land

MDPI

Article

Land Financialization, Uncoordinated Development of Population Urbanization and Land Urbanization, and Economic Growth: Evidence from China

Yunyang Ji [1], Xiaoxin Guo [2,*], Shihu Zhong [2] and Lina Wu [2]

[1] School of Public Finance & Taxation, Guangdong University of Finance & Economics, Guangzhou 510320, China; 20196031@gdufe.edu.cn

[2] School of Public Economics and Administration, Shanghai University of Finance and Economics, Shanghai 200433, China; zhongshihu@163.sufe.edu.cn (S.Z.); 2015310055@live.sufe.edu.cn (L.W.)

* Correspondence: guoxiaoxin@163.sufe.edu.cn

Received: 10 November 2020; Accepted: 26 November 2020; Published: 29 November 2020

Abstract: In recent years, it has become common practice for Chinese local governments to inject land assets into financing platform companies and use them as mortgage or credit guarantees to obtain bank loans and issue urban investment bonds, which is known as "land financialization". This study investigates the impact and mechanism of land financialization on the uncoordinated development of population urbanization and land urbanization in China. Theoretical analysis and empirical analysis results based on the data of prefecture-level cities in China from 2006 to 2015 demonstrate that land financialization by local governments is a significant cause of the uncoordinated development of population urbanization and land urbanization, and the pressure of urban economic development will strengthen this negative impact. Extended analysis further reveals that in areas where population urbanization and land urbanization are uncoordinated, land financialization, while promoting urban spatial expansion, will lower land use efficiency and have an inverted U-shaped influence on economic growth due to a weak agglomeration effect. The above conclusion shows that urbanization driven by debt-based investment is unsustainable. Efforts should be made to establish a financialization system that propels sound urbanization and to build a stable input linkage between land financialization and the supply of urban public service.

Keywords: land financialization; uncoordinated development of population urbanization and land urbanization; pressure of urban economic development; land use efficiency; urban economic growth

1. Introduction

Urbanization is a vital symbol showcasing economic development in a country and is the universal choice used by developing countries to promote economic development. Existing research shows that urbanization can boost economic growth through promoting the accumulation of elements and the spillover of knowledge, expanding consumption and investment and delivering an agglomeration effect and economies of scale [1–3]. Further, it has become a critical issue facing countries across the world to facilitate economic growth based on faster and better-quality urbanization.

As the largest developing country, China's urbanization level has soared over the past 40 years, with its urbanization rate growing from 17.92% in 1978, the fledgling years of China's reform and opening up, to 59.58% in 2018. The number of permanent residents in urban areas has reached 831.4 million (China Statistical Yearbook, 2018). Urbanization has become a gigantic engine, after industrialization, for China's economic growth [4,5]. However, there is no denying that some contradictions and problems appear along with China's urbanization. The major problem is that population urbanization

lags behind land urbanization [6,7] (China's New Urbanization Plan (2014–2020), 2014). According to the author's estimation based on data from the China Urban Construction Statistical Yearbook, the pace of urban land expansion in China measured by built-up area is 1.44 times that of the increase in permanent residents from 1990 to 2000. The difference between the two from 2000 to 2015 further expands to 1.94 times, far beyond the reasonable level of 1.12 [8]. Additionally, in terms of the annual average growth rate, the difference between the annual average growth rate of urban built-up area in China and that of urban population is 3.21% from 1990 to 2006. This figure climbs to 3.47% from 2006 to 2015. Meanwhile, among three regions in China, the difference between the increased rate of land urbanization and population urbanization in the western area is the largest, followed by the central and eastern area (see Figure A1).

Existing literature shows that the uncoordinated development of population urbanization and land urbanization will result in a series of long-term negative effects on socioeconomic development, such as an increasingly distorted economic structure [6,9] and a widening income gap among urban and rural residents [10]. Ultimately, this uncoordinated development will obstruct urban-rural economic sustainable development and the healthy development of the city [11,12]. The cases in point are mushrooming "ghost cities", "empty cities", and the low occupancy rate in some development zones in China [13]. Indeed, promoting the coordinated development of land urbanization and population urbanization has become a critical issue in encouraging future urbanization in China. Resolving this issue will require the examination of its internal logic.

What are the reasons for the uncoordinated development of population urbanization and land urbanization in China? Existing literature has focused on the effect of some institutional factors, including the hukou system's obstruction of population urbanization in China [14,15], urban spatial expansion facilitated by the land-dependent fiscal system [12,16], and land urbanization propelled by regional competition under the fiscal decentralization system [17,18]. Moreover, the urbanization model in China is different from those in Western countries, such as governance structures for farmland conversion [19], the hukou system, internal migration, the taxation system, and the key role of local government in development [20]. Therefore, the behavior and intention of local governments should be considered in order to understand urbanization in China [21]. The above literature laid the foundation for our analysis of the uncoordinated development of population urbanization and land urbanization, but the impact of the land financialization mode, which local governments rely on, on the development of urbanization has been, to some extent, ignored.

In actual fact, local governments in China have established a huge number of financing platform companies in recent years, which directly or indirectly assume the functions of land reserve, development, and transfer in various cities [22]. It has become common practice for Chinese local governments to inject land assets into financing platform companies and use them as mortgage or credit guarantees to obtain bank loans and issue urban investment bonds, which is known as "land financialization". This land financialization model greatly enhances the financing effect of land transfer [23]. Although they take the same form as land capitalization, land financialization differs from land transfer greatly, because the former is a borrowing behavior, which creates implicit debts, while the latter is a one-time deal. According to the statistics for 84 major cities in China, the area and revenue from land mortgages have continued to rise and gradually exceed those of land transfer since the market-orientated reform of industrial land in 2006 (see Figure A2). Large-scale land financialization provides funding support for urban construction and land development, forming a Chinese-style urban construction investment and financialization model characterized by positive feedback between land financialization and urban infrastructure investment [24].

Thus, the question must be asked, does land financialization by Chinese local governments affect land urbanization and population urbanization? If the impact exists, does this kind of financialization lead to the uncoordinated development of population urbanization and land urbanization? Moreover, in what way does urbanization propelled through land financialization by local governments affect urban economic growth? These answers are the mainly logic connection of this study.

In effect, urbanization propelled via land financialization by Chinese local governments is, in essence, designed to promote urban construction investment through borrowing. Land financialization, while accelerating urban construction, generates huge debts for local governments [25]. As of the end of 2017, the local debts released by the authority amounted to 16.47 trillion yuan. In addition, urban development in China follows a "supply-driven" model led by local governments, where urban construction predates the agglomeration of industry and people. This means that economic agglomeration and economies of scale will determine whether a city can realize sustainable development. If local governments fail to attract enough people and companies after the construction is completed, construction investment which relies on borrowing will not be translated into an effective tax base and land tax revenue, which will probably trigger fiscal risks. In particular, in cities where unbalanced development is noted, population urbanization which is lagging behind reflects the insufficient spatial conglomeration of the population. The large-scale "enclosure for cities" movement gives rise to a low efficiency in land use [26]. Economies of scale are stunted, thus obstructing sustainable economic development in China.

This study focuses on the impact of land financialization by local governments on the uncoordinated development of population urbanization and land urbanization in China and its underlying mechanism. The contributions of this study mainly include: first, from the research perspective, previous research proceeds from land financialization and examines its stimulating effect on urban spatial expansion, while our study explores the uncoordinated development of population urbanization and land urbanization during urban construction and land development funded by local governments' debt-based financialization. This study also puts under the microscope the moderating effect of urban development pressure on the uncoordinated development of population urbanization and land urbanization caused by land financialization. Second, by combining the realistic background of "debt-oriented" urbanization financing and "supply-oriented" urban construction, this study analyzes the potential negative effect of land financialization on urban economic development and its working mechanism. Lastly, as financing platform companies are the main carrier allowing local governments to conduct land financialization, this study calculates the land financialization scale through the interest-bearing debt of financing platform companies for empirical research. This constitutes a beneficial attempt in the absence of relevant data.

2. Institutional Background and Hypotheses

2.1. The Formation and Evolution of the Financing of Urban Development in China

Local governments are major players in urban construction investment and public service supply in China [27–29]. The fiscal revenue and spending caused by Chinese local governments have a huge impact on urban development [30]. Since China's tax-sharing reform in 1994, financial power has been transferred to the central government, while responsibilities and spending have been laid on the shoulders of local governments [31]. The budgetary fiscal deficit of local governments has grown with each passing year, pushing local governments to expand extra budgetary sources of revenue. In the meantime, the newly revised Land Management Law of 1998 made Chinese local governments the only monopoly in land supply. While the market-orientated reform of urban housing in 2000 and the "bidding, auction, and listing" land transfer system that started in 2002 have made market-orientated land transfer possible in China. These reform measures have bred the commercial value of land, which gradually rises as the important asset for local governments. In this stage, land-related fiscal revenue for local governments mainly includes three components: land transfer fees, taxes related to the construction industry and the real estate industry (including farmland occupancy tax, urban land use tax, land appreciation tax, deed tax, and property tax), and land mortgage loans. Therefore, the fiscal revenue of Chinese local governments and urban construction has become increasing dependent on land.

