978 to 54,300 square kilometers in 2016, representing an increase of 7 times [1]. 'It is not difficult to find that China's economic growth has a high degree of similarity with the scale of urban construction land in terms of dynamic changes; therefore, the important relationship between China's economic growth and construction land expansion has aroused great concern and has been the subject of meaningful study in the academic community, particularly since 2005, when the Chinese government implemented land policies for macroeconomic regulation and control (Wang et al., 2017) [2]. In recent decades, the process of industrialization and urbanization in China has continued to deepen. This process has increasingly become the main engine of urban economic development in China and the development of industrialization and urbanization is highly dependent on the investment in and expansion of construction land [3]. Therefore, the expansion of urban construction land plays a very important role in regional economic growth (Wang Yuan et al., 2016) [4]. Although construction land is not directly involved in the production process, it can provide a space and place for production activities and can impact the accumulation of capital, labor and technology and thus indirectly promote economic growth (Mao Wei, 2015) [5]. In short, as a material carrier for the rapid development of urban economy, how does the urban construction land relate to economic growth? How does it contribute to economic growth? Furthermore, how can we rationally use this relationship to promote the development of the city? These issues are worthwhile to explore in depth.

China has a vast territory and the level of economic development of a region is closely related to its resource endowments. There are certain differences in the resource endowments and scale of economic development in different regions, so urban construction land factors do not have the same impact on economic growth in these regions [6]. The Yangtze River Economic Belt spans the three eastern, central and western regions of China and covers 11 provinces and cities, with a total area of approximately 2.05 million square kilometers. Furthermore, its total production value and population exceed 40% of the national total. The large area, wide coverage and economic output of the Yangtze River Economic Belt account for the unique advantages and great development potential of this region. Therefore, the regional urban agglomeration of the Yangtze River Economic Belt is a representative example useful for the study of the impact of urban construction land expansion on economic growth.

Based on this point, this article selects the Yangtze River Economic Belt as the research area, by taking the panel data of 108 prefecture-level cities from 2005 to 2015, using cobb-douglas production function, the spatial weight is set after the spatial correlation is determined and the spatial dependence and spatial heterogeneity are incorporated into the traditional panel model to form the spatial measurement model. Then combines spatial econometrics and traditional panel data to analyze how urban construction land affects economic growth. Furthermore, it provides relevant policy recommendations on regional economic growth to help governments take advantage of the urban construction land in various regions. The research conclusion of this paper will be helpful for other researchers to further discuss the driving factors of the economic development of many prefecture-level cities in the Yangtze river economic belt and the related mechanism of the increase of construction land on promoting economic growth.

2. Literature Review

Many experts and scholars in academia have studied on the relationship between land elements and economic growth and achieved fruitful results. The results found in the existing literature provide different conclusions because of the scholars' use of different research methods, models and scales.

