Frontiers in Business, Economics and Management
ISSN: 2766-824X | Vol. 11, No. 1, 2023

Land Financing Model and Local Government Debt Governance: An Empirical Study of Prefecture-Level Cities in China

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Abstract: This paper addresses the lack of comprehensive research on land financing in relation to local government debt governance. It examines two land financing methods: "Getting revenue by selling land" and "land finance," using an endogenetic approach. The study analyzes the interactive relationship between local government debt expansion and land financing modes using panel data from Chinese prefecture-level cities. Key findings include: (1) Land financing methods significantly increase local government debt leverage, with varying performance levels. (2) Regional economic competition and financial status influence the interaction between land financing and local debt risk. (3) Fiscal and financial policies regulate local government's land financing behavior, leading to diverse approaches. To achieve effective fiscal and financial governance, it is crucial to establish a strong connection between local government debt risk prevention/control and land use mode. Implementing differentiated systems can enhance land use efficiency.

Keywords: Getting revenue by selling land, Land finance, Local debt, Collaborative governance.

1. Introduction

In the face of fierce regional economic competition, local governments strive to expand their financial sources and increase revenue. One way they achieve this is by issuing government debt. This requires controlling debt leverage at reasonable levels and keeping local government debt within acceptable ranges. Therefore, exploring the operational mechanisms of local government debt leverage and understanding its role in fiscal and financial policy implementation are highly important endeavors. Limited financial options have compelled local governments to rely on land as a crucial element in fiscal and financial policies. They use land to attract industrial enterprises and stimulate economic development by offering industrial land at reduced prices. They also generate revenue by increasing the price of commercial and residential properties, acquiring land transfer income and associated tax revenue (getting revenue by selling land). Additionally, local governments secure urban construction funds by mortgaging land (land finance). These three modes of land utilization not only reflect China's unique approach to land development but also establish land as a critical factor in local financial development.

The research has several key contributions: Firstly, it distinguishes between two land financing modes, "getting revenue by selling land" and "land finance," clarifying their relationship with local government debt based on their characteristics. Secondly, it explores the interaction model between land financing and debt leverage under different fiscal pressures and political performance targets. Lastly, it diagnoses the impact of different land use modes on local government debt, offering policy recommendations to prevent and resolve debt risks.

2. Literature Review and Theoretical Mechanism

Local governments can generate additional revenue for their finances by increasing land utilization and development. The impact of this practice extends beyond direct income from land transfer fees and related taxes and fees. It also enables local governments to expand their debt financing capacity through collateral channels. Relying solely on large-scale land transfers does not effectively enhance the quality of economic development (Hansen and Prescott, 2002). Land finance leverages land resources through mortgage guarantees. Compared to traditional “getting revenue by selling land”, this approach allows for increased leveraging of funds for long-term infrastructure investments (Bai et al., 2016).

The substantial increase in government debt is intricately linked to the crucial role of the land system (Yao and Li, 2022). The practice of selling commercial and residential land at high prices to supplement fiscal revenue is commonly referred to as " getting revenue by selling land" (Huang Z and Du X, 2017). Additionally, "land finance" involves utilizing land as collateral, guarantees, or credit enhancements for debt financing (Zhang et al., 2018). “Getting revenue by selling land” allows for the acquisition of significant one-time cash flow in the short term. “Land finance” is characterized by long-term land utilization and emphasizes the cyclical nature of fund rotation. As the area of land transfers continues to expand, the urban sprawl intensifies, leading to increased demands and costs associated with urban maintenance and construction. Amidst a growing fiscal deficit, local governments are compelled to rely on debt as a means to secure funds for construction projects, thereby exacerbating the risk associated with local government debt leverage (Milan BF et al., 2016).

Drawing from the existing literature, we can delineate a theoretical mechanism as follows: local governments, when procuring funds for urban construction through government debt issuance, are influenced and constrained by regional land use patterns. Simultaneously, the pressures of regional economic growth and fiscal constraints exert various effects on the debt behavior of local governments.