Originally, Chinese local governments mainly obtained land transfer revenue through selling land use rights in primary markets. According to the China Land and Resources Statistical Yearbook 2001 to 2014, land transfer fees, known as "the secondary fiscal revenue", soared to 4.37 trillion yuan in 2013 from 59.5 billion yuan in 2000. The share of land transfer revenue in local fiscal revenue has increased from 9.3% to 63%. In some cities, such as Nanjing, Hefei, and Hangzhou, etc., the dependence on land finance (the ratio of budget revenue to land transfer fees) even approaches 100%, and remains at that level. Along with the development of the real estate market, the relevant tax revenue accordingly increased rapidly. Land finance therefore came into place. While compensating for fund shortage in local governments, the revenue also exerted far-reaching impacts on socioeconomic development in China. Said revenue was utilized in urban infrastructure construction and provided a funding guarantee for urbanization [32].

However, in China, along with deepening regulations in the real estate market and the growing pressure on economic downturn, land transfer revenue and relevant tax fees could hardly keep up with the substantial spending in urban construction, which ushered in the tipping point of land finance. According to Research on Real Estate's Contribution to Fiscal Revenue 2015[1], the tax revenue in real estate in 2015, including property tax, urban land use tax, deed tax, farmland occupancy tax, and land appreciation tax, amounted to around 1.3 trillion yuan, a decrease of 3.6% compared to 2014, the first-ever decline in the past 15 years. Land transfer fees in 2015 registered negative growth for the fourth time in the past 15 years. The land revenue of local governments fell by nearly one half. Against this backdrop, establishing a local financialization platform through mortgaging land to financial institutions or using land transfer revenue as a guarantee to issue urban investment bonds has become an alternative for local governments to obtain land financing. Since then, the financing of urban development has transformed from land finance to land financialization in China. Particularly, after the financial crisis in 2008, China encouraged the establishment of local financing platform companies in order to raise supporting capital for the "funds for the "four-trillion stimulus plan". The number of local financing platform companies surged to 8221 at the end of 2009 from 3000 in the second half of 2008. In 2009 alone, more than 2000 new financing platform companies were added. These platform companies raised 75% of the supporting capital [33]. Land, as the major asset, played a key role in fund collecting.

Essentially, land and land-related revenue are deeply involved, from the establishment of local financialization platforms and asset injection, guarantees, and mortgages in borrowing and issuing bonds, to the repayment of principle and interest in the future. Extensive empirical research has verified the guarantee function of land in the issuance of urban investment bonds and its mortgage function in obtaining loans from banks. For example, the research of Shu, Xie, Jiang, and Chen (2018) [16] and Zhong, Chen, and Huang (2016) [34] indicates that the greater the price of urban land transfer or revenue, the higher the possibility of issuing urban investment bonds. The scale of the bonds issued will also accordingly be larger. This is because land use rights are often used as the guarantee, and land transfer revenues are promised to pay back debt during the issuance of urban investment bonds. Zhang, Nian, and Liu (2018) [23] found that there was a significant positive relationship between land transfer revenue and urban investment bonds. According to the debt auditing report by the National Audit Office from 2011 to 2013, as of the end of 2010 the outstanding obligation that local governments promised to pay through land transfer revenue stood at 2.547 trillion yuan, amounting to 38% of the total liable debts. This figure grew to 3.49 trillion yuan at the end of 2012—an increase of nearly 37% within two years. The outstanding obligation promised to be paid through land transfer revenue is shown in Figure 1. We can find that, by the end of 2012, the proportion

[1] Shanghai E-House Real Estate Research Institute, Local government's dependence on Land Finance, 29 February 2016. https://finance.sina.com.cn/roll/2016-02-29/doc-ifxpvzah8335807.shtml.

of outstanding obligation promised to be paid through land transfer revenue in Zhejiang Province, Tianjin Municipality, and Beijing Municipality exceeds 60%.

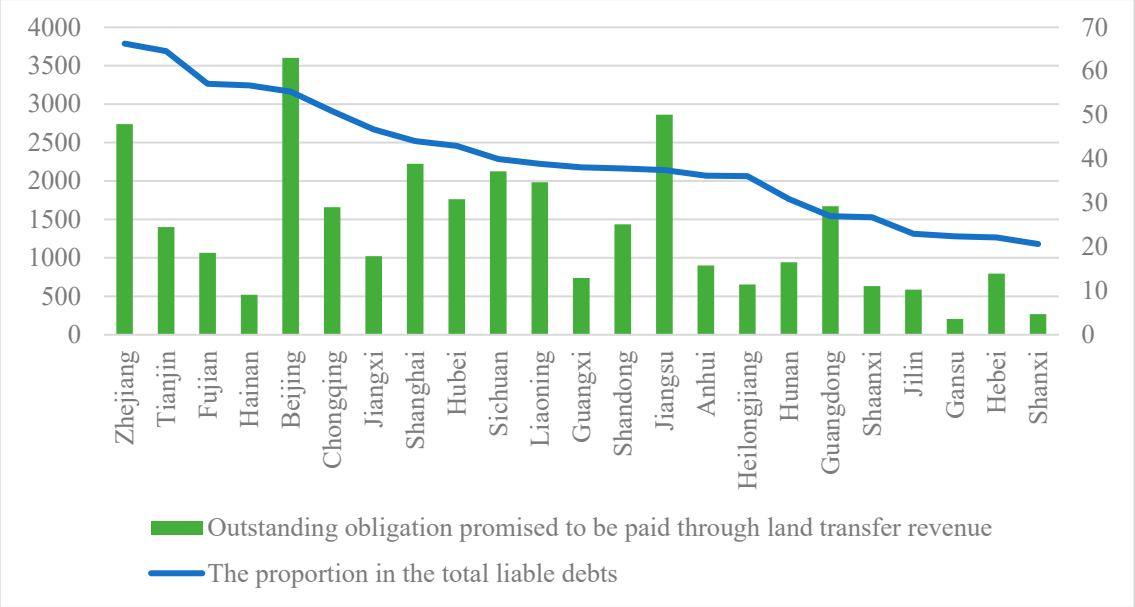

Figure 1. Debts promised to be paid by land transfer revenue in Chinese provinces. Note: data were retrieved from the Local Debts Audit Report of provinces in 2014.

The above evidence shows that large-scale urban land expansion and land transfer revenue provide a credit basis for Chinese local governments to obtain debt financialization and thus play a catalytic role in the expansion of local government debt [35,36]. Against the backdrop of severe dependence on debt-based investment, local governments' passion for "operating city" and "operating land" will be galvanized through constructing various development zones, new areas, and new cities, turning agricultural land into construction land and ultimately triggering precocious urban construction. Following the ideas of Chang and Lu (2017) [37], as of early 2014, 272 out of 280 prefecture-level cities in China had new built-up cities. The number of cities with new cities under construction accounts for 90% of all prefecture cities in China—the area of which amounts to 66,300 km^2.

On the other hand, the employment of debt-based capital through land financialization by local governments showcases an obvious orientation to land urbanization. The majority of the capital was invested in areas related to land urbanization, such as municipal construction, land purchasing and storage, and transportation, with a proportion of approximately 70.38%. Only 10.5% of the capital was, however, invested in areas relevant to population urbanization, such as education, science, culture, healthcare, and affordable housing (National Audit Report on Debt). This means that land financialization does not promote population urbanization in the way that it does in facilitating urban spatial expansion and "land urbanization". On the contrary, the rapid rises in urban land price and housing price caused by land financialization may even suppress population urbanization. Research Group on China's Economic Growth (2011) [38] points out that the land urbanization and land-based urbanization financialization model led by local governments will accelerate land discount, heightening issues such as soaring land prices and housing prices while also having a crowd-out effect on the population and industries.

Based on the above analysis, we propose the first hypothesis.

Hypothesis 1. *The stimulating effect of land financialization activities by local governments on land urbanization is stronger than that on population urbanization, resulting in the uncoordinated development of population urbanization and land urbanization.*

China's special system of the political centralization of state power and the separation of economic power effectively resolves the incentives for local governments [39,40]. However, it also brings about "yardstick competition" among different regions [41,42]. An official government promotion mechanism focusing on economic performance, which has been gradually formed since the 1980s, leads to "competition for growth" among government officials at a local level. The competition for promotion has been turned into competition in economic growth among various regions [43,44], putting pressure on economic development. Li and Zhou (2005) [45] found, based on empirical research, that local government officials with better economic performance to their credit during their tenure do receive more promotion opportunities. Considering this, local governments tend to realize more public spending related to economic development within a short period of time, such as urban infrastructure construction and land development, to achieve excellent economic development performance. This move has also significantly distorted the fiscal expenditure structure of local governments, showcasing an emphasis on infrastructure and a neglect of human capital investment and public service [46]. Similarly, in the supply of public goods, local governments are passionate about providing public goods of an economic nature while overlooking those of a social nature [47] The research of Caldeira (2012) [48] demonstrates that there is competition in investment among prefecture-level cities in China. Large-scale infrastructure construction and government investment require ample funding support. Extrabudgetary debt funds from land financialization simply loosen budgetary constraints. Therefore, under the decentralized system and official government promotional mechanism, "yardstick competition" emerges in land financialization among local governments, which is indicated by greater passion about, and dependence on, land financialization in regions with larger pressure on economic development.

In comparison, land urbanization relies on government investment and infrastructure construction, while population urbanization is more dependent on the supply of public goods which are social in nature. The biased public spending structure originating from promotional incentives for local governments' officials will indirectly strengthen land urbanization orientation in spending the capital raised. A vicious cycle in the investment and financialization process centring on land has been formed, augmenting the uncoordinated development of population urbanization and land urbanization. Meanwhile, in cities with greater pressure on economic development, local governments would have preferred to follow a spending structure orientated towards land urbanization to obtain greater achievements.