In classical economic growth theory, the main considerations are capital, labor and technological progress; the role of land elements is ignored, while the substitution effect of capital on land is emphasized. At the same time, classical economic growth theory posits that technological progress can promote economic growth instead of land scarcity and is optimistic about the scarcity of land factors (Solow, Sw An, 1956; Denison, 1962) [7,8]. However, with the rapid growth of the economy and the deterioration of the natural environment, the role of land as a factor of production has become more prominent. The new growth theorists, represented by Romer (1986) and Lucas (1993) [9,10], began to incorporate the land elements into the endogenous model and to explore the effect of land elements on economic growth under the condition of land scarcity. Nagi (2000) incorporated land and natural elements on the basis of neoclassical growth theory and extended the Solow model [11]. His research shows that the reasons for the economic take-off of some developed countries such as the United States and Japan is due to the conversion of their technology from Malthusian technology to Solow's technology, which demonstrates the role of land in promoting economic growth. Tommy (2001) compared and analyzed the economic level and the quantity and structure of land input in various time periods in Indonesia and concluded that the input of land will positively promote economic growth through the change in land supply quantity or the land supply structure. Changes will affect economic growth [12]. Copeland (2003) used a large amount of empirical data to suggest from a policy point of view that systems and policies such as land reforms that are in line with the local economic development level play a role in promoting more efficient intensive land use and increasing the land use efficiency. In this way, the effective land supply will also increase, ultimately leading to economic growth [13]. Rodrik (2004) explored the factors influencing economic growth and indicated that when economic growth slows down, the policy of land reform can be used to pull the economy forward because the land dividend promotes economic growth [14]. Feng Lei (2008) analyzed the means of the impact and the contribution of land to economic growth from two angles of theory and demonstration and used the data of 31 provinces in China for the years 1997–2004 to carry out a measurement test. The author derived a Solow model that considers land and analyzed the state of the economy when growth becomes stable [15]. The conclusion shows that the contribution of land investment to China's economic growth has reached 11%. Based on the perspective of sustainable land use, Harun (2009) stated that the rapidly increasing population, intensive agricultural development, increase in innovation, increase in scientific and technological input and high level of urbanization are the main reasons for the change in land use, which will promote the increase in cultivated land and transform more cultivated land into construction land to support economic development [16]. Z Arvasi, M Koçak (2011) started from the perspective of the driving factors of the expansion of urban construction land and used panel data from 31 provinces, cities and autonomous regions in China [17]. The results show that the urban land in the eastern, central and western regions is rapidly expanding. The change in the urban population has an important impact on the expansion of urban construction land. In addition, fixed asset investment has a positive impact on the expansion of urban land use on all spatial scales. Ye Jianping (2011) empirically analyzed the relationship between land and economic growth based on the panel data model of China's three time periods and added the factor of spatial correlation [18]. The empirical results show that from 1989 to 2009, the rate at which land factors contributed to economic growth reached 19.31%, with a rate of 13.93% from 1992 to 2000 and a rate of 26.7% from 2001 to 2009. Tan Shukui et al. (2012) added spatial items to the existing research [19]. The contribution of land factors estimated by the volumetric error model to China's economic growth exceeded 25%. Di Jianguang and Wu Kangping (2013) mainly analyzed the contribution of construction land from the two angles of the expansion of the construction land area and the increase in the land use volume rate and used the transcendental logarithmic production function to estimate the contribution rate of urban construction land to nonagricultural economic growth over the years 2003–2008 [20]. Their empirical results show that the total contribution rate of construction land to economic growth in 28 provinces of China over the period is 11.81%. J Gibson, G Boegibson (2014) examined the relationship between urban construction land and economic growth from 1993 to 2012 and the results show that the elasticity of urban construction land to economic output is approximately 0.3 [21]. Over time, the expansion of urban construction land has become less responsive to the growth of the local nonagricultural population. Based on the Cobb-Douglas (C-D) production function, Wang Jiankang (2015) empirically analyzed the role of the construction land supply in the economic growth of the cities in the country and the three major regions [22]. The conclusion shows that the average effect of land on economic growth is 3.46% across the whole country but in the sub regions, the greatest effect is in the central region, followed by the western and eastern regions. Zhou Yan et al. (2017) estimated the contribution of construction land to economic growth in Wuhan metropolitan area by using the extended C-D production function and panel data model and proposed a differentiated management and control measure for construction land based on regional differences in contribution rates [23]. Y Liu, Z Zhang et al. (2018) used the provincial panel data from 1985 to 2014 to measure the efficiency of construction land allocation at the national and regional levels [24]. The results show that over the past 30 years, China's construction land has shown a clear growth trend and the growth rate in the central region is relatively higher than the rates in the eastern and western regions. In addition, capital, labor and land investment have contributed to the growth of China's nonagricultural GDP [25].

As shown in the existing domestic and foreign literature, most scholars base their research on traditional panel data when analyzing the relationship between land factors and economic growth at the provincial level and then further study the contribution rate of land factors to economic growth. However, because of China's vast territory, there are large differences in geographical location, environment, resource endowments and economic development patterns between regions; thus, the economic growth in each region has obvious spatial heterogeneity and spatial dependence [26]. It is necessary to incorporate the spatial correlation factors into the research content to study whether there are spatial dependence, lag and spillover effects of construction land on urban economic growth. If such factors are not incorporated, the research standard will inevitably include greater errors in the results for each province. Therefore, this paper selects a representative region, the Yangtze River Economic Belt, as a case area and comprehensively uses spatial econometric models to analyze the impact of construction land expansion on urban economic growth. At the same time, the paper divides the Yangtze River Economic Belt into eastern, central and western regions for comparison due to regional differences. It explores whether there are differences in the impacts of the expansion of urban construction land when different economic bases are used to measure economic growth.

3. Theoretical Basis and Research Methods

3.1. Theoretical Basis

In the late 1920s, Charles Cobb, an American mathematician and Paul Douglas, an economist, proposed the concept of a production function and used the statistical data from 1899–1922 to derive the famous C-D production function. In this paper, we introduce urban construction land into the traditional C-D production function and use it as an explanatory variable to analyze the impact on the economic growth of the regional urban agglomeration. The new C-D production function is as follows:

$$Y = AK^{\alpha}N^{\beta}L^{\gamma}$$

To complete the data trending and eliminate the heteroscedasticity in the time series, we take the natural logarithm on both sides of the above formula and establish an ordinary linear regression model, as shown in the following formula:

$$\ln Y_{it} = C + \alpha \ln K_{it} + \beta \ln N_{it} + \gamma \ln L_{it} + \varepsilon_{it}$$

In this model, Y denotes the explanatory variable, economic growth; K denotes the capital stock of local cities; N denotes the labor level; L denotes the investment level of urban construction land; i denotes each prefecture city; and t denotes the year. The coefficients α, β and γ are constants, which represent the output elasticity of capital, labor and urban construction land, respectively; C = lnA, which represents the general level of technological progress and $\alpha > 0$, $\beta > 0$ and $\gamma > 0$, $A \neq 0$.

