VILNIUS TECH
Vilnius Gediminas Technical University

International Journal of Strategic Property Management
ISSN: 1648-715X / eISSN: 1648-9179
2021 Volume 25 Issue 1: 65–75
https://doi.org/10.3846/ijspm.2020.13834

LAND ASSETS, URBAN INVESTMENT BONDS, AND LOCAL GOVERNMENTS' DEBT RISK, CHINA

Juanfeng ZHANG [1,*], Lele LI[1], Ting YU[1], Jie GU[2], Haizhen WEN [3]

[1] *College of Management, Zhejiang University of Technology, 310023, Hangzhou, China*
[2] *School of Public Administration, Zhejiang Gongshang University, 310018, Hangzhou, China*
[3] *Center for Real Estate Studying, Department of Civil Engineering, Zhejiang University, 310058, Hangzhou, China*

Received 12 February 2020; accepted 05 September 2020

Abstract. As the collateral for the issuance of urban investment bonds (UIBs), land leasing revenue is the fund that is used to repay the debt with large-scale land hoarding and increasing land price due to China's rapid urbanization. This paper employs the fixed effect model and panel data from 2006 to 2015 to analyze the influence of land hoarding and price on debt scale and risk of local governments. Results reveal that both land hoarding scale and land price exhibit a positive influence on the UIBs' scale and risk. However, regional differences are evident. In the Eastern region, the correlation between land asset and UIBs can be testified.

Keywords: land assets, debt risk, land price, urban investment bonds, local government, China.

Introduction

After China's tax-sharing reform between central and local governments in 1996, high-quality tax sources are allocated to the central government, thereby affecting the fiscal revenue of local governments (Hu, 1998; Zheng et al., 2014). Under the new tax-sharing system, the local governments' tax resource and revenue were reduced. However, the expenditure in local public goods and service increased. The imbalance between fiscal revenue and expenditure has inevitably increased financial pressure on local governments (Wong, 2000; Chen, 2008; Chen & Liu, 2015; Liu & Zhao, 2011; Tanya et al., 2017). Therefore, local governments should find new revenue sources to complete substantial economic development plans and supply public goods (Ho & Lin, 2003; Huang & Chan, 2018). The emergence of urban land market has encouraged the local governments to recognize the value of land resources that are controlled and managed by municipal authorities. Local governments hold land acquisition and land leasing rights and thus use land revenue to stimulate regional economic development (Sun & Zhou, 2014; Wu et al., 2015a; Xu, 2019; Zhang et al., 2019a).

After the establishment of China's land bank system in 2007, local governments have monopolized the constructive land supply in urban region. On the one hand, land leasing revenue becomes an important supplement fund as a capital for infrastructure projects. On the other hand, land assets are guarantees for local government to issue urban investment bonds (UIBs). Land prices play a crucial role in the UIBs' repaying process, which affects the local governments' land leasing revenue (Zhang et al., 2017a; Wang & Ye, 2016; Zhang et al., 2019b). Since 2004, the proportion of land leasing revenue in local fiscal revenue illustrates a rising trend, with an average annual proportion of more than 30%. Rapid urbanization requires an increasing expansion of infrastructure construction. Local governments pursue the maximization of land revenue to compensate for the fiscal deficit. They are inclined to hoard and sell land assets depending on the timing of high land price to capture maximum of profit (Cao et al., 2008). Thus, economic development and rapid urbanization are accompanied by large-scale land hoarding and soaring land price. In 2015, 76,200 hectares added land was hoarded by China's local governments. Land hoarding by local governments could cause land speculation and consequently raise land price, which would trigger a real estate bubble and social problems (Zheng et al., 2014).

Land assets have become the local governments' tool to obtain revenue and financing leverage for infrastructure construction (Tsui, 2011). The debt financing mode of local governments is popular. Figure 1 indicates that

*Corresponding author. E-mail: *juanfengzh@hotmail.com*

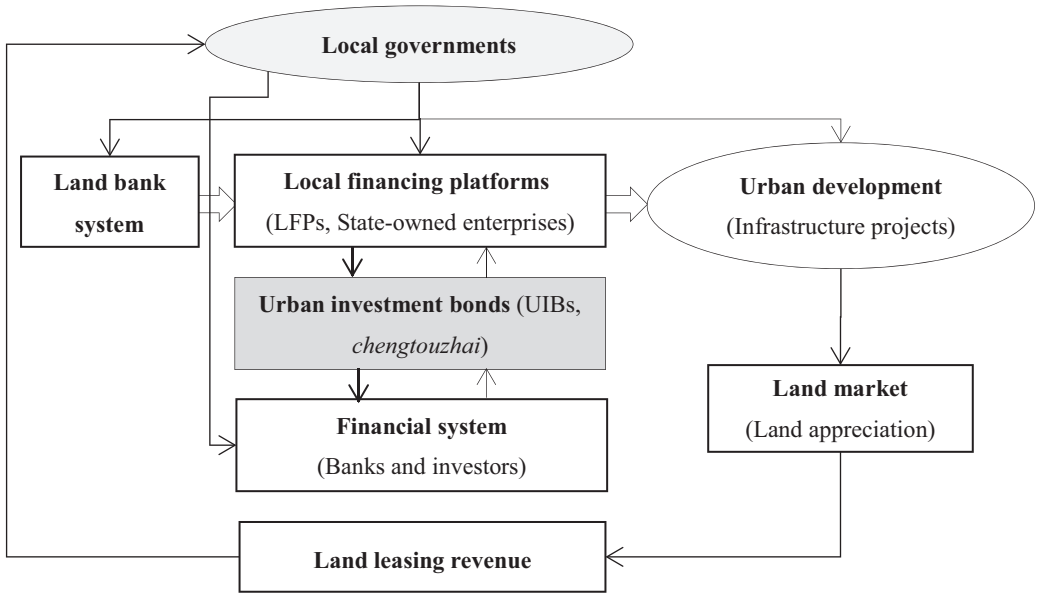

Figure 1. China's UIBs issuance and repayment process

state-owned enterprises (SOEs) are established as local financing platforms (LFPs). Land is used as collateral to issue UIBs to obtain money from financial system. UIBs (*chengtouzhai*), which are known as "quasi-municipal bonds," are corporate bonds issued publicly by SOEs to support local infrastructure construction. The *China's Wind Database* reports that 2,854 new UIBs were issued in 2018, and the total amount of the UIBs has reached 2 trillion yuan.