Therefore, it can be inferred that, under the competition mechanism for the promotion of officials, local governments under great development pressure are more dependent on land financialization model to raise urban construction funds, and their expenditure is more inclined towards land urbanization, thus heightening the uncoordinated development of population urbanization and land urbanization. We therefore propose the second hypothesis.

Hypothesis 2. *The stimulating effect of land financialization on the uncoordinated development of population urbanization and land urbanization is more prominent in cities with greater pressure on economic development.*

2.2. Land Financialization, the Uncoordinated Development of Population Urbanization and Land Urbanization, and Economic Growth

Although each city has formed its own features in the course of development, the urbanization of these cities usually includes the continuous conglomeration of industries and populations, which promotes economic growth in cities, increased job opportunities, the inflow of population, and the expansion of urban land construction. We refer to this model as a market-led "demand-driven" model. Under this model, land expansion in cities is based on industrial conglomeration and population growth. Economies of scale can therefore be generated, realizing relatively high land use efficiency and ensuring sustainable economic development. In other words, sustainable economic growth is based on alternative and coordinated development between population urbanization and land urbanization.

However, in the government-led "supply-driven" urban development model in China, investment and construction rely on land financialization. Companies and populations are then attracted to the region through preferential policies on land and taxation [49]. This means that income from investment based on land financialization is decided by the conglomeration effect of urban construction on population and industry. However, when urban differentiation and regional difference become increasingly prominent, not all cities are able to attract enough companies and labour to the region. This is particularly true in areas where population urbanization and land urbanization are uncoordinated. Lagging-behind population urbanization itself reflects inadequate population conglomeration, ultimately resulting in a low land use efficiency [50,51]. In the meantime, land use efficiency is critical to sustainable economic development [52]. If precocious land urbanization could not deliver "increasing return to scale", sustainable economic growth in cities would face severe challenges.

Additionally, in terms of the effect of the transmission mechanism of urbanization on promoting economic development, population urbanization facilitates economic growth through population agglomeration and increasing consumption, while land urbanization does so via increments of fixed asset investments. In recent years, investments' contribution to economic growth has continued to decline during the adjustment of the economy structure. Increasing residential consumption is the key to realizing sustainable economic development. If population urbanization lags behind land urbanization over a long period of time, the effect of the demand structure, characterized by high investment and low consumption, on economic structure will have a threshold value according to the law of diminishing return on investment. The effect will shift from positive to negative once the demand structure passes the threshold.

To summarize, urbanization lacking industrial and population support could be temporarily sustained through government efforts and debt-based capital. Long-term economic growth relies on the performance of economic conglomeration and population urbanization. Land financialization leads to the uncoordinated development of population urbanization as well as land urbanization and is detrimental to sustainable economic development. Therefore, we propose the third hypothesis.

Hypothesis 3. *In areas with the uncoordinated development of population urbanization and land urbanization, due to weak conglomeration, land financialization will, while promoting urban spatial expansion, lower land use efficiency, generating an inverted U-shaped effect on economic performance.*

3. Model, Data and Variable

3.1. Econometric Model

Based on previous literature concerning land financialization, population urbanization, and land urbanization, this study constructs the following econometrics model to test the impact of land financialization on the uncoordinated development of population urbanization and land urbanization:

$$land\_urban_{it} = \alpha_1 + \beta_1 land\_financialization_{it} + \sum \gamma_1 X_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (1)$$

$$pop\_urban_{it} = \alpha_2 + \beta_2 land\_financialization_{it} + \sum \gamma_2 X_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (2)$$

$$unco\_development_{it} = \alpha_3 + \beta_3 land\_financialization_{it} + \sum \gamma_3 X_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (3)$$

$$\begin{aligned} unco\_development_{it} = \alpha_4 + \beta_4 land\_financialization_{it} + \varphi pressure_{it} + \\ \eta land\_financialization_{it} * pressure_{it} + \sum \gamma_4 X_{it} + \mu_i + \delta_t + \varepsilon_{it} \end{aligned} \quad (4)$$

where the dependent variable in model 1 is $land\_urban_{it}$, representing the land urbanization in city i at year t, which is measured by the logarithm of the urban built-up area. The dependent variable in model 2 is pop_urban_{it}, representing the population urbanization in city i at year t, which is measured by the logarithm of permanent residents in city districts. The dependent variable in models 3 and 4 is $unco\_development_{it}$, indicating the dummy variable of the uncoordinated development of population urbanization and land urbanization in city i at year t. The value 1 demonstrates the existence of the uncoordinated development of population urbanization and land urbanization, or the value will be 0. In models 1-4, the independent variable is $land\_financialization_{it}$, representing land financialization scale in city i at year t. The subscripts i and t represent the i-th city and the t-th year, respectively. X_{it} is the set of control variables, as discussed above. Further, μ_i represents the municipal fixed-effects and is used to control the unobservable but invariant characteristics of cities; δ_t represents the year fixed-effects, and is used to control the systematic differences in cities over time. ε_{it} represents other city-level natural endowments and socioeconomic factors that could potentially impact the uncoordinated development of population urbanization and land urbanization.

In models 1–3, we focus on the coefficients of $\beta_1, \beta_2,$ and β_3, which represent the net effect of the land financialization on land urbanization, population urbanization, and the uncoordinated development of population urbanization and land urbanization, respectively. In model 4, the moderating variable is $pressure_{it}$, representing the pressure on urban economic development in city i at year t; we focus on the coefficient of η, which represents the moderating effect of urban economic development pressure on the uncoordinated development of population urbanization and land urbanization caused by land financialization.

The fixed-effect (FE) panel data method is first used to control factors that do not vary with time. However, there may be a reverse causality between land financialization and the uncoordinated development of population urbanization and land urbanization. Land financialization offers funding support for land development and spatial expansion and gives rise to the uncoordinated development of population urbanization and land urbanization. Meanwhile, increases in construction land further galvanize land-based mortgages and guarantees in cities with unbalanced development, adding fuel to land financialization. The Generalized Method of Moments (GMM) and two stage least square (2SLS) regression are therefore used to address this problem by introducing exogenous variables.

3.2. Data Source and Variable Selection

Our main data is drawn from the China Statistics Yearbook, the China Municipal Statistics Yearbook, the China Population and Employment Statistics Yearbook, the China Urban Construction Statistical Yearbook, and the China Land and Resources Statistical Yearbook between 2007 and 2016. Samples of Tibet and some other autonomous prefectures are excluded. Data on local financialization platforms comes from the Wind Economic Database (The Wind Economic Database pairs over 1.3 million macroeconomic and industry time series with powerful graphics and data analysis tools to give financial professionals the most comprehensive insights into China's economy). Missing values are filled using the interpolation method. It is important to note that, in the Chinese context, a city is often not a municipal unit (i.e., a large continuous urban area), but rather an administrative unit that with hierarchy ranking lower a province but higher a county in the Chinese administrative structure. A Chinese city

usually comprises a main central urban area (with the same name as the "city") and a much larger surrounding rural area [53]. In this study, only the information regarding the city's central urban (municipal) area is used. Thus, our analysis is not very sensitive to changes in the city's administrative boundaries. The variable definitions and statistical descriptions of samples used in the analysis will be recorded as shown below.

3.2.1. Dependent Variables

The key dependent variables include: $\ln land\_urban_{it}$, the logarithm of city-level built-up area, which is the important index of land urbanization; $\ln pop\_urban_{it}$, the logarithm of city-level permanent residents, which is the important index of population urbanization; $unco\_development_{it}$, the dummy variable of the uncoordinated development of population urbanization and land urbanization. In reference to the practice of Xie (2016) [54], this study employs the elastic coefficient of urban built-up area growth (i.e., the growth rate of urban built-up area/the growth rate of permanent residents in a municipal district) to measure the lagged-behind level of population urbanization relative to land urbanization. Currently, the internationally recognized appropriate value for the elastic coefficient is 1.12. Further, following the research of Gail (2003) [8], this study defines the uncoordinated development of population urbanization and land urbanization as Equation (5) below. When $\frac{growth\ rate\ of\ urban\ built\text{-}up\ area}{growth\ rate\ of\ permanent\ residents\ in\ municipal\ district} \leq 1.12$, $unco\_development_{it}$ will equal 0, which means that the land urbanization growth rate relative to the population urbanization growth rate is within an appropriate range, and the uncoordinated development of population urbanization and land urbanization does not exist. When $\frac{growth\ rate\ of\ urban\ built\text{-}up\ area}{growth\ rate\ of\ permanent\ residents\ in\ municipal\ district} > 1.12$, $unco\_development_{it}$ will equal 1, which means that the population urbanization growth rate severely lags behind the land urbanization growth rate, and the uncoordinated development of population urbanization and land urbanization does exist. That is,

$$unco\_development_{it} = \begin{cases} 0, & \frac{Growth\ rate\ of\ urban\ built\text{-}up\ area}{Growth\ rate\ of\ permanent\ residents\ in\ municipal\ district} \leq 1.12 \\ 1, & \frac{Growth\ rate\ of\ urban\ built\text{-}up\ area}{Growth\ rate\ of\ permanent\ residents\ in\ municipal\ district} > 1.12 \end{cases}. \quad (5)$$

We have drawn up a map related to the development of population urbanization and land urbanization. This is shown as follows.