3.2. Research Methods

In terms of research methods, we conduct empirical research using the C-D production function by combining traditional panel models with spatial econometric models.

3.2.1. Spatial Correlation Test

Before deciding whether to use spatial econometric methods, it is necessary to consider whether there is spatial dependence in the data. If there is no spatial dependence, standard measurement methods can be used; otherwise, spatial measurement methods can be used. Based on the complexity of spatial autocorrelation and referring to a series of methods for measuring the spatial autocorrelation proposed in the related literature, the well-known Moran's *I* (Moran, 1950) is used in this paper:

$$I = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i - \overline{x})(x_j - \overline{x})}{S^2 \sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}}$$

where $S^2 \sum\limits_{i=1}^{n}\sum\limits_{j=1}^{n} w_{ij}$ represents the sample variance, w_{ij} represents the (i, j) element of the spatial weight matrix (used to measure the distance from area *i* to area *j*) and reflects the spatial correlation between regions and $\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}$ represents the sum of all spatial weights. The value of Moran's *I* is generally between 0 and 1; a value close to 1 indicates a positive spatial correlation of economic behaviors between regions, while a value close to -1 indicates a negative spatial correlation of economic behaviors between regions and a value equal to 0 indicates no spatial correlation. Therefore, the greater the absolute value of Moran's *I* is, the stronger the spatial correlation is.

3.2.2. Setting of Spatial Weight Matrix

The spatial weight matrix needs to be determined before the spatial econometric model is estimated. The spatial weight matrix is an effective measure of the spatial distance between regions and represents the degree of the influence of economic factors of other regions on the local region. Because the traditional 0–1 matrix cannot reflect the spatial relationship between regions, the subjective intention of distance range selection is strong and the Yangtze River Economic Belt runs from west to east with a gradually increasing concentration of cities, the traditional 0–1 matrix does not reflect the spatial distribution well. Therefore, this paper will combine spatial econometric and panel data and abandon the traditional 0–1 spatial matrix, referring to previous references (Madariaga, Poncet, 2005; Blonigen, 2007; Ye Jianping, 2011) [27,28] and construct a spatial weight matrix by taking a distance reciprocal function. The distance between region *i* and region *j* is denoted as W_{ij} and the number m of the regional spatial weight matrices is as follows:

$$W = \begin{bmatrix} w_{11} & \cdots & w_{1m} \\ \vdots & \ddots & \vdots \\ w_{m1} & \cdots & w_{mm} \end{bmatrix}$$

Among them, the element on the main diagonal $w_{11} = \ldots = w_{mm} = 0$, indicating that the value of any region cannot include itself.

3.2.3. Spatial Econometric Model

After the spatial correlation is determined, spatial econometric models can be established. In this paper, spatial dependence and spatial heterogeneity are incorporated into the traditional panel model, which is embodied in the form of a spatial weight matrix or spatial error term and then a spatial econometric model is built.

1. Spatial Lag Model (SLM)

The spatial lag model represents the effect of the interpreted variables in other regions on the explanatory variables in the local region. In this paper, the economic growth in the region is affected by the economic growth in other regions. The spatial correlation between regions is reflected by the explanatory variables of the spatial lag. The spatial lag model is as follows:

$$\mathrm{lnY}_{it} = \mathrm{C} + \lambda \sum_{i=1}^{m} \mathrm{W}_{ij}\mathrm{lnY}_{jt} + \alpha \mathrm{lnK}_{it} + \beta \mathrm{lnN}_{it} + \gamma \mathrm{lnL}_{it} + \varepsilon_{\ it}$$

In the above formula, W_{ij} is a spatial weight matrix of order $m \times m$ and λ is a spatial autoregression coefficient, which indicates the direction and degree of the spatial correlation of the explanatory variables.