Funds obtained by local governments through LFPs are mainly used for infrastructure construction and urban land development. Thus, SOEs must repay the debts through the land leasing revenue. If land prices do not rise, then local governments and LFPs would face pressure from repayment and thus results in uncontrollable risks. If local governments take immense land as mortgage to obtain funds and the land market enters depression period, then bond risk would rapidly increase. In the financial system, default risks increase when government-invested infrastructure projects are not profitable and exhibit poor solvency. The debt risk of UIBs rapidly changes the bank system and local governments, thereby damaging social economy and the urban sustainable development (Pan et al., 2017).

Local governments use land assets to pay back the UIBs and counteract debt risk. UIBs aim to invest in urban infrastructure projects, which are closely related to land value. This study analyzes the influence of land hoarding area and land prices on local debt risk among 31 provinces, from 2006 to 2015. Compared with existing literature, the main contributions of this study are as follows. First, in addition to socio-economic, demographic, financial and political factors, this paper analyzes the impact of land assets on local debt scale and risk. The new framework is proposed for the analysis of local debt influencing factors. Second, the influence of local governments' land speculation on local debt risk is verified. When hoarding a lot of land, local governments tend to issue more urban investment bonds. And the risk of urban investment bonds also increases. It benefits local governments to adjust management policies, take preventive action, and avoid debt crisis. Third, the regional difference of land hoarding and land price on debt risk are tested. Land speculation of local governments has different effects on the scale and risk of urban investment bonds in different regions.

The remainder of this paper is organized as follows. The first section reviews the literature. The second section introduces the data variables and empirical models. The third section reports and discusses the empirical results and regional heterogeneity. The final section presents the conclusion.

1. Literature review

Since the Second World War, urbanization has played a key role in promoting economic development and social change, while most developing countries have been promoting urbanization (Bloom et al., 2008; Long et al., 2012). China has also experienced unprecedented urbanization since the late 1970s. The urban population in China has increased from 172 million in 1978 to 830 million in 2018. Thus, China's urbanization rate has increased by approximately 1% every year, from 17.92% in 1978 to 59.58% in 2018. Socioeconomic development demands infrastructure construction, such as highways, subways, schools, and hospitals, to maintain the normal operation and development of cities (Harvey, 1978). However, infrastructure construction and operation are expensive and require substantial amount of funds (Lin & Yi, 2011; Cai et al., 2019).

Local governments need to seek for additional revenues to maintain the balance of local finances. The competition pressure pushes local governments to land finance (*tudi caizheng*) (Lin & Yi, 2011; Wu et al., 2015b; Xu, 2019). Land assets are effective collateral for local governments to raise funds for achieving ambitious urbanization goals (Wang et al., 2018; Tu & Padovani, 2018). Land development and leasing revenue are the means to generate fiscal revenue and promote economic growth. Such strategy has greatly contributed to industrialization and urbanization (Wu et al., 2016b; Bao & Peng, 2016; Liu et al., 2016).

In China's land bank system, land leasing revenue, land-related tax, and land mortgage are taken as "land finance" (Wang et al., 2018; Gao, 2019). On the one hand, China's land ownership is divided into urban state-owned and rural collective-owned land. Local governments have the right to requisition rural collective land at low prices for urban development. The local governments lease land use rights to commencers through bidding, auction, and listing. The land leasing revenue is used to invest in new infrastructure projects (Cheng et al., 2018). On the other hand, to satisfy fiscal debt, local governments establish LFPs to obtain loans from commercial banks and investors (Lu & Sun, 2013; Pan et al., 2017). UIBs exceeded bank loans and became the main financial resources of local governments, and LFPs' bonds accounted for the largest share in investment (Tsui, 2011). UIBs become the main source of local urban construction funds, and land is the main asset of LFPs' collateral for bonds (Wang & Hui, 2017).

Land speculation and the immense hoarding of land assets for large-scale borrowing occur. The scarcity and non-renewability of land lead to the inelasticity of supply, which makes speculation easy. Land speculation is a widespread economic phenomenon in urbanization, in which speculators strategically hoard land in advance to obtain high future profits. Given the prosperity, recession, and depression in the economic cycle, a wide range of land speculation has been prevalent worldwide (Hyman & Markowski, 1980; Tewfik, 1989). Land speculation activities objectively support the urban development process and maintain economic vitality (Rancich, 1970; Firman, 2000). Some studies have proved that land speculation is a factor for real estate price volatility and assets' bubble. Land speculation is consistently accompanied by land hoarding, which directly affects land supply (Goodman & Thibodeau, 2008).

Neutze (1970) documented that land speculation strategy aims to hoard undeveloped, potential, and readily tradable land to obtain high profits. However, the instability of the land value generates unpaid risk to UIBs. As the main driving force, land finance has promoted land-centered urbanization to compel China's economic development, but the practice exhibited negative impact on social development, such as housing poverty, real estate price bubble, and debt risk (Feng et al., 2019). If land prices constantly rise, then local governments can obtain loans or issue UIBs to support their development plans (Wu et al., 2015a). However, potential depression on the land market may impair the solvency of local governments.

In 2010, The *China State Council* issued a policy to strengthen the management of LFPs and the supervision of LFPs bond risk. The reduction of land leasing revenue threatens local governments' repayment and endangers China's bank system (Peng, 2011). The downturn of land and real estate market can potentially trigger a local debt crisis (Wu et al., 2016a; Cao et al., 2014). In China's rapid urbanization, the debt risk of local governments is perceived to be on the verge of collapse (Wu et al., 2017; Geng et al., 2018; Liu et al., 2018; Wang et al., 2018). Although China's land bank system has provided substantial funds to support infrastructure construction in past decades, the risk and unsustainability yield serious financial and debt crisis that could endanger social stability and disrupt future development (Cai et al., 2019).

Some studies find that socio-economic, demographic, fiscal, land finance, and political indicators have impact on local government debt. The higher the unemployment rate is, the higher the debt will be (Liu et al., 2017; Faulk & Killian, 2016). The wage has a negative impact on local debt and GDP per capita is a negative impact on the debt risk (Veiga & Veiga, 2014; Cooray et al., 2017). Population size and population density have a positive impact on local debt (Faulk & Killian, 2016). The demographic structure, such as the proportion of the 65-year-old population in the total population, has different effects on debt in different regions (Bellot et al., 2017).

The balance of local revenue and expenditure and the ratio of public budget to GDP have a negative impact on the debt risk. Fiscal concentration has a negative impact on local government debt scale (Galiński, 2016; Liu et al., 2017). Based on land finance, the influence of proportion of urban land use on debt scale is negative. The amount of land leasing revenue is positively correlated with the debt scale. The countries with higher levels of public corruption have higher local debt scale. Competition between local governments in infrastructure and economic development will increase debt scale (Liu et al., 2017; Cooray et al., 2017; Pan et al., 2017).

Land finance and debt risk is a popular issue in China's rapid urban development, which is affected by many factors. This study attempts to explore the relationship between land leasing and governments' debt risks in China's land marketization.