Figure 2 represent the lagged-behind level of population urbanization relative to the land urbanization of Chinese cities in 2015. Coordinated urbanization represents that the land urbanization growth rate relative to the population urbanization growth rate is within an appropriate range, and the uncoordinated development of population urbanization and land urbanization does not exist. Uncoordinated urbanization represents that the population urbanization growth rate severely lags behind the land urbanization growth rate, and the uncoordinated development of population urbanization and land urbanization does exist. We find that uncoordinated urbanization exists in most cities in China.

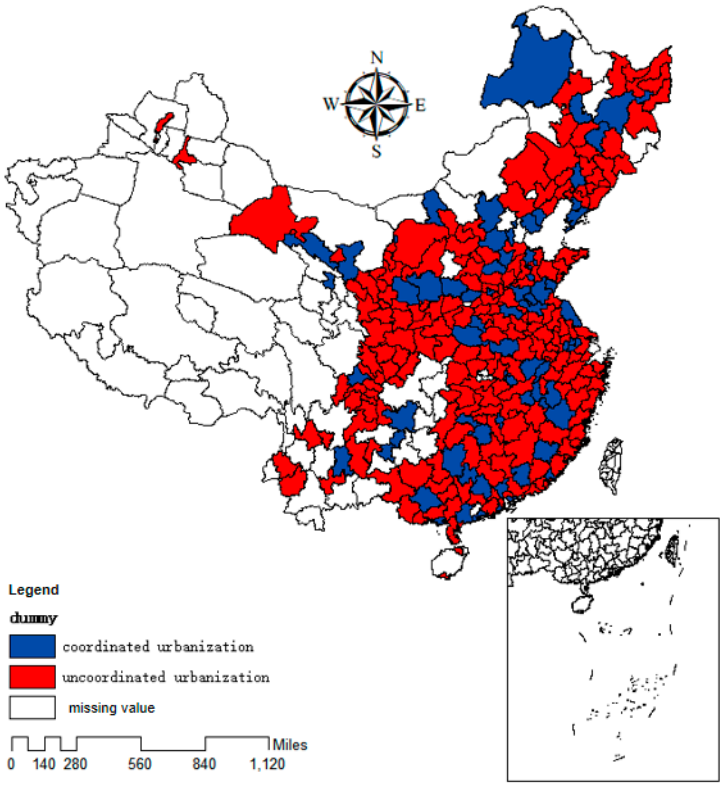

Figure 2. The uncoordinated development of population urbanization and land urbanization in Chinese cities.

3.2.2. Independent Variable

The land financialization scale in prefecture-level cities is the key independent variable in this study. In China, local governments have no right to issue government bonds to raise funds for infrastructure construction and other public welfare projects, so local governments have built some financing platform companies for financing. Further, local governments could rely on the financing platform companies to obtain bank loans through land mortgages and to issue urban investment bonds by taking land transfer revenue as a guarantee. Considering this, the present study selects the interest-bearing debt of local financing platform companies, including current liability and long-term liability, as the proxy variable for the land financialization scale. The specific calculation formula is shown below.

$$\begin{aligned} \textit{Land financialization level} = {} & \textit{short term liability}\ (\textit{short term borrowing} + \textit{notes payable} + \\ & \textit{non current liabilities due within one year} + \textit{other current liabilities} + \\ & \textit{short term bond payable}) + \\ & \textit{long term liability}\ (\textit{long term borrowing long term bond payable}) \end{aligned} \tag{6}$$

3.2.3. Moderating Variable

Referring to the existing literature, this study utilizes economic development catch-up pressure (including economic development level and fixed-assets investment etc.) to reflect the pressure of urban economic development. The calculation formula is shown below.

$$\textit{Economic development catch up pressure} = \frac{\textit{economic indicators of the prefecture level city which is one place ahead in ranking in the province}}{\textit{economic indicators in the respondent prefecture level city}} \tag{7}$$

where economic indicators include GDP per capita and the total investment in fixed assets as the proportion of GDP.

3.2.4. Control Variables

Control variables in the study mainly include factors affecting land urbanization and population urbanization, such as: (1) the economic development level ($\ln GDP_{it}$), which is measured by the logarithm of GDP per capita [55]; (2) industrial structure (ind_2_{it} *and* ind_3_{it}), which is represented by the ratio of the second and third industries' added value in GDP [14]; (3) population density ($\ln pop\_density_{it}$), which is measured by the logarithm of the city-level population density [53]; (4) fiscal expenditure ($\ln Fis\_expenditure_{it}$), which is represented by the logarithm of local public expenditure per capita [56]; (5) economic openness ($eco\_openness_{it}$), which is measured by the ratio of accumulated foreign direct investment (FDI) in capital stock [57]; (6) fixed-asset investment ($\ln fix\_investment_{it}$), which is measured by the logarithm of fixed-asset investment per capita [58].

Descriptive statistics of the key variables are shown in Table 1.

Table 1. Descriptive statistics of the data for 277 Chinese cities during the period 2006–2015.

Variable	Definition	Obs	Mean	Standard Error	Minimum	Maximum
$\ln land\_urban_{it}$	Logarithm of city-level built-up area	2770	9.544	0.405	8	11.27
$\ln pop\_urban_{it}$	Logarithm of city-level permanent residents	2770	4.549	0.708	2.703	6.750
$unco\_development_{it}$	Dummy variable of the uncoordinated development of population urbanization and land urbanization	2770	0.668	0.471	0	1
$land\_financialization_{it}$	Interest-bearing debt of local financing platform companies	2770	6.239	3.815	0	12.17
$\ln GDP_{it}$	Logarithm of GDP per capita	2770	10.15	0.729	7.306	13.11
ind_2_{it}	Ratio of the second and third industries' added value in GDP	2770	49.88	10.63	15.17	90.97
ind_3_{it}	Ratio of the second and third industries' added value in GDP	2770	36.33	8.461	8.580	75.84
$\ln pop\_density_{it}$	Logarithm of city-level population density	2770	422.2	309.8	4.700	2648
$\ln Fis\_expenditure_{it}$	Logarithm of local public expenditure per capita	2770	8.310	0.734	6.305	11.51
$eco\_openness_{it}$	Ratio of accumulated foreign direct investment (FDI) in capital stock	2770	7.556	2.140	0	13.89
$\ln fix\_investment_{it}$	Logarithm of fixed-assets investment per capita	2770	9.767	0.869	6.883	12.30
$\ln road_{it}$	Logarithm of road area per capita	2770	2.202	0.599	0.157	4.686
$\ln con\_land_{it}$	Amount of newly increased construction land	2770	5.664	1.713	0	12.41
$GDP\_pressure_{it}$	Pressure of urban economic development	2770	1.159	0.240	1	3.397
$inv\_pressure_{it}$	Pressure of urban investment	2770	1.077	0.118	1	2.262
$human\_rate_{it}$	Ratio of college students	2770	1.584	2.198	0	12.936

4. Measuring the Impact of Land Financialization on the Uncoordinated Development of Population Urbanization and Land Urbanization

4.1. Benchmark Results

Table 2 presents the regression results regarding the impact of land financialization on land urbanization and population urbanization. As can be seen, in models 1 and 2, $land\_financialization_{it}$ is significantly and positively correlated with $\ln land\_urban_{it}$. This indicates that land urbanization significantly facilitates land urbanization. Additionally, in models 3 and 4 $land\_financialization_{it}$ is positively correlated with $\ln pop\_urban_{it}$, but this is not significant. This reveals that the impact of land financialization on population urbanization is not significant. Therefore, land financialization by

local governments may give rise to the uncoordinated development of population urbanization and land urbanization.

Table 2. Estimation results for the impact of land financialization on land urbanization and population urbanization.

	Model 1	**Model 2**	**Model 3**	**Model 4**
	FE	GMM	FE	GMM
Variable	$\ln land\_urban_{it}$		$\ln pop\_urban_{it}$	
$land\_financialization_{it}$	0.006 **	0.004 ***	0.001	−0.001
	(0.003)	(0.001)	(0.003)	(0.001)
$\ln GDP_{it}$	0.045	0.011	−0.105 **	0.056 ***
	(0.047)	(0.022)	(0.042)	(0.015)
$\ln pop\_density_{it}$	−0.000 ***	−0.000	0.000 *	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
$\ln Fis\_expenditure_{it}$	0.022	0.111 ***	0.055 **	−0.091 **
	(0.046)	(0.037)	(0.025)	(0.038)
$\ln fix\_investment_{it}$	−0.026	0.005	−0.026	0.050
	(0.037)	(0.035)	(0.026)	(0.031)
ind_2_{it}	0.007 ***	−0.009 ***	0.002	−0.003
	(0.003)	(0.002)	(0.003)	(0.003)
ind_3_{it}	0.004	−0.009 ***	0.002	0.004
	(0.003)	(0.002)	(0.003)	(0.003)
$eco\_openness_{it}$	0.001	0.000	0.008 **	0.019 ***
	(0.006)	(0.002)	(0.003)	(0.007)
Lag		0.894 ***		0.914 ***
		(0.018)		(0.023)
_cons	8.681 ***	0.668 ***	4.892 ***	−0.072
	(0.406)	(0.212)	(0.433)	(0.231)
Time effect	Y	Y	Y	Y
Regional effect	Y	Y	Y	Y
Hansen p		0.907		0.304
Adjusted R^2	0.291		0.182	
N	2763	2491	2765	2493

Notes: figures in parentheses denote the standard errors of the respective coefficients, while ***/**/* indicate significance at the 1%/5%/10% levels, respectively.