2. Spatial Error Model (SEM)

The spatial error model indicates that there is spatial autocorrelation between missing variables that are affected by the explanatory variables but not included in the explanatory variables or that there is spatial autocorrelation in unpredictable random shocks. In this paper, the economic growth of the region is affected by random interference items in other areas. The spatial correlation is reflected by the spatial lag of the error term. The spatial error model is set up as follows:

$$\mathrm{lnY}_{it} = \mathrm{C} + \alpha \mathrm{lnK}_{it} + \beta \mathrm{lnN}_{it} + \gamma \mathrm{lnL}_{it} + u_{it}$$
$$u_{it} = \rho W_{ij} u_{it} + \varepsilon_{\ it}$$

where W represents the spatial weight matrix and Rho represents the spatial autocorrelation coefficient. The model shows that the disturbance term u is spatially dependent.

3. Spatial Autoregressive Model with Spatial Autoregressive Disturbances (SARAR)

The general spatial econometric model combines the spatial autoregressive model with the spatial error model and is also known as the "spatial autoregressive model with spatial autoregressive error terms." This paper suggests that economic growth in a region may be influenced not only by other regions but also by other omitted variables or unpredictable random impact factors. The general spatial model is established as follows:

$$\mathrm{lnY}_{it} = \mathrm{C} + \lambda \sum_{i=1}^{m} W_{ij}\mathrm{lnY}_{jt} + \alpha \mathrm{lnK}_{it} + \beta \mathrm{lnN}_{it} + \gamma \mathrm{lnL}_{it} + u_{it}$$
$$u_{it} = \rho M_{ij} u_{it} + \varepsilon_{\ it}$$

where W and M are, respectively, the spatial weight matrix of the interpreted variable Y and the perturbation term u, which can be equal and λ and ρ are the spatial autocorrelation coefficients of the two.

After the model is established, it is estimated to reveal the spatial spillover effect. The typical approach is to use the partial derivative form to decompose the total effect into the direct effect and the indirect effect [29]. We use the spatial lag model as an example. The expression of the spatial lag model is described as above. We rewrite it in vector format as follows:

$$y = I - \lambda W^{-1} X\epsilon + I - \lambda W^{-1}\varepsilon = \sum_{r=1}^{K} \epsilon_r I - \lambda W^{-1} x_r + I - \lambda W^{-1}\varepsilon$$

where $S_r(W) = \epsilon_r I - \lambda W^{-1}$ is a matrix that depends on ϵ_r and W. The above equation is expanded to be:

$$\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix} = \begin{bmatrix} S_r(W)_{11} & S_r(W)_{12} & \cdots & S_r(W)_{1n} \\ S_r(W)_{21} & S_r(W)_{22} & \cdots & S_r(W)_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ S_r(W)_{n1} & S_r(W)_{n2} & \cdots & S_r(W)_{nn} \end{bmatrix} \begin{bmatrix} x_{1r} \\ x_{2r} \\ \vdots \\ x_{nr} \end{bmatrix} + I - \lambda W^{-1}\varepsilon$$

According to the above, we know that $\frac{\partial y_i}{\partial x_{jr}} = S_r(W)_{ij}$. In particular, when $j = i$, we have $\frac{\partial y_i}{\partial x_{ir}} = S_r(W)_{ii}$.

Therefore, the average value of the sum of elements on the main diagonal line of matrix $S_r(W)$ is the direct effect, reflecting the significant influence of the explanatory variables on the dependent variable and the average value of all the nondiagonal elements in matrix $S_r(W)$ is the indirect effect, which is mainly used to measure the existence of spatial spillover effects. We know that there are certain spatial dependencies between regions. An explanatory variable in a certain region will not only have a certain degree of influence on the interpreted variables in the region but also affect the explanatory variables in other regions [30]. Specifically, the impact of the change in the urban construction land area of area i on the economic growth in the region is called the "direct effect." When the urban construction land area in all regions changes by one unit, the total impact on the economic growth level of region i is called the "total effect" and the indirect effect is obtained by subtracting the direct effect from the total effect [31].

4. Empirical Process and Results Analysis

4.1. Index Selection and Data Preprocessing

This article selects the panel data of 108 prefecture-level cities (of a total of 11 provinces and cities, including Shanghai, Jiangsu, Zhejiang, Anhui, Jiangxi, Hubei, Hunan, Chongqing, Sichuan, Yunnan and Guizhou) in the Yangtze River Economic Belt in China over the period from 2005 to 2015 as the data for empirical research. As indicators, the economic growth Y of the explanatory variables will be measured by the added value of the secondary and tertiary industries. As the three explanatory variables, the capital factor K will be measured by the urban capital stock and the labor force factor N will be measured by the employed population of the secondary and tertiary industries. The urban construction land will be measured by the urban construction land area of each prefecture-level city.