2. Data, variables, and methods

2.1. Research area and data source

This study analyzes the UIBs, land market, and economic development of 31 provinces from 2006 to 2015. Data of the GDP, per capita GDP, local fiscal revenue, fixed asset investment, secondary and tertiary industry added value, and employment growth were obtained from *The China Statistical Yearbooks* (2006–2015). Provincial land bidding, auction and listing, approval quotas of residential land,

residential land purchase area, and land price were obtained from *The China Land and Resources Statistical Yearbooks* (2006–2015). The land price and per capita GDP, as well as the local financial revenue and transaction price are measured in Chinese yuan, and the unit of land area is hectare.

UIBs data are from *the China's WIND Data Bank*. To improve the data accuracy, this study analyzed the bond data of LFPs. Moreover, 2,419 LFPs from 2006 to 2017 were obtained, and 13,926 UIBs data were collected. The unit of UIBs is 100 million Chinese yuan. To eliminate the effect of inflation and reflect the actual change of variables with 2006 as the research base year, the data of money value variables from 2006 to 2015 were reduced to 2006 according to the corresponding index, and the index data sources are from the *2006–2015 China Statistical Yearbooks*.

2.2. Descriptive statistics and definitions of the variables

Owing to unavailability of data, existing research about UIBs used qualitative analysis (Tsui, 2011). This paper selected UIBs scale and risk as the explained variables and tested the land hoarding area and residential land price effect. The data of the secondary and tertiary industry added value, fixed asset investment, employment growth, per capita GDP, and land financial dependence, government intervention, and the degree of land marketization that affected local government's land behavior were the control variables. Table 1 indicates the quantitative methods and descriptive statistics of each variable.

Urban investment bonds (*UIBonds*) are also known as "quasi municipal bonds," which are issued by SOEs. UIBs are corporate bonds for local infrastructure construction or public welfare projects. The size of UIBs is the dependent variable in the study.

Debt risk (*DRisk*): Fan and Lv (2012) used the debt ratio (total debt / GDP) as a risk measurement indicator, and believed that debt ratio remains below 50% was manageable. Ma (2013) provided the viewpoint that the proportion of debt scale to GDP is close to 60%, which was regarded as a risk warning line. Based on previous literature, we use the ratio of the UIBs' scale and GDP to express the debt risk and measure the bearing capacity of the local economy's total scale to local debt. The larger the value is, the higher the governments' fiscal risk will be.

According to Baldacci et al. (2011), the debt risk index is constructed, which is expressed as follows. Debt risk is measured by the ratio of the total amount of UIBs of provincial region every year, GDP is the annual GDP of the region, g^d represents the growth rate of local UIBs, g^g represents the growth rate of nominal GDP, and t is the observed year.

$$DRisk = UIBonds\left(1+g^{d}\right)^{t} / gdp\left(1+g^{g}\right)^{t}. \quad (1)$$

Land hoarding area (*LHArea*): According to Du and Peiser (2014), land hoarding area can reflect land speculation by local governments. Land hoarding area is an indicator of the hoarded land size and is determined by using the difference between the approved quota and actual trading volume. The potential land supply is measured by the indicator of approved quota from the central government. Actual land trading volume by the developers is regarded as the actual land selling amount. The former minus the latter generates the current scale of local government land hoarding.

Land price (*LPrice*): According to Pan et al. (2017), the land leasing revenue of local governments has a positive impact on the debt scale. The land price of each province is obtained by dividing the land transaction amount by land trading area, which was purchased by developers. Local governments sell land use rights in the form of tendering, auction, and listing.

Land hoarding value (*LHValue*): This variable is an interactive term between the land hoarding area and land price, which reflects the value of the land hoarded by local governments. Land hoarding value is obtained by multiplying the land hoarding area by the land price.

Secondary and tertiary industry added value (*Gstgdp*): Fiscal revenue and regional economic vitality will affect the issuance of UIBs (Pan et al., 2017). This variable reflects the economic vitality of one year. The service industry value indicates urban economic growth. Therefore, urban economic growth can indirectly reflect the expectation of developers who purchase land and the motivation of the governments that hoard land. The annual output value of the industrial and service industries can be obtained from the *China Statistical Yearbooks*.

Fixed asset investment (*FAInvest*): According to Wu et al. (2016a), holding Mega-events will promote local governments to increase urban sports facilities and infrastructure construction, leading to an increase in fixed asset investment, thereby exacerbating local government debt. This variable includes capital construction, renovation, major repairs, and other fixed asset investments. The annual statistics of urban fixed assets investment in each province can be obtained from the C*hina Statistical Yearbooks*.

Employment growth (*EGrowth*): Employment situation can have a certain impact on debt issuance. The higher the unemployment rate is, the higher the debt scale will be. This paper uses employment growth to reflect the employment situation (Liu et al., 2017; Faulk & Killian, 2016). Employment growth is the number of employed people in the current year minus the employed population in the previous year.

Per capita GDP (*PCgdp*): According to Coolay et al. (2017), GDP per capita has a negative impact on the debt risk. This variable reflects the level of regional economic development and indirectly affects the scale of UIBs. Local governments need supply for the infrastructure projects. The annual per capita GDP of each province in China can be obtained using the *China Statistical Yearbooks*.

Land finance dependence (*LFDepend*): Land finance has become the main revenue of local government. Therefore, land financial dependence may affect land leasing behavior and the scale of bonds issued by local government.

Table 1. Descriptive statistics of the variables

Type	Variable	Unit of measure	Mean	Middle	Max	Min	Std. Error
Explained variables	*UIBonds* (Total UIBs)	Hundred million Chinese dollar	166.900	62.850	2860.000	0.000	291.600
	DRisk (Debt scale risk)	Percentage	37.910	19.490	325.000	0.000	48.020
Explanatory variables	*LHArea* idle (Land hoarding area)	Ten thousand square meter	1133.000	706.300	7358.000	–3220.000	1479.000
	LPrice (Land price level)	Chinese dollar	2328.000	1613.000	25665.000	0.000	2814.000
	LHValue (Land hoarding value)	Million Chinese dollar	2.700	1.200	1.900	–5.700	3.980
	Gstgdp (Second and third industry added value)	Hundred million Chinese dollar	14036.000	11000.000	69467.000	239.900	12920.000
	FAInvest (Fixed asset investment)	Hundred million Chinese dollar	9358.000	6960.000	47382.000	200.700	8438.000
	EGrowth (Employment growth)	Ten thousand person	21.030	8.000	672.400	–53.800	61.090
	PCgdp (Per capita GDP)	Chinese dollar	36406.000	32000.000	107960.000	5932.000	21565.000
	LFDepend (Land financial dependence)	Percentage	0.461	0.430	1.400	0.000	0.239
	GInterven (Government intervention on land market)	Percentage	0.243	0.120	1.840	0.000	0.269
	DLMarket (Degree of land marketization)	Percentage	0.974	0.670	7.590	0.080	1.048

Notes: The data is derived from the *China Statistical Yearbooks (2006–2015);* Provincial land bidding, auction and listing, approval of residential land area, residential land purchase area, and transaction price are derived from the *China Land and Resources Statistical Yearbooks (2006–2015).*

Land financial dependence is the ratio between the land leasing revenue and the total local government's revenue in the current year.