We further investigate the impact of land financialization on the uncoordinated development of population urbanization and land urbanization. Table 3 presents the regression results using the linear probability model (LPM), the probit analysis method (PROBIT), logistic regression analysis (LOGIT), IV-PROBIT, and GMM. According to the results of models 1–3, $land\_financialization_{it}$ is significantly and positively correlated with $unco\_development_{it}$. This implies that land financialization significantly leads to the uncoordinated development of population urbanization and land urbanization in China.

Moreover, what can be seen from model 2 is that there exists a negative relation between population density and the uncoordinated development of population urbanization and land urbanization, thus demonstrating that increasing population density helps ease the uncoordinated development of population urbanization and land urbanization. The relation between fiscal spending and the uncoordinated development of population urbanization and land urbanization is positive and significant, which is attributable to the economic development orientation of fiscal spending and the urban construction model being dependent on government investment. Meanwhile, growth in the proportion of secondary industry also fuels the uncoordinated development of population urbanization and land urbanization, which is associated with the competition in attracting businesses and investments among local governments and the construction of large-scale industrial parks.

Table 3. Estimation results for the impact of land financialization on the uncoordinated development of population urbanization and land urbanization.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
	LPM	PROBIT	LOGIT	IV-PROBIT	GMM
$land\_financialization_{it}$	0.010 **	0.041 **	0.065 **	0.251 **	0.031 ***
	(0.004)	(0.017)	(0.029)	(0.113)	(0.008)
$\ln GDP_{it}$	0.010	−0.079	−0.101	0.038	0.073
	(0.048)	(0.290)	(0.498)	(0.299)	(0.239)
$\ln pop\_density_{it}$	−0.001	−0.003 *	−0.005 *	−0.003 *	0.000
	(0.000)	(0.002)	(0.003)	(0.002)	(0.000)
$\ln Fis\_expenditure_{it}$	0.141 **	0.655 **	1.121 **	0.508 *	0.174
	(0.061)	(0.285)	(0.487)	(0.306)	(0.286)
$\ln fix\_investment_{it}$	0.038	0.259	0.404	0.238	−0.351
	(0.042)	(0.185)	(0.309)	(0.192)	(0.236)
ind_2_{it}	0.011 **	0.050 **	0.088 **	0.034	0.007
	(0.004)	(0.023)	(0.038)	(0.025)	(0.014)
ind_3_{it}	0.009 *	0.041	0.074	0.024	0.023
	(0.005)	(0.028)	(0.046)	(0.030)	(0.019)
$eco\_openness_{it}$	−0.030 ***	−0.135 ***	−0.222 ***	−0.119 ***	0.010
	(0.009)	(0.043)	(0.073)	(0.045)	(0.036)
Lag					0.123 ***
					(0.030)
_cons	−1.603 **	−17.579	−13.567 *	−7.690 *	0.339
	(0.694)	(170.690)	(7.188)	(4.316)	(1.442)
Time effect	Y	Y	Y	Y	Y
Regional effect	Y	Y	Y	Y	Y
Hansen p	0.390	0.380	0.162		
Adjusted R^2					0.154
N	2770	2770	2770	2770	2493

Notes: figures in parentheses denote the standard errors of the respective coefficients, while ***/**/* indicate significance at the 1%/5%/10% levels, respectively.

Considering the estimation bias induced by the reciprocal causation that land financialization and the uncoordinated development of population urbanization and land urbanization always interact with each other, the spatial lagged term of land financialization as the instrumental variable is introduced, and the 2SLS method is employed to re-examine the relationships in our study. The result in model 4 shows that the coefficient of $land\_financialization_{it}$ remains significantly positive. In addition, considering institutional inertia and path dependence, this study introduces the one-phase lagged term of $unco\_development_{it}$ as the control variable. The *Hansen* test in model 5 demonstrates the efficacy of the instrumental variables. The regression coefficient remains positive in model 5, verifying the robustness of the result.

In summary, the above regression result corroborates hypothesis 1—that is, that the enabling effect of land financialization by local governments on land urbanization is stronger than that on population urbanization, which results in the uncoordinated development of population urbanization and land urbanization. The reason for this is, as explained previously, that one of the features of land financialization is that it binds government debts with land. Land transfer fees are not only the reference of credit standing for local governments' current borrowing, but a vital source of capital in repaying local governments' debt. Therefore, local governments are highly motivated to channel debt-based capital into land reserve and development activities. This forms a continuous cycle which propels the rapid expansion of urban space. However, local governments fail to establish a stable investment linkage between public services in cities such as education, science, culture, healthcare, and land financialization. Coupled with rising land and housing prices, the citizenization of rural-to-urban migrants moves ahead slowly, leading to the uncoordinated development of population urbanization and land urbanization.

4.2. Robustness Checks

This study conducts robustness checks on benchmark regression results, including replacing measurement indicators of land urbanization and population urbanization, changing sample range, and increasing the number of control variables. First, this paper refers to the practice of Xiong and Gao (2012) [59] and replaces the city district area, which represents land urbanization, with the urban road area to calculate the uncoordinated development of population urbanization and land urbanization. Detailed regression results are shown in model 1. Second, we replace the total population in urbanized city districts, which denotes population urbanization, with non-agricultural population calculated through household registration to obtain the uncoordinated development of population urbanization and land urbanization. Detailed regression results are given in model 2. Third, this study excludes 58 cities which have undergone administrative upgrading from county to district so as to expel the influence of administrative region adjustment. The regression results in Table 4 reveal that the impact of land financialization on the uncoordinated development of population urbanization and land urbanization is significantly positive, showcasing the robustness of the benchmark regression results. Fourth, we only employ samples after 2008 for regression to avoid potential influence by the surge of financialization platforms after the financial crisis in 2008. Results are shown in model 4. Finally, this paper utilizes new land supply for construction (*lnland*) as a control variable. The expansion of the urban built-up area is affected not only by factors from the demand side, such as population and economy, but also factors from the supply side, such as land for construction. Of particular note is that land for construction is determined by the administrative distribution of government in China and is therefore of greater significance. The results of model 5 indicate robustness.

Table 4. Robustness checks on the impact of land financialization on the uncoordinated development of population urbanization and land urbanization.

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
$land\_financialization_{it}$	0.046 **	0.041 **	0.038 **	0.046 *	0.040 **
	(0.018)	(0.020)	(0.018)	(0.025)	(0.017)
$\ln GDP_{it}$	−0.060	−0.112	0.036	0.089	−0.080
	(0.271)	(0.354)	(0.364)	(0.285)	(0.290)
$\ln pop\_density_{it}$	−0.003 *	−0.001	−0.002	−0.002	−0.003 *
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
$\ln Fis\_expenditure_{it}$	−0.378	−0.019	0.628 **	1.063 ***	0.657 **
	(0.248)	(0.313)	(0.290)	(0.363)	(0.285)
$\ln fix\_investment_{it}$	0.082	0.182	0.176	0.309	0.252
	(0.191)	(0.204)	(0.189)	(0.233)	(0.185)
ind_2_{it}	0.012	−0.014	0.056 **	0.053	0.050 **
	(0.022)	(0.026)	(0.023)	(0.039)	(0.023)
ind_3_{it}	0.005	−0.014	0.047 *	0.068	0.041
	(0.028)	(0.032)	(0.028)	(0.047)	(0.028)
$eco\_openness_{it}$	−0.073 *	−0.058	−0.120 ***	−0.119 **	−0.135 ***
	(0.041)	(0.044)	(0.044)	(0.048)	(0.043)
$\ln con\_land_{it}$.					0.017
					(0.026)
_cons	−1.413	−8.447	−14.357	−15.958 ***	−17.907
	(606.945)	(203.141)	(701.848)	(5.341)	(269.780)
Time effect	Y	Y	Y	Y	Y
Regional effect	Y	Y	Y	Y	Y
N	2770	2770	2712	1939	2770

Notes: figures in parentheses denote the standard errors of the respective coefficients, while ***/**/* indicate significance at the 1%/5%/10% levels, respectively.

4.3. Moderating Effect of Urban Development Pressure on the Uncoordinated Development of Population Urbanization and Land Urbanization Caused by Land Financialization

China has implemented an official selection mechanism focusing on officials' achievements. The indicator that can best reflect the achievement of an official is GDP per capita. Besides this, investment currently remains the major "carriage" driving China's economic growth. Under the pressure of urban economic development, local governments have the impulse to boost investment and regard it as a vital means to promote economic development. Therefore, this study takes the backwardness of cities in terms of GDP per capita and fixed-asset investment relative to their counterparts to measure development pressure.

Hypothesis 2 states that the stimulating effect of land financialization on the uncoordinated development of population urbanization and land urbanization in cities with greater development pressure is more prominent—i.e., the pressure of urban economic development regulates land financialization's stimulating effect on the uncoordinated development of population urbanization and land urbanization. In order to test this hypothesis, the present study constructs Equation 3. If η, the coefficient of interaction term between land financialization and development pressure, is positive, the stimulating effect of land financialization on the uncoordinated development of population urbanization and land urbanization will be more obvious in regions with greater development pressure. Last, under the yardstick competition mechanism, there may be interaction on strategies for land financing among different regions. Therefore, we constructed a Spatial Dubin Model (SDM) to investigate the spillover effect of competition on land financing among different regions. Then, we added the spatial lagged term of land financing size into the regression model to examine whether competition on land financing among different regions affects urbanization unbalance. In terms of weight matrix, we constructed an economic weight matrix based on the GDP per capita of cities from the same province.