3. Research Design

3.1. Construction and selection of key indicators

3.1.1. Construction of explained variables

Following the methodology proposed by Mao Jie et al. (2018), we construct the local government debt ratio index, which calculates the ratio of the local government debt balance to the local financial level. The local financial resources are represented by the combined sum of local fiscal revenue, government fund revenue, and transfer payments. Additionally, as a robustness test index, we adopt the ratio of local government debt balance to local government GDP, drawing inspiration from the Maastricht Treaty.

3.1.2. Core explanatory variable selection

The land financing modes employed by local governments primarily consist of “getting revenue by selling land” and “land finance”. The ratio of net land transfer income to regional general financial revenue is adopted as a proxy variable to characterize "getting revenue by selling land". In terms of the land finance index, recognizing that land mortgage, as a financial product, is influenced by financial policy adjustments and exhibits similar patterns of increase or decrease as the loan balance of local financial institutions, the land mortgage loan figures published in 2008 are employed as a baseline. The annual land mortgage loan amounts are derived based on changes in the loan balance of local financial institutions, and the ratio of land mortgage loans to fixed asset investment is utilized as a proxy index for "land finance." Additionally, the ratio of land transfer income to fiscal revenue and the ratio of real estate investment to fixed asset investment are utilized as alternative indicators to assess the robustness of “getting revenue by selling land” and “land finance”, respectively.

3.2. Metrological model setting

We proceed to construct the following econometric model :

$$\mathrm{DB}_{it} = \beta_0 + \beta_1 \mathrm{LT}_{it} + \beta_2 \mathrm{LF}_{it} + \beta_3 \sum control_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

DB is the explained variable of the model, which is used to describe the debt leverage level of local government i in period t. The core set of explanatory variables includes two indicators, “getting revenue by selling land”-LT and “land finance”-LF. Control is the set of control variables; β_0、β_1、β_2、β_3 are the coefficients to be estimated; μ_i is the individual fixed effect; λ_t is the time fixed effect; and ε_{it} is the model disturbance term.

Considering that the level of local government debt leverage is primarily influenced and constrained by factors such as local economic development, financial situation, the pressure for local government economic growth, fiscal gap, and fiscal deficit to GDP ratio of the higher government, we select these variables as the core mechanism variables in our model. We introduce four categories of control variables, which are regional infrastructure status, economic development environment, public service quality, and local tax capacity. For further details, please refer to Table 1.

Table 1. Description of the selection of model variables

Variable type		Variable subset	Variable definition
Mechanism variable		Pressure on regional economic growth *EGP*	the economic growth target is marked as "1" after 50% of prefecture level cities in the same province; otherwise, marked as "0".
		Pressure on government finances at the same level *FPL*	government expenditure - revenue
		Higher government financial pressure *FPH*	higher government fiscal gap/Fiscal revenue
Control variable	**Infrastructure condition**	*IBU*	Number of people with broadband Internet access
		RIS	Value added of secondary industry /GDP
	Economic development environment	*GRS*	The total retail sales of social sales increased year-on-year
		UFC	Year-on-year growth in actual use of foreign capital
	Public service quality	*EFI*	Number of employees in the financial sector/employed population
		PAI	Number of people employed in public administration/employed population
		UI	Number of employees in the public facilities industry/employed population
	Tax capacity	*IET*	Year-on-year growth rate of VAT payable by industrial enterprises

This study set comprising 271 prefecture-level cities is constructed, covering the period from 2008 to 2020. The debt balance data of local governments are sourced from the *Wind database*. Other variables are sourced from *the statistical yearbooks*.