Government intervention on land market (*GInterven*): The supply of state-owned construction land is mainly derived through allocation, transfer, lease, and other land supply methods. Allocated land is state-owned land use right acquired gratis after government approval according to law. Government regulation on the land market can affect house prices and land prices. Under China's land bank system, land supply is a powerful tool that could intervene urban development. The proportion of allocated land indicates the government's intervention in the land market. The administrative allocation/transfer of land area reflects the direct intervention of local governments in land transfer.

Degree of land marketization (*DLMarket*): This variable refers to the area allocated by the government to the transfer scale reflecting the relative degree of liberalization of the regional land market. A high indicator value indicates a low degree of land marketization in the region. The high degree of land marketization indicates highly competitive urban land market. This paper measured the degree of land marketization by the proportion of the contracted transferred area in the supply of state-owned construction land to the total transferred land area (Wen et al., 2018; Wang & Hui, 2017; Hu & Qian, 2017; Zhang et al., 2017b).

2.3. Models and hypotheses

The mixed-, random-, and fixed-effect models are the three types of panel data models. The null hypothesis of the F test supports the mixed-effects model. The alternative hypothesis supports the fixed-effects model. Table 2 reflects the test results of the F statistics. Based on the F statistics of UIBonds and DRisk models, the P value is 0.000. Therefore, the null hypothesis is rejected at the 1% significance level, and the fixed-effect model is supported.

Hausman test was used to select between the random- and the fixed-effect model. The null hypothesis of Hausman test posits that the random-effect model is best among the aforementioned models. The alternative hypothesis states that the fixed effect is the best model among the aforementioned models. If χ^2 value is greater than the critical value, then the null hypothesis is rejected.

Table 3 reveals that the P values of the Hausman test in UIBonds and DRisk models are likewise 0.000. Thus, the

Table 2. F test of mixed- and fixed-effect models

Model	UIBonds model	DRisk model
F statistics	5.790	5.360
P-value	0.000	0.000

Note: Total UIBs are the dependent variables in the UIBonds model and the debt scale risk is the dependent variable in the DRisk model.

Table 3. Hausman test of random effects and fixed effect models

Model	UIBonds model	DRisk model
χ^2	31.050	43.580
P-value	0.000	0.000

Note: Total UIBs are the dependent variables in the UIBonds model and debt scale risk is the dependent variable in the DRisk Model.

null hypothesis is rejected at the significance level of 1%. The test results indicated that the panel fixed-effect model should be used for estimation.

Based on F and Hausman tests, the double fixed effect model is adopted to examine the influence of land hoarding and land price on UIBs' scale and risk. Formula 2 presents the empirical model.

$$y_{it} = \beta_0 + \beta_1 LHArea_{i,t-1} + \beta_2 LPrice_{i,t-1} + \beta_3 LHValue_{i,t-1} + \beta x_{it} + u_i + u_t + \varepsilon_{it}, \quad (2)$$

where: y_{it} is UIBs' scale (*UIBonds*) and UIBs' risk (*DRisk*) of *i* province in *t* year; $LHArea_{i,t-1}$ is the residential land hoarding area of *i* province in *t*–1 year; $LPrice_{i,t-1}$ is land price level for residential land of *i* province in year *t*–1; $LHValue_{i,t-1}$ is the total value of hoarding land of *i* province in year *t*–1; x_{it} is a set of socioeconomic variables that affect issuance of UIBs, including level of economic development (per capita GDP), employment growth, land financial dependence, government intervention, and the degree of land marketization; u_i is the fixed effect of regions; u_t is the time effect; ε_{it} is the random error term. This paper attempts to test the influence of the scale of land hoarding, price level, and land value on the scale and risk of UIBs. Three hypotheses are presented below.

Hypothesis 1: The land hoarding scale by local governments exhibits a positive influence on UIBs' scale and risk. The large hoarded land size highly guarantees that local governments can repay their debts.

Hypothesis 2: Land price exhibits a positive influence on UIBs' scale and risk. High land price in *t*–1 term increases the debt that local governments will issue. Thus, the risk of local debt increases.

Hypothesis 3: Regional difference exists in the relationship between land hoarding scale, land price and UIBs scale and risk. Comparing to the Central and Western regions, the economic vitality of the Eastern region is strong and the land market price is relatively high. Therefore, it is expected that the land price is likely to rise, leading to land speculation in the Eastern region, and local governments are more inclined to issue UIBs.

3. Results

3.1. Empirical results

Before empirical work, some tests about the data, such as Hausman test, Variance Inflation Factor test, and Levin-Lin-Chu test, are done to ensure the reliability of the results. The fixed-effect model is selected to examine the three hypotheses with the 31 provincial-level panel data from 2006 to 2015. Table 4 shows the results of the UIBonds scale models.

In model 4, the adjustment R^2 is 0.735. Thus, 73.5% of the changes can be explained by the explanatory variables selected. Furthermore, the model's explanatory power is strong. The residential land hoarding area is positive on the debt scale of local governments. Table 4 shows that the residential land hoarding area is positive on UIBs' scale and statistically significant at the 10% level of significance, with a coefficient value of 0.237. The increase of residential land hoarding by local governments increases the issuance of UIBs' scale. The land price is also positive on UIBs' risk and statistically significant at the 5% level of significance, with a coefficient value of 0.281. So, the land asset and its price can impact the UIBonds' scale.