In terms of data sources and processing, the historical data of the added value of the secondary and tertiary industries in the prefecture-level cities are not directly available, so they will be calculated by multiplying the added value of the total industrial production by the proportion of the added value of the secondary and tertiary industries. The data of the added value of the secondary and tertiary industries come from the website of the National Bureau of Statistics. The data of the added value of the total industrial production come from the "Statistical Yearbook of China's Cities." In addition, the data on employment in the secondary and tertiary industries and the construction area of the various prefecture-level cities come from the "China City Statistical Yearbook." Finally, as the value of the city's capital stock cannot be directly obtained, we will use the perpetual inventory method proposed by Goldsmith and add Shan Haojie's capital stock estimation method for calculation. The formula for estimating the capital stock of the city is:

$$\mathrm{K}_t = (1 - \delta)\mathrm{K}_{t-1} + (I_t + I_{t-1} + I_{t-2})/3$$

where K represents the urban capital stock in phase t and δ represents the depreciation rate of capital and we use Shan Haojie's research method to set δ = 10.96% [32]. I_t denotes the amount of investment in urban fixed assets in period t. The data come from the "Statistical Yearbook of China's Urban Construction." Before estimating the urban capital stock in phase t, we need to calculate the base capital stock. In this paper, we estimate the capital stock in the chosen base period of 2005 according to the formula method of Reinsdorf et al. (2005) [33]. The capital stock K_0 of the base period in 2005 is equal to $I_0(1 + \mathrm{g})/(\mathrm{g} + \delta)$ and g represents the average growth rate of the constant investment I over the past three years [34–36].

After pre-processing the data, we performed a descriptive statistical analysis of the main variable data characteristics and made a distinction between the overall data and the eastern, central and western regions. The results are shown in Table 1. It can be seen from Table 1 that the index values of the more developed eastern regions are significantly higher than those in the central and western regions, both for the dependent variable and the independent variables. Therefore, it is necessary to compare the eastern, central and western regions in subsequent empirical analysis.

Table 1. Descriptive statistics.

Variables	All		Eastern		Central		Western	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Second and third industry added value (10^8 yuan)	1597.104	2481.202	3101.439	3631.483	1039.549	1246.393	1124.508	1982.976
City capital stock (10^8 yuan)	2136.934	4231.958	4391.932	6433.464	1325.453	2348.941	1610.928	3931.954
Second an d third industry employment population (10^4 person)	52.01886	82.80413	86.44952	104.2848	35.65543	30.34495	49.94504	112.5206
Urban construction land area (km^2)	131.8301	279.3401	256.0392	522.4023	88.75729	95.81077	105.025	172.3899

4.2. Empirical Analysis

4.2.1. Spatial Autocorrelation Test

Before the spatial econometric model is run, it is necessary to test the spatial correlation between the economic growth of the cities around the Yangtze River Economic Belt and the test method is used to employ Moran's I, mentioned in the previous section. Using ArcGIS 10.1, Moran's I of the economic growth of the urban agglomeration of the Yangtze River Economic Belt from 2005–2015 is shown in Table 2. Moran's I of economic growth over the years passes the 1% significance test, which shows that there is a significant spatial autocorrelation between the regional urban agglomerations of the Yangtze River Economic Belt in China. Therefore, we can build a spatial econometric model to test the impact of urban construction land expansion on economic growth in this region.

Table 2. Moran's I of Economic Growth in the Yangtze River Economic Belt from 2005–2015.

Year	2005	2006	2007	2008	2009	2010
Moran's I	0.2234 *** (4.041)	0.2341 *** (4.161)	0.2334 *** (4.133)	0.2269 *** (3.944)	0.2144 *** (3.675)	0.2129 *** (3.595)
Year	**2011**	**2012**	**2013**	**2014**	**2015**	
Moran's I	0.2015 ** (3.344)	0.1906 *** (3.114)	0.1818 *** (2.962)	0.1708 *** (2.789)	0.1631 *** (2.665)	

Note: Where the values in parentheses represent the T statistic, ** represents $p < 0.01$ and *** represents $p < 0.001$.

4.2.2. Model Estimation Results and Analysis

First, we will calculate the correlation coefficient between output, capital elements, labor force and urban construction land area. The results are shown in Table 3.

Table 3. The Degree of Association between Different Elements.

Variables	lnY	lnL	lnK	lnN
lnY	1.0000			
lnL	0.8470 ***	1.0000		
lnK	0.8982 ***	0.8636 ***	1.0000	
lnN	0.8920 ***	0.8448 ***	0.7928 ***	1.0000

Note: Where *** represents $p < 0.001$.