According to the result in Table 5, the coefficients of interaction terms are significantly positive in five models. From this, development pressure is constructed based on the GDP per capita in models 1 and 2, while it is constructed based on the proportion of fixed-asset investment in models 3 and 4. Development pressure caused by lagging-behind GDP or fixed-asset investment will intensify the motivation and incentive of local governments to expand urban construction and land development though land financialization. Hypothesis 2 is therefore proved. The regression results in Model 5 and 6 demonstrate emulation strategies for land financing among cities, which further aggravates the degree of uncoordinated development of population urbanization and land urbanization.

Table 5. Estimation results for development pressure, land financialization, and the uncoordinated development of population urbanization and land urbanization.

	Model 1 LPM	**Model 2 PROBIT**	**Model 3 LPM**	**Model 4 PROBIT**	**Model 5 SDM**	**Model 6 LPM**
	Catch-Up Pressure in GDP		**Catch-Up Pressure in Fixed-Assets Investment**		**Yardstick Competition**	
land_financialization	0.010 **	0.041 **	0.011 **	0.046 ***		
	(0.004)	(0.017)	(0.004)	(0.018)		
$GDP\_pressure_{it}$	0.065	0.193				
	(0.151)	(0.647)				
*land_financialization * GDP_pressure*	0.069 ***	0.363 ***				
	(0.025)	(0.112)				
$inv\_pressure_{it}$			0.199 **	1.061 **		
			(0.090)	(0.429)		
*land_financialization * inv_pressure*			0.033 *	0.140 *		
			(0.018)	(0.081)		
*W * land_financialization*					1.617 ***	0.251 **
					(0.225)	(0.113)
_cons	−1.574 **	−17.578	−2.007 ***	−19.402	10.805 **	−9.981 **
	(0.709)	(169.466)	(0.708)	(169.248)	(5.353)	(4.322)

Table 5. *Cont.*

	Model 1 LPM	Model 2 PROBIT	Model 3 LPM	Model 4 PROBIT	Model 5 SDM	Model 6 LPM
	Catch-Up Pressure in GDP		Catch-Up Pressure in Fixed-Assets Investment		Yardstick Competition	
Controls	Y	Y	Y	Y	Y	Y
Time effect	Y	Y	Y	Y	Y	Y
Regional effect	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.319		0.320		0.768	0.164
N	2770	2770	2770	2770	2770	2770

Notes: figures in parentheses denote the standard errors of the respective coefficients, while ***/**/* indicate significance at the 1%/5%/10% levels, respectively.

5. Land Financialization, the Uncoordinated Development of Population Urbanization and Land Urbanization, and Economic Growth

This section analyzes the potential impact of land financialization, which stimulates the uncoordinated development of population urbanization and land urbanization, on urban economic sustainable development to examine the hidden risks behind the development model characterized by debt-based urbanization financialization and supply-driven urban construction.

The essence of urbanization driven by land financialization adopted by Chinese local governments is debt-based urban construction investment (Pan et al., 2017) [18]. During this process, the investment revenue for local governments comes mainly from economic growth due to population and industrial conglomeration. Currently, economic growth is indicated by the added value of secondary and tertiary industry. Therefore, this study, in reference to the practice of Lu (2011), divides the added value of secondary industry and tertiary industry by built-up area to obtain the land use efficiency and uses it to denote investment return on urban spatial expansion [50]. The basic logic here is that if land financialization decreases the land use efficiency, debt-based urban spatial expansion could not generate a scale effect and economic conglomeration. The return on investment is therefore insufficient. This study divides samples into the unbalanced group and the balance group. If land financialization causes a decline in land use efficiency in the unbalanced group compared to the balance group, hypothesis 3 is corroborated. Furthermore, we test whether there exists a threshold value for the effect of land financialization on economic growth—in other words, whether the effect of land financialization on economic growth turns to an inverted U shape.

To test hypothesis 3, we construct the following regression model.

$$land\_use_{it} = \alpha_4 + \beta_4 land\_financialization_{it} + \sum \gamma_4 X_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (8)$$

$$growth_{it} = \alpha_5 + \beta_5 land\_financialization_{it} + \lambda_5 land\_financialization_{it}{}^2 + \sum \gamma_5 X_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (9)$$

where $land_{\mathrm{use}it}$ and $growth_{it}$. denote the land use efficiency and growth rate of GDP per capita, respectively. Control variables include city-level population density ($\ln pop\_density_{it}$), human capital ($human\_rate_{it}$), economic openness ($eco\_openness_{it}$), fiscal expenditure ($\ln Fis\_expenditure_{it}$), fixed-asset investment ($\ln fix\_investment_{it}$), and industrial structure (ind_2_{it} *and* ind_3_{it}).

Table 6 displays the impact of geographical factors on land use efficiency and urban economic growth. According to the regression result of model 1 in Table 6, land financialization lowers the land use efficiency in cities with the uncoordinated development of population urbanization and land urbanization. This might be because land financialization does not generate economic conglomeration or increasing returns to scale. The return on investment is low. The regression results of model 3 indicate that the first-order term of land financialization is significantly positive, while its second-order term is significantly negative. This signifies that the effect of land financialization on economic growth in cities with the uncoordinated development of population urbanization and land urbanization showcases an

inverted U shape. That is to say, after surpassing the threshold value, the effect of land financialization on economic growth will transit from a positive one to a negative one. These characteristics are not found in cities with the coordinated development of population urbanization and land urbanization.

Table 6. Estimation results for land financialization, the uncoordinated development of population urbanization and land urbanization, and sustainable development.

	Model 1	**Model 2**	**Model 3**	**Model 4**
Variables	Land use efficiency		Economic growth rate	
	uncoordinated	coordinated	uncoordinated	coordinated
$land\_financialization_{it}$	−0.006 *	0.005	5.612 **	4.285
	(0.003)	(0.007)	(2.223)	(5.459)
$land\_financialization_{it}$^2			−2.733 **	−2.062
	0.020	0.160	(1.102)	(2.727)
	(0.056)	(0.175)		
$\ln pop\_density_{it}$	0.001 *	0.000		
	(0.000)	(0.000)		
$\ln Fis\_expenditure_{it}$	0.080 *	0.185 **	0.266	1.421
	(0.047)	(0.075)	(1.459)	(3.812)
$\ln fix\_investment_{it}$	0.129 ***	0.101	4.801 ***	2.117
	(0.034)	(0.063)	(1.213)	(1.850)
ind_2_{it}	0.021 ***	0.013		
	(0.004)	(0.008)		
ind_3_{it}	0.019 ***	0.019 **	−0.079	−0.262
	(0.005)	(0.008)	(0.078)	(0.202)
$eco\_openness_{it}$	−0.003	0.010	0.928 ***	0.847 *
	(0.007)	(0.013)	(0.268)	(0.443)
$\ln land\_urban_{it}$			3.581	12.835 *
			(4.519)	(6.517)
$human\_rate_{it}$			1.138 ***	3.095 ***
			(0.301)	(0.919)
_cons	6.640 ***	4.995 ***	−51.324	−85.826
	(0.661)	(1.434)	(34.066)	(62.265)
Adjusted R^2	0.383	0.479	0.551	0.493
N	1850	920	1850	920

Notes: Figures in parentheses denote the standard errors of the respective coefficients, while ***/**/* indicate significance at the 1%/5%/10% levels, respectively.

6. Conclusions and Discussion

Nobel Prize-winning economist David Stiglitz has said that two events of the 21st century will have the greatest impact on the world: "America's high-tech industry and China's urbanization." The rapid development of urbanization in China cannot be separated from the promotion of local governments, and land financialization is an important means for the government to lead the urbanization process. For a long time, the gap between fiscal revenue and expenditure forces local governments to use land to obtain as much extrabudgetary income as possible, and this gradually forms the fiscal situation of relying on land. In recent years, the urbanization financing mode has been transformed from land transfer to land financialization, which has resulted in huge local government debts. By the end of 2019, the local government debt ratio has risen to 24.3%. What impact does this have on the pattern of urbanization?

In this paper, we investigate the effect and mechanisms of land financialization on the uncoordinated development of population urbanization and land urbanization in China for 277 Chinese cities during the period spanning 2006 to 2015. Moreover, the pressure of urban economic development is included as a mediation variable to measure how much it accounts for the effect of land financialization on the uncoordinated development of population urbanization and land urbanization.

Finally, this paper examines the hidden risks behind the development model characterized by debt-based urbanization financialization and supply-driven urban construction.

The three main findings are that, first, land financialization significantly leads to the uncoordinated development of population urbanization and land urbanization. On the one hand, Chinese local governments' dependence on land-based urbanization financialization will intensify their motivation in land development and conveyance, leading to chaotic urban expansion. On the other hand, the expenditure structure of debt-based capital financed through land showcases an obvious orientation towards land urbanization and a weak "pushing" and "pulling" effect on the citizenization of rural-to-urban migrants. Population urbanization is relatively slow.

Second, the pressure of urban economic development positively regulates the stimulating effect of land financialization on the uncoordinated development of population urbanization and land urbanization. In cities with greater development pressure, the stimulating effect of land financialization on the uncoordinated development of population urbanization and land urbanization is more prominent.

Third, urbanization propelled by land financialization is unsustainable, because in regions with the uncoordinated development of population urbanization and land urbanization, land financialization, while promoting urban spatial expansion, lowers the land use efficiency due to weak conglomeration effect and exerts an inverted U-shaped influence on economic growth.