Table 5 reflects the *DRisk* models' results. Evidently, risk is the explanatory variable. In model 8, the adjustment R^2 of the models is 0.736, which indicates that 73.6% of the changes can be explained by the explanatory and

Table 4. Estimation results about UIBs' scale models

Variable	Model 1	Model 2	Model 3	Model 4
LHArea	0.035*			0.237*
	(1.570)			(1.700)
LPrice		0.230**		0.281**
		(1.890)		(1.740)
LHValue			0.012	−0.104
			(0.730)	(−1.530)
Gstgdp	0.686*	0.587	0.679*	0.574
	(1.680)	(1.420)	(1.660)	(1.380)
FAInvest	1.290***	1.388***	1.337***	1.247***
	(3.320)	(3.710)	(3.46)0	(3.180)
EGrowth	−0.000	0.000	−0.000	−0.000
	(−0.010)	(0.020)	(−0.010)	(−0.070)
PCgdp	−1.398*	−1.391*	−1.367*	−1.579**
	(−1.880)	(−1.860)	(−1.840)	(−2.090)
LFDepend	0.180***	0.147***	0.171***	0.205***
	(2.490)	(2.400)	(2.470)	(2.560)
GInterven	0.249	0.288	0.249	0.286
	(0.510)	(0.590)	(0.510)	(0.580)
DLMarket	−0.157	−0.157	−0.156	−0.148
	(−1.180)	(−1.170)	(−1.170)	(−1.100)
Constant	−0.742***	−2.149***	−1.307***	0.476***
	(−2.110)	(−2.310)	(−2.190)	(2.070)
Province effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
N	310	309	310	309
Adj. R^2	0.737	0.734	0.736	0.735
F	36.654	36.485	36.532	32.949

Notes: ***, **, and * denote variables that are statistically significant at the 1%, 5%, and 10% levels of significance, respectively. The values of *t* are enclosed in parentheses.

Table 5. Estimation results about UIBs' risk models

Variable	Model 5	Model 6	Model 7	Model 8
LHArea	0.055***			0.043**
	(3.530)			(3.120)
LPrice		0.007**		0.023**
		(2.010)		(2.540)
LHValue			0.014	–0.000
			(0.290)	(–0.380)
Gstgdp	2.178*	2.136*	2.161*	0.000
	(1.710)	(1.650)	(1.700)	(0.520)
FAInvest	2.324*	2.514**	2.422**	0.032***
	(1.920)	(2.150)	(2.010)	(5.780)
EGrowth	0.004	0.003	0.004	0.009
	(0.300)	(0.270)	(0.290)	(1.460)
PCgdp	–3.682**	–3.612**	–3.631**	–0.018**
	(–2.590)	(–2.550)	(–2.570)	(–2.520)
LFDepend	–0.187	–0.194	–0.199	2.307
	(–0.160)	(–0.170)	(–0.180)	(0.420)
GInterven	0.099	0.092	0.098	2.648
	(0.070)	(0.060)	(0.060)	(0.640)
DLMarket	–0.194**	–0.174***	–0.188***	–4.186***
	(–2.470)	(–3.420)	(–3.450)	(–3.430)
Constant	4.898***	3.319**	3.866**	22.588**
	(2.230)	(2.150)	(2.180)	(2.010)
Province effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
N	310	310	310	310
Adj. R^2	0.677	0.677	0.678	0.736
F	12.335	12.258	12.313	10.998

Notes: ***, **, and * denote variables that are statistically significant at the 1%, 5%, and 10% levels of significance, respectively. The values of *t* are enclosed in parentheses.

control variables. The influence of residential land hoarding area on the UIBs' risk is 0.043, which is positive and statistically significant at the 5% level. Hence, the increase of residential land hoarding would encourage an increase in UIBs' risk. The land price is also positive on UIBs' risk and statistically significant at the 5% level of significance, with a coefficient, 0.023. So, the land asset's price can impact the debt risk.

Tables 4 and 5 reveal that the influence of land hoarding scale, land price on the UIBs' scale and risk is positive and statistically significant. Therefore, the increase in scale and price increases the issuance scale of UIBs, thereby rising UIBs' risk. Therefore, when the land price of residential land rises, the risk of UIBs also increases. Thus, the land price rise enhances the local government's ability to finance land assets. Infrastructure construction needs a considerable amount of funds. The investment in fixed assets and the development of secondary and tertiary industries are intensified. Hence, local governments have increased motivation to issue bonds to fulfill the financing needs brought by economic development.

3.2. Regional difference

In China, significant differences are noticeable in the economic development among different regions. This regional difference affects the UIBs' scale and risk. To investigate this difference, the samples were divided into Eastern and Central and Western regions for analysis. According to the criteria of the *China National Bureau of Statistics,* the Eastern region comprised 10 provincial-level regions, including *Beijing, Tianjin, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, and Hainan*. The Central and Western regions consisted of 21 provincial-level regions, including *Liaoning, Jilin, Heilongjiang, Shanxi, Anhui, Jiangxi, Henan, Hubei, Hunan, Inner Mongolia, Guangxi, Gansu, Sichuan, Guizhou, Yunnan, Shaanxi, Chongqing, Ningxia, Xinjiang, Qinghai,* and *Xizang*.

In Table 6, the results present that the influence of land hoarding is positive and statistically significant at

Table 6. Estimation results of Eastern and Central and Western regions

Variable	Eastern region		Central and Western region	
	UIBonds model	DRisk model	UIBonds model	DRisk model
LHArea	0.380*	1.026**	0.219	0.327
	(1.920)	(2.330)	(1.040)	(0.470)
LPrice	0.411**	0.212*	0.102	0.092
	(1.690)	(1.13)	(0.300)	(0.07)
LHValue	–0.135	–0.288	–0.102	–0.175
	(–1.43)	(–1.53)	(–0.91)	(–0.49)
Gstgdp	0.020***	2.811***	1.089***	2.833***
	(2.020)	(2.960)	(2.200)	(2.770)
FAInvest	3.152	5.142	0.802	1.024
	(1.800)	(0.950)	(1.380)	(0.670)
EGrowth	0.001	0.010	–0.001	0.005
	(0.160)	(0.790)	(–0.10)	(0.260)
PCgdp	–6.135**	–17.419***	0.431	–1.217
	(–2.79)	(–3.69)	(0.270)	(–0.22)
LFDepend	0.366**	0.524*	–0.380**	–0.998*
	(1.400)	(1.210)	(–1.68)	(–1.56)
GInterven	0.309	–1.317	0.582	0.901
	(0.410)	(–0.45)	(0.610)	(0.280)
DLMarket	–0.659**	–0.418**	–0.091**	–0.036**
	(–2.170)	(–2.220)	(–2.710)	(–2.090)
Constant	35.615***	117.346**	–18.164***	–13.215***
	(3.640)	(2.630)	(–3.300)	(–3.270)
Year effect	Yes	Yes	Yes	Yes
N	110	110	199	199
Adj. R^2	0.674	0.359	0.758	0.569
F	–	–	265.949	202.256

Notes: ***, **, and * denote variables that are statistically significant at the 1%, 5%, and 10% levels of significance, respectively. The values of *t* are enclosed in parentheses.

the significance level of 10% and 5% in the Eastern region. The coefficient is 0.38 and 1.026. Therefore, the UIBs scale and risk will continue to expand given the expansion of land hoarding scale. In addition, the influence of land price on UIBs' risk is positive and statistically significant at the different significance levels. The coefficient value is 0.411 and 0.212. Therefore, the UIBs' risk of local governments would continue to expand given rising in land price. However, the estimation results of samples from the Central and Western regions show no statistically significant relationship among land hoarding scale and price, hoarding land value on UIBs' scale, and risk.