We found that the correlation between elements is very close. Next, we will use STATA 15.0 to perform regression analysis on traditional panel models that have not been added to the spatial factors. When dealing with panel data, the choice of using a fixed-effect (FE) or a random-effect (RE) model is a fundamental problem. This article will use the Hausman test to choose the model. According to the results of the Hausman test, the *p*-value is 0.0000 and the test statistic passes the test for significance at the 1% level. Therefore, the original hypothesis H0 is strongly rejected. We will use the FE model. The regression results based on the FE panel data are shown in the first column of Table 3. The R^2 of the model is 0.9016, indicating that the model has a good fit to the data. The high F value also indicates that the model is very significant overall. In addition, each variable passes the test for significance at the 1% level. From the regression coefficient point of view, the output elasticities of capital factors, labor force and urban construction land to economic growth are 0.687, 0.199 and 0.158, respectively, indicating that these three factors of production play a significant positive role in promoting economic growth. Capital factors have the greatest impact on economic growth and the effect of urban construction land expansion on economic growth is weak. However, due to the spatial spillover effect between regions, the traditional panel regression ignores the corresponding spatial effects, resulting in a certain bias in the results. Therefore, we will use spatial econometric methods to establish and re-estimate the model.

We also uses STATA 15.0 to estimate the parameters of the spatial error model and the spatial lag model. The estimated results are shown in the second and third columns of Table 4.

Table 4. Model Estimation Results of Panel Data.

Variables	OLS	SLM	SEM	SARAR
lnL	0.158 ***	0.076 ***	0.073 ***	0.064 ***
	(6.73)	(4.69)	(4.70)	(4.85)
lnK	0.687 ***	0.287 ***	0.128 ***	0.242 ***
	(53.89)	(19.88)	(7.22)	(18.68)
lnN	0.199 ***	0.058 ***	0.32 9 ***	0.119 ***
	(8.11)	(3.32)	(21.46)	(7.86)
_cons	8.227 ***			
	(61.25)			
W				
lnY		0.642 ***		0. 933 ***
		(34.75)		(45.80)
e.lnY			1.057 ***	0.951 ***
		(76.31)		(76.31)
sigma_e				
R^2	0.9016	0.8656	0.2154	0.1215
Log-L		858.3230	823.5012	1013.3242

Note: Where the values in parentheses represent the T statistic, *** represents $p < 0.001$.

As shown in Table 4, we find that the output elasticities of capital factors, labor, secondary and tertiary industries and urban construction land all passed the 1% significance test. According to the spatial error model, a 1% increase in urban construction land will result in an economic growth of 0.073% in the region and a 1% increase in the capital stock will drive the economic growth by 0.128%. With a 1% increase in the labor force, the economic growth will increase by 0.329%. According to the spatial lag model, when urban construction land increases by 1%, the economy of the area will achieve growth of 0.076%, while a 1% increase in the amount of capital stock will drive the level of economic growth to 0.287%. For every 1% increase in the labor force, the economic growth will increase by 0.058%. It can thus be seen that the capital stock, labor force and land for urban construction all have a significant positive effect on China's economic growth. However, compared with the role of capital stock in promoting economic growth, the expansion of urban construction land has a weaker effect on economic growth. This is mainly because China's current economic growth rate is slightly lower than the rate of 7% in previous years but the current 6% growth rate indicates that China's economy is still in a stage of relatively fast growth. During this period, China's economic growth mainly depends on the input of a large number of capital elements. Although urban construction land expansion will also provide an impetus for the overall economy of the country, it is obviously not as effective as capital input.

Because of the spatial dependence between regions, in order to explore the spatial spillover effects, we use STATA 15.0 to employ the spatial lag model and obtain the decomposition effect of various factors of production on economic growth, as shown in Table 5.

Table 5. Model Effect Decomposition Results of Panel Data.

Variables	Direct Effect	Indirect Effect	Total Effect
lnL	0.077 ***	0.123 ***	0.201 ***
	(4.70)	(4.62)	(4.72)
lnN	0.058 ***	0.093 ***	0.152 ***
	(3.32)	(3.41)	(3.41)
lnK	0.291 ***	0.464 ***	0.756 ***
	(20.32)	(20.07)	(31.38)

Note: Where the values in parentheses represent the T statistic, *** represents $p < 0.001$.

According to Table 5, the coefficient of the influence of various factors on economic growth passes the 1% significance test. According to the model effect decomposition results and considering the direct effect, the increases in the urban construction land area, labor force and capital stock in the region have a positive effect on the local economic growth. Judging from the indirect effects, the factor growth in the region has a positive spillover effect. That is, in the Yangtze River Economic Belt, the increases in the urban construction land, labor force and capital stock in a prefecture-level city can to some extent promote economic development in adjacent regions of the economic belt.