In the Chinese context, this finding is as expected. Since the financial crisis in 2008, local governments of China have established a huge number of financing platform companies, obtained bank loans and issued urban investment bonds through land mortgages or guarantees, and created large-scale invisible local government debts. This debt capital is mainly invested in urban public facilities and land development and becomes significant funding support for urbanization. A unique urbanization financialization model with Chinese characteristics has been gradually formed. This debt-based financialization model, which is highly reliant on land, further intensifies local governments' passion for "operating city" and "operating land", leading to a large-scale movement known as "enclosure for urbanization". Constructions for development zones, new cities, and new areas in various forms are fledgling. However, supply-driven urban construction without the due consideration of demand factors is destined to cause the uncoordinated development of population urbanization and land urbanization, which is unsustainable.

The conclusion of this study carries some policy implications. First, efforts should be made to explore financialization systems that facilitate sound urban development. A local tax revenue system with property tax being the main tax ought to be established during the early days to divert local governments from blind passion about land development. Besides this, a stable input linkage between land financialization and public service supply should be forged to deliver a pulling effect on the citizenization of rural-to-urban migrants. Furthermore, land, population, and industry are the most important elements in economic activities. Sustainable economic development can only be realized when land supply matches the trend of population and industrial conglomeration. The government should set up and improve cross-regional land resource regulating systems and land supply systems. Last, efforts should be made to tighten the budgetary constraints on local governments and to improve the utilization efficiency of debt capital and return on investment, while also establishing management systems that guard against and resolve local debt risks. On the whole, the key to new urbanization lies in population urbanization. The government should emphasize the quality of urbanization, promote integration between cities and industry, and support population conglomeration through enhanced public service to ensure the sustainable development of the urban economy.

Due to constraints in access to data, there are deficiencies in the research results which need further consideration. (1) Limitations in the measurement of variables: The existing studies on land financialization in China usually use urban investment bonds as a proxy variable, while we use the liabilities of local financing vehicles to estimate the scale of land financialization for the first time. There will still be a deviation from the real scale. In follow-up studies, additional micro-data of the

land mortgage of local financing vehicles need to be compiled for further analysis. (2) Not considering the issue in an international context: It is a great challenge to define the boundaries of the urbanization process in the world, since we do not have the data on urbanization and land financialization in the world. To clearly identify the boundaries of the urbanization process in the world needs a great deal of theoretical analysis, logical deduction, and empirical evidence. We therefore chose to study the impact and mechanism of land financialization by local governments on the uncoordinated development of population urbanization and land urbanization in the context of China, following the practice in the literature [4]. We also have added the Spatial Dubin Model (SDM) to investigate the spillover effect of competition on land financing among different regions. Studying urbanization and financialization in an international context needs to be explored and new solutions developed in follow-up research.

Author Contributions: Conceptualization, Y.J. and X.G.; methodology, Y.J., L.W., and S.Z.; validation, Y.J., X.G., and S.Z.; formal analysis, Y.J. and X.G.; data curation, Y.J. and S.Z.; writing—original draft preparation, Y.J., X.G., and S.Z.; writing—review and editing, Y.J., L.W., X.G., and S.Z.; visualization, Y.J. and X.G.; supervision, Y.J.; project administration, Y.J.; funding acquisition, X.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Fundamental Research Funds for the Central Universities, grant number CXJJ-2019-363.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

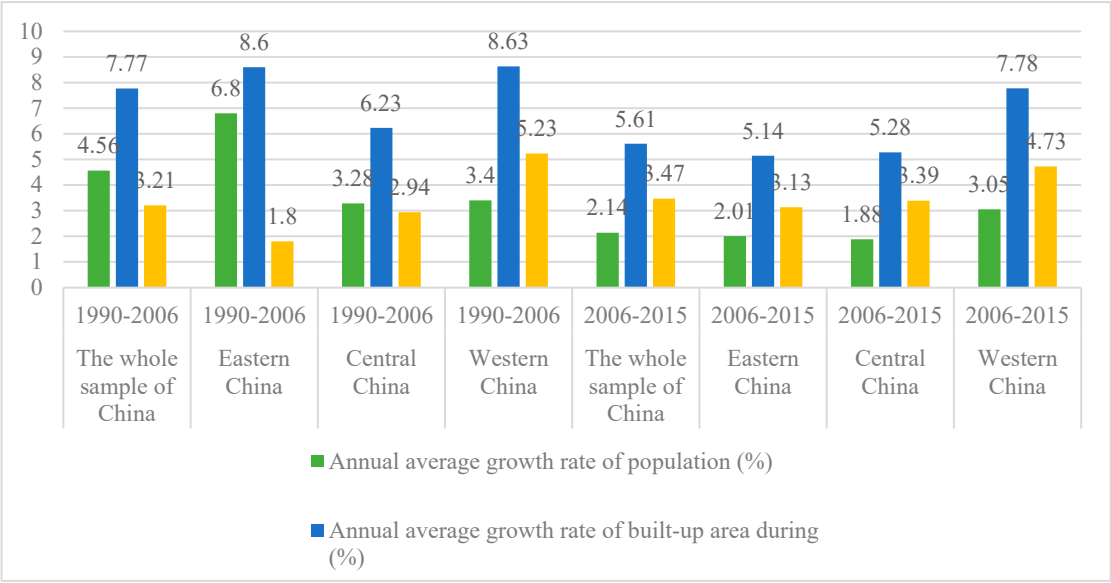

Figure A1. The trends of urban population and built-up area.

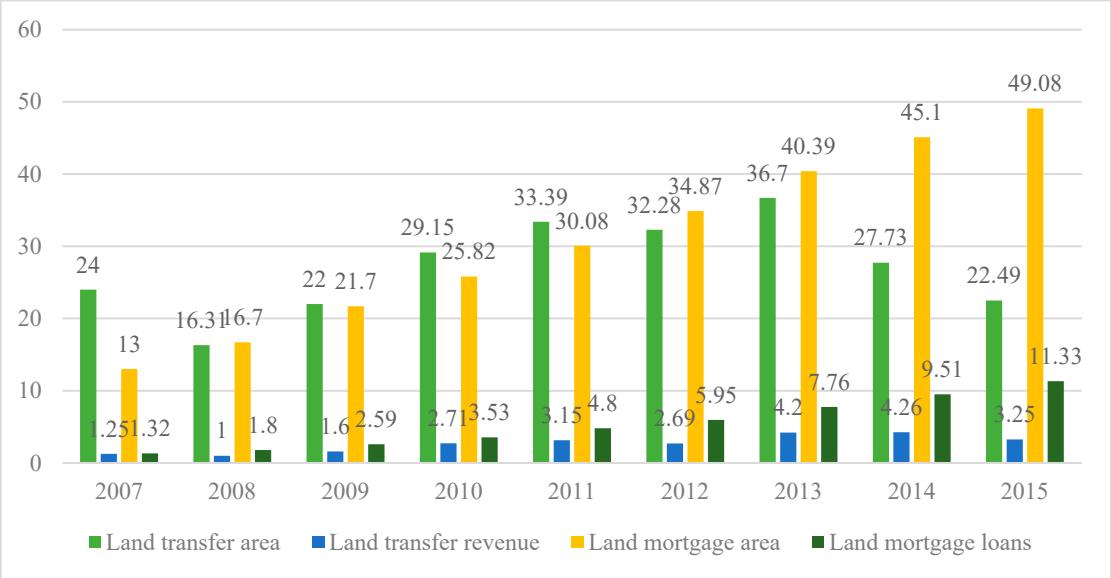

Figure A2. Land transfer and mortgage from 2007 to 2015. Note: data were retrieved from Report on China's Land Resources 2008–2016.

References

1. Duranton, G.; Puga, D. Micro-foundations of urban agglomeration economies. In *Handbook of Regional and Urban Economics*; Elsevier: Amsterdam, The Netherlands, 2004; Volume 4, pp. 2063–2117.
2. Bertinelli, L.; Black, D. Urbanization and growth. *J. Urban Econ.* **2004**, *56*, 80–96. [CrossRef]
3. Fujita, M.; Mori, T. The role of ports in the making of major cities: Self-agglomeration and hub-effect. *J. Dev. Econ.* **1996**, *49*, 93–120. [CrossRef]
4. Ding, C.; Lichtenberg, E. Land and urban economic growth in China. *J. Reg. Sci.* **2011**, *51*, 299–317. [CrossRef]
5. Du, D. The causal relationship between land urbanization quality and economic growth: Evidence from capital cities in China. *Qual. Quant.* **2017**, *51*, 2707–2723. [CrossRef]
6. Zhu, F.K.; Zhang, F.R.; Li, C.; Jiao, P.F.; Wang, J.X. Coordination and regional difference of urban land expansion and demographic urbanization in china during 1993–2008. *Prog. Geogr.* **2014**, *33*, 647–656.
7. Wang, Z.K. *The Imbalance in Regional Economic Development in China and Its Reasons*; Palgrave Macmillan: London, UK, 2015.
8. Gail, J. *Communication and Space*; China Building Industry Press: Beijing, China, 2003.
9. Liu, S. Risks and reform of Land-Based development model. *Int. Econ. Rev.* **2012**, *2*, 92–109.
10. Guan, X.; Wei, H.; Lu, S.; Dai, Q.; Su, H. Assessment on the urbanization strategy in China: Achievements, challenges and reflections. *Habitat Int.* **2018**, *71*, 97–109. [CrossRef]
11. Tan, M.; Li, X.; Xie, H.; Lu, C. Urban land expansion and arable land loss in China—A case study of Beijing–Tianjin–Hebei region. *Land Use Policy* **2005**, *22*, 187–196. [CrossRef]
12. Ye, L.; Wu, A.M. Urbanization, Land Development, and Land Financing: Evidence from Chinese Cities. *J. Urban Aff.* **2014**, *36*, 354–368. [CrossRef]
13. Jin, X.; Long, Y.; Sun, W.; Lu, Y.; Yang, X.; Tang, J. Evaluating cities' vitality and identifying ghost cities in China with emerging geographical data. *Cities* **2017**, *63*, 98–109. [CrossRef]
14. Au, C.-C.; Henderson, J.V. How migration restrictions limit agglomeration and productivity in China. *J. Dev. Econ.* **2006**, *80*, 350–388. [CrossRef]
15. Hertel, T.; Zhai, F. Labor market distortions, rural–urban inequality and the opening of China's economy. *Econ. Model.* **2006**, *23*, 76–109. [CrossRef]
16. Shu, C.; Xie, H.; Jiang, J.; Chen, Q. Is Urban Land Development Driven by Economic Development or Fiscal Revenue Stimuli in China? *Land Use Policy* **2018**, *77*, 107–115. [CrossRef]
17. Jin, H.; Qian, Y.; Weingast, B.R. Regional decentralization and fiscal incentives: Federalism, Chinese style. *J. Public Econ.* **2005**, *89*, 1719–1742. [CrossRef]