Discussion and conclusion

Results discussion

Using the regional economic data among China's 31 provincial-level regions from 2005 to 2016, this paper employed fixed-effect models to test the UIBs' scale and risk and their influence factors. This study focuses on the land hoarding scale and land price's effect, which is controlled by local governments in China.

Hypothesis 1 is verified. The land hoarding area by local government has positive influence on the UIBs' risk. Hence, funds for local debt repayment are obtained from land leasing revenue and land tax income. When local governments have sufficient land assets, their repayment ability is strong in the future. The guarantees, namely land assets, can be used to repay debts. However, UIBs are hidden debts for local governments, and the debt repayment relies on land revenue. The debt repayment sources are based on the expectation of rising land prices. If the land price falls, it will be difficult for the LFPs to repay, and the debt risk will be transferred to the local government. The local government must use other resources to repay.

Hypothesis 2 is proven. The residential land price exhibits positive influence on UIBs' risk. This is similar to the results of Pan et al. (2017). High land sale price in the term t–1 indicates high expectation from the local government on the income from land leasing. Therefore, land revenue increases stability. Local governments are likely to issue bonds. But land asset is an important source of local government. Due to the limited and non-renewable nature of land resources, urban development supported by land finance is unsustainable. Local governments need to seek new sources of funding to promote urban development.

Hypothesis 3 is also verified. The relationship between land assets and UIBs is positive in the Eastern region. However, this close relationship is unapparent in the Central and Western regions. The economic vitality of the Eastern region is higher, and the economic development level and the land market price are relatively higher than other two regions. In Table 6, the results present that the influence of secondary and tertiary industry added value is positive in the Eastern and the Central and Western regions. Pan et al. (2017) research also shows that regional economic performance positively affects the local governments' tendency to issue debt. In our results, land hoarding and land prices have no significant impact on the scale and risks of UIBs in the Central and Western regions, which may be due to the lower financing pressure caused by urban infrastructure construction than the Eastern regions. The level of economic development and land prices are relatively low, and expected land prices are less likely to rise in the Central and Western regions.

In addition, the empirical results show that local government fixed asset investment has a positive impact on the issuance scale and risk of UIBs, which confirms Wu et al. (2016a) results. The increase of urban fixed asset investment, as the major driving force for economic growth, leads to the increase of financing demand, which will lead to the aggravation of local government debt. Local governments can avoid issuing more bonds by broadening the financing channels for infrastructure construction. The paper also concludes that the per capita GDP of local government has a negative impact on the issuance scale and risk of UIBs, which is the same as the results of Cooray et al. (2017).

Research conclusion

After China's tax-sharing reform, local governments face financial pressure in rapid urbanization and therefore need financial sources to support urban infrastructure construction. After the establishment of the land bank system, the urban land supply has been monopolized by local governments. The local governments initially aim to pursue the maximization of land leasing revenue on the land market to support rapid urban development. Land finance is the popular means for local governments that rely heavily on land for mortgage loans. The UIBs allow local governments to loan money from bank system and investors. The holding land value directly affects UIBs' risk. To maximize land revenue, local governments would prefer to hoard land and lease the land at a high price to capture the land value.

Our research found that local government's land speculation has a certain impact on the scale and risk of UIBs issuance. Empirical results show that when the land hoarding scale increases, land assets are added for mortgage and repayment. The local governments have increased confidence to issue bonds by LFPs, particularly in the developed regions. In the Eastern region, the pressure of maintaining economic growth and public good demand is high. An increase in the UIBs' scale will increase UIBs' risk. Although land finance can provide financial support for infrastructure construction, UIBs debt repayment pressure will yield huge costs and risks. The results are that local government's land speculation has a certain impact on the scale and risk of UIBs. The fluctuation of land value leads to uncertainty of debt repayment. When the LFPs cannot repay the bonds, the debt risk will be transferred to local governments, increasing the financial pressure of local governments. In recent years, the UIBs have been growing rapidly, and there are certain fiscal and financial risks, which are harmful to urban sustainable development.

Thus, risk assessment and warning mechanisms should be established. Moreover, the value assessment and related processes of land mortgage loans should be regulated, and local government bank financial risks should be prevented. It is unsustainable to keep the urban rapid development supported by land finance. Local governments need to broaden financing channels and innovate ways to promote urban development. This research focuses on local governments' land speculation, analyzes the influence factors of local governments' UIBs scale and risk, and provides a new theoretical framework for related research. However, there are some limitations. The provincial panel data is selected as the research unit. Actually, the debt repayment pressure of the prefecture-level cities in the Eastern region is greater than that of provincial governments. So the influence of land assets on prefecture-level municipal governments' debt can be studied in the future.

Policy discussion

Based on the conclusion, there are some proposals for debt risk management. Firstly, the unbalance between fiscal revenue and expenditure in China's tax-sharing system should be changed, which pushes the local governments turn to land finance for urban development. The fiscal and taxation system should be reformed to clarify the rights and responsibilities of the Central and local governments. Some policies should be issued to promote the match between financial resources and expenditure. Secondly, the behaviors of LFPs should be regulated in order to reduce debt risks. It is helpful to clarify the LFPs' repayment, guarantee and rescue responsibilities. It is a long time that UIBs play a major role in China's infrastructure construction. But, with less land available for leasing, the unsustainability of the mode is obvious. Therefore, the situation that urban construction relies too much on UIBs should be changed. For large-scale public infrastructure construction projects, the Public-Private Partnership model (PPP) can be adopted to encourage enterprises and private capital to participate in infrastructure construction. Thirdly, the monitoring system for local governments' debt risk should be established, and the warning line of debt risk should be set up according to local socioeconomic condition.

Acknowledgements

This work was supported by National Social Science Fund of China (16BJL053), Zhejiang Provincial Natural Science Foundation (LY18G030039, LY17G030008, LQ18G010008), and National Natural Science Foundation of China (71974169).

Conflict of interests

The authors declare no conflict of interests.