4.2.3. Comparative Analysis of Sub Regions

China has a vast territory. The Yangtze River Economic Belt extends from the Sichuan-Chongqing region in the west to the Jiangsu-Zhejiang region in the east. There are significant differences between the regions in terms of resource endowments and scale of economic development. There may also be differences in the output elasticity coefficients of urban construction land factors on economic growth. Therefore, the Yangtze River Economic Belt is divided into three parts, east, center and west, to conduct comparative analysis, which is of great significance [37]. The eastern part includes 25 prefecture-level cities such as Shanghai, Jiangsu and Zhejiang; the central part includes 52 prefecture-level cities in the four provinces of Anhui, Jiangxi, Hubei and Hunan; and the western part includes 31 prefecture-level cities in Chongqing, Sichuan, Yunnan and Guizhou. We use the spatial error model to estimate the model for the three regional groups. The results are shown in Table 6.

Table 6. Spatial Lag Model Estimation Results by Divided Regions.

	East	Center	West
lnL	−0.0153	0.0723 ***	0.0477
	(−0.54)	(3.33)	(1.36)
lnN	0.0177	0.0856 ***	0.314 ***
	(0.01)	(3.96)	(6.78)
lnK	0.366 ***	0.180 ***	0.202 ***
	(11.67)	(9.22)	(6.14)
lnY	0.653 ***	0.737 ***	0.659 ***
	(21.51)	(30.31)	(16.77)
_cons	0.0891 ***	0.0913 ***	0.135 ***
	(21.87)	(31.90)	(24.02)
R^2	0.2342	0.0970	0.1362
Log-L	234.8988	489.4697	163.6406

Note: Where the values in parentheses represent the T statistic, *** represents $p < 0.001$.

According to the results in Tables 5 and 6, in the eastern region, only the capital stock passed the 1% significance test. The expansion of urban construction land has no significant effect on the economic growth in the eastern region. The reason for this phenomenon is mainly due to the high level of economic development in the eastern Jiangsu, Zhejiang and Shanghai regions. There, economic development is mainly driven by the capital stock and technological progress at the current stage and because of the saturation of the labor force and the disappearance of the "demographic dividend," the labor force will no longer play a significant role in promoting economic growth [38]. Urban construction land can be replaced by other factors because of its scarcity and immobility. Therefore, it will no longer have a significant impact on economic growth at this stage.

The three major factors of production in the central region all pass the 1% significant test, indicating that the urban construction land, labor force and capital stock have a significant effect on the economic growth in the central region at the present stage. The output elasticities of urban construction land, labor force and capital stock are 0.0723, 0.0856 and 0.180, respectively. The expansion of urban construction land and the increase in labor force bring about similar degrees of economic growth and the impact of capital stock is more obvious. The urban land use area in the central region can play a significant role in stimulating economic growth. The main reason for this result is that the economy of the central region is in the growth stage that needs not only a large labor force as a support but also a variety of high and new technology industries from the developed areas for its own development. There should be a large amount of urban construction land to provide a guarantee for the input of the industry.

In the western region, all the factors other than the element of urban construction land pass the 1% significant test, indicating that the urban construction land has not played a significant role in stimulating the economic development of the western region. This result is mainly because the economic development level of the western region is low and economic growth depends more on the policy support of the state, while the urban construction land does not have a great effect.

Since the factors of production in the central region have a more significant impact on economic growth than the factors in the other regions do, we use STATA15.0 to take the spatial lag model as an example to obtain the decomposition effect of various production factors on economic growth, as shown in Table 7.

Table 7. Model Effect Decomposition Results in the Central Region.

Variables	Direct Effect	Indirect Effect	Total Effect
lnL	0.076 ***	0.193 ***	0.268 ***
	(3.34)	(3.25)	(3.33)
lnN	0.089 ***	0.228 ***	0.318 ***
	(3.97)	(3.75)	(3.89)
lnK	0.188 ***	0.478 ***	0.666 ***
	(9.73)	(16.06)	(18.48)

Note: The values in parenthesis represent the T statistic, *** represents $p < 0.001$.

According to Table 7, the coefficient of the effect of the influence of various factors on economic growth passed the 1% significance test. According to the effect decomposition of the spatial lag model, the increases in urban construction land, labor force and capital stock in the central provinces of the Yangtze River Economic Belt all have a positive direct effect on the local economic growth level. Concerning the indirect effect, the factor growth in the central provinces of the Yangtze River Economic Belt has a positive spillover effect. In other words, in the prefecture-level cities in the central region of the Yangtze River Economic Belt, the increases in urban construction land, labor force and capital stock can to a certain extent promote the economic development in the adjacent regions.