18. Pan, F.; Zhang, F.; Zhu, S.; Wójcik, D. Developing by borrowing? Inter-jurisdictional competition, land finance and local debt accumulation in China. *Urban Stud.* **2017**, *54*, 897–916. [CrossRef]
19. Tan, R.; Beckmann, V.; Berg, L.V.D.; Qu, F. Governing farmland conversion: Comparing China with the Netherlands and Germany. *Land Use Policy* **2009**, *26*, 961–974. [CrossRef]
20. Hamnett, C. Is Chinese urbanisation unique? *Urban Stud.* **2020**, *57*, 690–700. [CrossRef]
21. He, C.; Zhou, Y.; Huang, Z. Fiscal decentralization, political centralization, and land urbanization in China. *Urban Geogr.* **2016**, *37*, 436–457. [CrossRef]
22. Sun, J.; Chen, T.; Cheng, Z.; Wang, C.C.; Ning, X. A financing mode of Urban Rail transit based on land value capture: A case study in Wuhan City. *Transp. Policy* **2017**, *57*, 59–67. [CrossRef]
23. Zhang, L.; Nian, Y.; Liu, J. Land market fluctuations and local government debts: Evidence from the municipal investment bonds in China. *China Econ. Q.* **2018**, *17*, 1103–1126.
24. Zheng, S.; Sun, W.; Wu, J.; Wu, Y. Infrastructure investment, land leasing and real estate price: A unique financing and investment channel feo urban development in Chinese cities. *Econ. Res. J.* **2014**, *49*, 14–27.
25. Chen, J.; Wu, F. Housing and land financialization under the state ownership of land in China. *Land Use Policy* **2020**, 104844. [CrossRef]
26. Yuan, F.C.; Kang, H.J. The Imbalance Between Human and Land in the Process of New Urbanization and Its Breakthrough. *J. Chin. Acad. Goverance* **2016**, *4*, 47–52. (In Chinese)
27. Wu, Y.; Pagano, M.A. Municipal Communications Tax Revenue Reliance and Fiscal Impact of Possible Federal Preemption. *Public Budg. Finance* **2008**, *28*, 82–100. [CrossRef]
28. Brehm, S. Fiscal Incentives, Public Spending, and Productivity—County-Level Evidence from a Chinese Province. *World Dev.* **2013**, *46*, 92–103. [CrossRef]
29. Bo, L.; Mear, F.C.J.; Huang, J. New development: China's debt transparency and the case of urban construction investment bonds. *Public Money Manag.* **2017**, *37*, 225–230. [CrossRef]
30. Wu, F. Planning centrality, market instruments: Governing Chinese urban transformation under state entrepreneurialism. *Urban Stud.* **2018**, *55*, 1383–1399. [CrossRef]
31. Lin, G.C.; Li, X.; Yang, F.F.; Hu, F.Z.Y. Strategizing urbanism in the era of neoliberalization: State power reshuffling, land development and municipal finance in urbanizing China. *Urban Stud.* **2015**, *52*, 1962–1982. [CrossRef]
32. Cao, G.; Feng, C.; Tao, R. Local "Land Finance" in China's Urban Expansion: Challenges and Solutions. *China World Econ.* **2008**, *16*, 19–30. [CrossRef]
33. Bai, C.-E.; Hsieh, C.-T.; Song, Z. (Michael) The Long Shadow of a Fiscal Expansion. *SSRN Electron. J.* 2016. [CrossRef]
34. Zhong, T.; Chen, Y.; Huang, X. Impact of land revenue on the urban land growth toward decreasing population density in Jiangsu Province, China. *Habitat Int.* **2016**, *58*, 34–41. [CrossRef]
35. Weber, R. Selling City Futures: The Financialization of Urban Redevelopment Policy. *Econ. Geogr.* **2010**, *86*, 251–274. [CrossRef]
36. Wu, F. Land financialisation and the financing of urban development in China. *Land Use Policy* **2019**, 104412. [CrossRef]
37. Chang, C.; Lu, M. Misery of new town—Density, Distance and Debt. *China Econ. Q.* **2017**, *16*, 1621–1642.
38. Research Group on China's Economic Growth. Urbanization, Fiscal expansion and Economic growth. *Econ. Res. J.* **2011**, *46*, 4–20.
39. Qian, Y.; Roland, G. Federalism and the Soft Budget Constraint. *Am. Econ. Rev.* **1998**, *88*, 1143–1162. [CrossRef]
40. Maskin, E.; Qian, Y.; Xu, C. Incentives, information, and organizational form. *Rev. Econ. Stud.* **2000**, *67*, 359–378. [CrossRef]
41. Besley, T.; Case, A. Incumbent behavior: Vote-Seeking, Tax-Setting, and yardstick competition. *Am. Econ. Rev.* **1992**, *85*, 25–45.
42. Tsui, K.-Y. Local tax system, intergovernmental transfers and China's local fiscal disparities. *J. Comp. Econ.* **2005**, *33*, 173–196. [CrossRef]
43. Zhou, L. Governing China's Local Officials: An Analysis of Promotion Tournament Model. *Econ. Res. J.* **2007**, *7*, 36–50.
44. Zhang, J.; Wang, J.; Yang, X.; Ren, S.; Ranab, Q.; Haocdefg, Y. Does local government competition aggravate haze pollution? A new perspective of factor market distortion. *Socio Econ. Plan. Sci.* **2020**, 100959. [CrossRef]

45. Li, H.; Zhou, L.-A. Political turnover and economic performance: The incentive role of personnel control in China. *J. Public Econ.* **2005**, *89*, 1743–1762. [CrossRef]
46. Fu, Y.; Zhang, Y. Chinese Style Decentralization and Government Spending Bias: The Cost of Growth. *Manag. World* **2007**, *3*, 4–12.
47. Qiao, B.Y.; Fan, J.Y.; Feng, X.Y. Fiscal Decentralization and Compulsory Primary Education in China. *Soc. Sci. China* **2005**, *6*, 37–46.
48. Caldeira, E. Yardstick competition in a federation: Theory and evidence from China. *China Econ. Rev.* **2012**, *23*, 878–897. [CrossRef]
49. Démurger, S.; Sachs, J.D.; Woo, W.T.; Bao, S.; Chang, G.; Mellinger, A. Geography, economic policy, and regional development in China. *Asian Econ. Pap.* **2002**, *1*, 146–197. [CrossRef]
50. Lu, M. Cross-regional redistribution of the right to use Construction Land: A New Driving Force for China's Economic growth. *J. World Econ.* **2011**, *34*, 107–125.
51. Li, Y.; Jia, L.; Wu, W.; Yan, J.; Liu, Y. Urbanization for rural sustainability—Rethinking China's urbanization strategy. *J. Clean. Prod.* **2018**, *178*, 580–586. [CrossRef]
52. Halleux, J.-M.; Marcinczak, S.; Van Der Krabben, E. The adaptive efficiency of land use planning measured by the control of urban sprawl. The cases of the Netherlands, Belgium and Poland. *Land Use Policy* **2012**, *29*, 887–898. [CrossRef]
53. Chen, J.; Zhou, Q. City size and urban labor productivity in China: New evidence from spatial city-level panel data analysis. *Econ. Syst.* **2017**, *41*, 165–178. [CrossRef]
54. Xie, D. Local government competition, Monopolizes land supply and urbanization development imbalance. *J. Financ. Econ.* **2016**, *42*, 102–111.
55. Fred, Y.Y. A quantitative relationship between per capita GDP and scientometric criteria. *Scientometrics* **2007**, *71*, 407–413.
56. Duan, H.; Zhan, J.V. Fiscal transfer and local public expenditure in China: A case study of Shanxi Province. *China Rev.* **2011**, *11*, 57–88.
57. Au, C.-C.; Henderson, J.V. Are Chinese Cities Too Small? *Rev. Econ. Stud.* **2006**, *73*, 549–576. [CrossRef]
58. Qin, D.; Song, H. Sources of investment inefficiency: The case of fixed-asset investment in China. *J. Dev. Econ.* **2009**, *90*, 94–105. [CrossRef]
59. Xiong, C.; Gao, H. The incongruity between population urbanization and spatial urbanization. *Financ. Econ.* **2012**, *11*, 102–108.