References

Baldacci, E., Gupta, S., & Mati, A. (2011). Political and fiscal risk determinants of sovereign spreads in emerging markets. *Review of Development Economics*, *15*(2), 251–263. https://doi.org/10.1111/j.1467-9361.2011.00606.x

Bao, H. J., & Peng, Y. (2016). Effect of land expropriation on land-lost farmers' entrepreneurial action: a case study of Zhejiang Province. *Habitat International*, *53*, 342–349. https://doi.org/10.1016/j.habitatint.2015.12.008

Bellot, N. J., Selva, M. L. M., & Menéndez, L. G. (2017). Determinants of sub-central European government debt. *The Spanish Review of Financial Economics*, *15*(2), 52–62. https://doi.org/10.1016/j.srfe.2017.04.001

Bloom, D. E., Canning, D., & Fink, G. (2008). Urbanization and the wealth of nations. *Science*, *319*(5864), 772–775. https://doi.org/10.1126/science.1153057

Cai, Z. Y., Liu, Z. X., Zuo, S. M., & Cao, S. X. (2019). Finding a peaceful road to urbanization in China. *Land Use Policy*, *83*, 560–563. https://doi.org/10.1016/j.landusepol.2019.02.042

Cao, G., Feng, C., & Tao, R. (2008). Local 'land finance' in China's urban expansion: challenges and solutions. *China & World Economy*, *16*(2), 19–30. https://doi.org/10.1111/j.1749-124X.2008.00104.x

Cao, S., Lv, Y., Zheng, H., & Wang, X. (2014). Challenges facing China's unbalanced urbanization strategy. *Land Use Policy*, *39*, 412–415. https://doi.org/10.1016/j.landusepol.2013.12.004

Chen, A. (2008). The 1994 tax reform and its impact on China's rural fiscal structure. *Modern China*, *34*(3), 303–343. https://doi.org/10.1177/0097700408315987

Chen, B. J., & Liu, Y. P. (2015). Local government debt risk early warning algorithm based on fuzzy analysis. In *2015 Sixth International Conference on Intelligent Systems Design and Engineering Applications* (pp. 494–499). IEEE. https://doi.org/10.1109/ISDEA.2015.129

Cheng, S., Xie, H. L., Jiang, J. F., & Chen, Q. R. (2018). Is urban land development driven by economic development or fiscal revenue stimuli in China? *Land Use Policy*, *77*, 107–115. https://doi.org/10.1016/j.landusepol.2018.05.031

Cooray, A., Dzhumashev, R., & Schneider, F. (2017). How does corruption affect public debt? An empirical analysis. *World Development*, *90*, 115–127. https://doi.org/10.1016/j.worlddev.2016.08.020

Du, J., & Peiser, R. B. (2014). Land supply, pricing and local governments' land hoarding in China. *Regional Science and Urban Economics*, *48*, 180–189. https://doi.org/10.1016/j.regsciurbeco.2014.07.002

Fan, G., & Lv, Y. (2012). Fiscal prudence and growth sustainability: an analysis of China's public debts. *Asian Economic Policy Review*, *7*(2), 202–220. https://doi.org/10.1111/j.1748-3131.2012.01234.x

Faulk, D., & Killian, L. (2016). Special districts and local government debt: an analysis of "Old Northwest Territory" states. *Public Budgeting & Finance*, *37*(1), 112–134. https://doi.org/10.1111/pbaf.12122

Feng, W. L., Liu, Y. S., & Qu, L. L. (2019). Effect of land-centered urbanization on rural development: a regional analysis in China. *Land Use Policy*, *87*, 104072. https://doi.org/10.1016/j.landusepol.2019.104072

Firman, T. (2000). Rural to urban land conversion in Indonesia during boom and bust periods. *Land Use Policy*, *17*(1), 13–20. https://doi.org/10.1016/S0264-8377(99)00037-X

Galiński, P. (2016). Determinants of debt limits in local governments: case of Poland. *Procedia - Social and Behavioral Sciences*, *213*, 376–382. https://doi.org/10.1016/j.sbspro.2015.11.554

Gao, H. N. (2019). Public land leasing, public productive spending and economic growth in Chinese cities. *Land Use Policy*, *88*, 104076. https://doi.org/10.1016/j.landusepol.2019.104076

Geng, B., Zhang, X., Liang, Y., Bao, H., & Skitmore, M. (2018). Sustainable land finance in a new urbanization context: theoretical connotations, empirical tests and policy recommendations. *Resources, Conservation and Recycling*, *128*, 336–344. https://doi.org/10.1016/j.resconrec.2016.11.013

Goodman, A. C., & Thibodeau, T. G. (2008). Where are the speculative bubbles in US housing markets? *Journal of Housing Economics*, *17*(2), 117–137. https://doi.org/10.1016/j.jhe.2007.12.001

Harvey, D. (1978). The urban process under capitalism: a framework for analysis. *International Journal of Urban and Regional Research*, *2*(1–4), 101–131. https://doi.org/10.1111/j.1468-2427.1978.tb00738.x

Ho, S., & Lin, G. (2003). Emerging land markets in rural and urban China: policies and practices. *China Quarterly*, *175*, 681–707. https://doi.org/10.1017/S0305741003000407

Hu, A. G. (1998). An arduous and difficult institutional innovation: a preliminary assessment of the reform in the tax-sharing system. *The Chinese Economy*, *31*(4), 30–96. https://doi.org/10.2753/CES1097-1475310430

Hu, F., & Qian, J. (2017). Land-based finance, fiscal autonomy and land supply for affordable housing in urban China: a prefecture-level analysis. *Land Use Policy*, *69*, 454–460. https://doi.org/10.1016/j.landusepol.2017.09.050

Huang, D., & Chan, R. C. (2018). On 'Land Finance' in urban China: theory and practice. *Habitat International*, *75*, 96–104. https://doi.org/10.1016/j.habitatint.2018.03.002

Hyman, G., & Markowski, S. (1980). Speculation and inflation in the market for house-building land in England and Wales. *Environment and Planning A: Economy and Space*, *12*(10), 1119–1130. https://doi.org/10.1068/a121119

Lin, G. C. S., & Yi, F. (2011). Urbanization of capital or capitalization on urban land? Land development and local public finance in urbanizing China. *Urban Geography*, *32*(1), 50–79. https://doi.org/10.2747/0272-3638.32.1.50

Liu, C., Moldogaziev, T. T., & Mikesell, J. L. (2017). Corruption and state and local government debt expansion. *Public Administration Review*, *77*(5), 681–690. https://doi.org/10.1111/puar.12711

Liu, T., Cao, G. Z., Yan, Y., & Raymond, Y. W. (2016). Urban land marketization in China: central policy, local initiative, and market mechanism. *Land Use Policy*, *57*, 265–276. https://doi.org/10.1016/j.landusepol.2016.06.001

Liu, Y., Fan, P., Yue, W., & Song, Y. (2018). Impacts of land finance on urban sprawl in China: the case of Chongqing. *Land Use Policy*, *72*, 420–432. https://doi.org/10.1016/j.landusepol.2018.01.004