5. Conclusions and Policy Recommendations

This paper takes the 108 cities of the Yangtze River Economic Belt as an example and uses the panel data of the area over the years 2005–2015 to explore the impact of the expansion of urban construction land on the economic growth of the region by building a spatial measurement model. The following conclusions are drawn:

(1) The expansion of urban construction land in the Yangtze River Economic Belt has a significant impact on the regional economic growth but the impact is not as great as the impact of the capital stock. This result shows that in the process of economic growth of the urban agglomerations in the region, the pulling effect of capital on the economy is far greater than the pulling effect of urban construction land. With the rapid development of the national economy in recent years, the economic development level of the Yangtze River Economic Belt has improved and the importance of capital elements has gradually increased, while urban construction land as an important factor of economic growth has gradually been replaced by its elements because of its immobility [39]. In addition, in the Yangtze River Economic Belt, the increases in urban construction land, labor force and capital stock have not only a positive effect on the local economic growth but also a certain spillover effect, which can promote the economic development level of adjacent areas in the economic belt.

(2) Although the expansion of urban construction land along the Yangtze River Economic Belt has contributed to the economic growth as a whole, the expansion of urban construction land in the eastern, central and western regions has different degrees of influence on economic growth. Furthermore, only the urban construction land in the central region has a significant driving effect on economic growth. The urban construction land in the eastern and western regions does not have a significant effect on the economic growth in the respective regions [40]. This result is due to the different economic development levels in the three regions. In the economically developed eastern region and the economically disadvantaged western region, urban construction land use is not a mainly driving force of economic development; the urban construction land factors play a significant role in promoting economic growth only in the central region, where the economy is in a stage of development [41].

The conclusions of these studies will also be helpful for other researchers to further explore the driving factors of economic development in many prefecture-level cities in the Yangtze River Economic Belt and the relevant mechanisms for the increase of construction land on prompting economic growth.

Urban construction land is a scarce resource in China's current stage of development and will continue to be scarce in the future. The efficient and rational use and the planning of urban construction land is crucial for the economic growth and sustainable development of the regional urban agglomeration in China. Therefore, it is necessary to establish a sound system for the protection and utilization of urban construction land to facilitate more efficient use of urban construction land. In addition, China has a vast territory and there are significant differences in the resource endowments between different regions. In formulating relevant planning policies for urban construction land, we must consider the regional differences in the economic development level. Therefore, based on the conclusions drawn from the above studies, we also put forward the following policy recommendations:

First, in recent years, because of the rapid development of China's economy, the expansion of urban construction land is no longer the main driver of economic growth, as it has been replaced by capital investment. However, we still cannot ignore the role of urban construction land and we need to plan urban construction rationally in consideration of its original role of importance. In addition, the development levels of the regions in Yangtze River Economic Zone vary and therefore, the planning of urban construction in different regions should be rationally implemented and the government should adjust measures to the local conditions.

Second, in the regional urban agglomeration of the Yangtze River Economic Zone, the economic development level of the eastern region is high and the urban construction land does not significantly stimulate economic growth. Therefore, in the process of economic development in the eastern region, we should rationally plan the urban construction land resources and realize intensive land use. In the planning of urban land use, it is necessary to carefully consider the scale, structure and utilization of the local urban construction land and scientifically allocate land to urban infrastructure, residents' housing, various service industries and other functions. It is necessary to renew and transform all the land that is used unreasonably and optimize the land use for various supporting facilities in the city.

Third, in the in the central region of the regional urban agglomeration of the Yangtze River Economic Belt, the expansion of urban construction land plays an obvious role in stimulating the economy. Therefore, we should not only promote the adjustment of the industrial structure but also optimize the structure of the land in the central region. This requires the scientific formulation of the urban planning, industrial layout and infrastructure planning in the central region, the unified and coordinated use of urban construction land under the overall planning and the transformation of a reasonable spatial layout and correct policy measures into reality to achieve the aim of optimizing the structure of land use. In addition, we should pay more attention to the transformation of the mode of economic growth in the central region to optimize the layout of the urban construction land, control the input of the urban land use factors and reduce the excessive dependence of economic growth on the urban construction land in the central region.

Fourth, among the regional urban agglomerations of the Yangtze River Economic Belt, the western region should rely on local policy support and land factors to attract labor and capital to promote economic growth while protecting the ecological environment. At the same time, it is necessary to increase investment in science and technology, introduce high-tech industries and provide more construction land for industrial agglomeration areas, which can generate more economic growth under a lesser input of land factor resources. Such growth will significantly increase the efficiency of urban construction land use in the western region.

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