Liu, Y. Z., & Zhao, J. M. (2011). Intergovernmental fiscal transfers and local tax efforts: evidence from provinces in China. *Journal of Economic Policy Reform*, *14*(4), 295–300. https://doi.org/10.1080/17487870.2011.591175

Long, H. L., Li, Y. R., Liu, Y. S., Woods, M., & Zou, J. (2012). Accelerated restructuring in rural China fueled by' increasing vs. decreasing balance' land-use policy for dealing with hollowed villages. *Land Use Policy*, *29*(1), 11–22. https://doi.org/10.1016/j.landusepol.2011.04.003

Lu, Y., & Sun, T. (2013). Local government financing platforms in China: a fortune or misfortune? *IMF Working Papers*, *13*(243), 1–30. https://doi.org/10.5089/9781475599671.001

Ma, J. (2013). Hidden fiscal risks in local China. *Australian Journal of Public Administration*, *72*(3), 278–292. https://doi.org/10.1111/1467-8500.12028

Neutze, M. (1970). The price of land for urban development. *The Economic Record*, *46*(3), 313–328. https://doi.org/10.1111/j.1475-4932.1970.tb02492.x

Pan, F., Zhang, F., & Zhu, S. (2017). Developing by borrowing? Inter-jurisdictional competition, land finance and local debt accumulation in China. *Urban Studies*, *54*(4), 897–916. https://doi.org/10.1177/0042098015624838

Peng, X. (2011). China's demographic history and future challenges. *Science*, *333*(6042), 581–587. https://doi.org/10.1126/science.1209396

Rancich, M. T. (1970). Land value changes in an area undergoing urbanization. *Land Economics*, *46*(1), 32–40. https://doi.org/10.2307/3145421

Sun, X. L., & Zhou, F. Z. (2014). Land finance and the tax-sharing system: an empirical interpretation. *Social Sciences in China*, *35*(3), 47–64. https://doi.org/10.1080/02529203.2014.927094

Tanya, T., Phyllis, L. L. M., & Hung, K. (2017). Tax collector or tax avoider? An investigation of intergovernmental agency conflicts. *The Accounting Review*, *92*(2), 247–270. https://doi.org/10.2308/accr-51526

Tewfik, M. (1989). Urban land in Jordan: issues and policies. *Cities*, *6*(2), 119–135. https://doi.org/10.1016/0264-2751(89)90065-6

Tsui, K. Y. (2011). China's infrastructure investment boom and local debt crisis. *Eurasian Geography and Economics*, *52*(5), 686–711. https://doi.org/10.2747/1539-7216.52.5.686

Tu, L. H., & Padovani, E. (2018). A research on the debt sustainability of China's major city governments in post-land finance era. *Sustainability*, *10*(5), 1606. https://doi.org/10.3390/su10051606

Veiga, L. G., & Veiga, F. J. (2014). Determinants of Portuguese local governments' indebtedness. *NIPE Working Paper*, *16*, 10–20.

Wang, J., Lin, Y. F., Glendinning, A., & Xu, Y. Q. (2018). Land-use changes and land policies evolution in China's urbanization processes. *Land Use Policy*, *75*, 375–387. https://doi.org/10.1016/j.landusepol.2018.04.011

Wang, W., & Ye, F. (2016). The political economy of land finance in China. *Public Budgeting & Finance*, *36*(2), 91–110. https://doi.org/10.1111/pbaf.12086

Wang, Y., & Hui, E. C. (2017). Are local governments maximizing land revenue? Evidence from China. *China Economic Review*, *43*, 196–215. https://doi.org/10.1016/j.chieco.2017.02.005

Wen, H., Chu, L., Zhang, J., & Xiao, Y. (2018). Competitive intensity, developer expectation, and land price: evidence from Hangzhou, China. *Journal of Urban Planning and Development*, *144*(4), 04018040. https://doi.org/10.1061/(ASCE)UP.1943-5444.0000490

Wong, C. P. W. (2000). Central-local relations revisited: the 1994 tax sharing reform and public expenditure management in China, mimeo World Bank Office. *China Perspectives*, *31*, 52–63.

Wu, G. L., Feng, Q., & Li, P. (2015a). Does local governments' budget deficit push up housing prices in China? *China Economic Review*, *35*, 183–196. https://doi.org/10.1016/j.chieco.2014.08.007

Wu, Q., Li, Y. L., & Yan, S. Q. (2015b). The incentives of China's urban land finance. *Land Use Policy*, *42*, 432–442. https://doi.org/10.1016/j.landusepol.2014.08.015

Wu, Y., Li, X., & Lin, G. (2016a). Reproducing the city of the spectacle: mega-events, local debts, and infrastructure-led urbanization in China. *Cities*, *53*, 51–60. https://doi.org/10.1016/j.cities.2016.01.004

Wu, Y. Z., Luo, J. J., & Zhang, X. L., Skitmore, M. (2016b). Urban growth dilemmas and solutions in China: looking forward to 2030. *Habitat International*, *56*, 42–51. https://doi.org/10.1016/j.habitatint.2016.04.004

Wu, Y. Z., Mo, Z. B., & Peng, Y. (2017). Renewal of land-use term for urbanization in China: sword of Damocles or Noah's Ark? *Land Use Policy*, *65*, 238–248. https://doi.org/10.1016/j.landusepol.2017.04.018

Xu, N. N. (2019). What gave rise to China's land finance? *Land Use Policy*, *87*, 1–12. https://doi.org/10.1016/j.landusepol.2019.05.034

Zhang, J., Fan, J., & Mo, J. (2017a). Government the intervention, land market, and the urban development: evidence from Chinese cities. *Economic Inquiry*, *55*(1), 115–136. https://doi.org/10.1111/ecin.12353

Zhang, J., Zhang, D., Huang, L., Wen, H., Zhao, G., & Zhan, D. (2019a). Spatial distribution and influential factors of industrial land productivity in China's rapid urbanization. *Journal of Cleaner Production*, *234*, 1287–1295. https://doi.org/10.1016/j.jclepro.2019.06.287

Zhang, J., Zhang, D., Zhao, G., Zeng, H., & Wen, H. (2019b). Land supply and urbanization strategy in the Yangtze River Delta region, China. *Growth and Change*, *50*, 1338–1355. https://doi.org/10.1111/grow.12331

Zhang, X., Lin, Y., Wu, Y., & Skitmore, M. (2017b). Industrial land price between China's Pearl River Delta and Southeast Asian regions: competition or coopetition? *Land Use Policy*, *61*, 575–586. https://doi.org/10.1016/j.landusepol.2016.12.011

Zheng, H., Wang, X., & Cao, S. (2014). The land finance model jeopardizes China's sustainable development. *Habitat International*, *44*, 130–136. https://doi.org/10.1016/j.habitatint.2014.05.008