4. Benchmark Regression and Mechanism Test

4.1. 4.1 Baseline regression result

We begin by investigating the impact of local governments' land financing mode on their debt burden. Models (1) to (4) are estimated using a two-way fixed effect panel model. The

findings support the theoretical analysis, demonstrating that local government debt expansion is influenced by their land financing behavior. Moreover, different financing methods have varying effects on local government debt leverage due to their unique endogenous functions. Specifically, the “land finance” model, involving inter-temporal fund transfers, has a more pronounced effect on increasing local government debt leverage compared to the "getting revenue by selling land" model, which generates one-time income.

Table 2. Baseline regression result

	(1)	(2)	(3)	(4)
LT	0.0477*		0.0635**	0.0601**
	(0.0249)		(0.0253)	(0.0251)
LF		0.1310***	0.1488***	0.1631***
		(0.0406)	(0.0412)	(0.0417)
Control variable	No	No	No	Yes
N	3522	3523	3522	3519
R^2	0.179	0.180	0.182	0.201

4.2. Robustness test

Estimation 1 in Table 3 replaces the dependent variable with the ratio of local government debt balance to GDP (referred to as DB1). Estimation 2 builds upon this by replacing the core explanatory variable "getting revenue by selling land" with land transfer income/fiscal revenue, while "land finance" is substituted with real estate investment/fixed asset investment.To assess the short-term debt repayment pressure of local governments from a cash flow perspective, Estimation 3 replaces the denominator of the dependent variable with fiscal revenue (DB2). Estimation 4 excludes cities separately listed in the state plan, conducting a robustness test by excluding these special samples due to potential differences in fiscal and financial endowments.Table 3 presents the results of Estimations (1) to (4), demonstrating that the benchmark regression results remain significant even after conducting various robustness tests.

Table 3. Robustness test

	(1) DB1	(2) DB1	(3) DB2	(4) DB
LT	0.0259***	0.0305***	0.0395***	0.0665**
	(0.0060)	(0.0095)	(0.0127)	(0.0258)
LF	0.0387***	0.0834*	0.1187***	0.1628***
	(0.0099)	(0.0495)	(0.0212)	(0.0426)
Control variable		Yes		
N	3519	3519	3519	3454
R^2	0.205	0.201	0.947	0.198

To address potential endogeneity concerns, a robustness test is conducted by incorporating the first-order lag term of the core explanatory variables. Table 4, Estimation (1), shows that the lagged variables continue to exert a significantly positive impact on the local government debt burden ratio. Estimations (2) to (3) employ instrumental variables for "getting revenue by selling land" and "land finance" using established approaches. Science and technology expenditure and medical expenditure per 100 people are selected as instrumental variables. The results indicate that the signs and significance of "getting revenue by selling land" and "land finance" remain largely unchanged. In Estimation 4, additional control variables, such as the average salary of local employees and the number of hospital beds, are included to account for potential omitted variables in the model. The regression results remain statistically significant and robust, further supporting the study's findings.

Table 4. Robustness test for endogeneity

	(1)	(2)	(3)	(4)
LT	0.0454*	0.7255**	0.2199**	0.0557**
	(0.0267)	(0.3446)	(0.1104)	(0.0250)
LF	0.1359***	0.3380***	1.8492*	0.1926***
	(0.0453)	(0.1013)	(1.1171)	(0.0421)
Control variable		Yes		
N	3248	3516	3516	3518
R^2	0.192			0.209

4.3. Mechanism test

To better understand how "getting revenue by selling land" and "land finance" influence local government debt, this study conducts group tests focusing on three key aspects: economic growth pressure, financial pressure at the same government level, and financial pressure at higher government levels.Estimates (1) to (4) in Table 5 indicate that

local governments, especially those facing significant economic growth pressure and substantial fiscal gaps, are more likely to utilize land financing to secure funds for urban construction. Estimates (5) to (6) provide insights into the relationship between higher-level and lower-level governments. When higher-level governments experience increased financial pressure, they tend to stimulate the financing sentiment of lower-level governments. This demonstrates their reliance on both "getting revenue by selling land" and "land finance" as viable options for managing their financial challenges.

Table 5. Mechanism test

	(1)	(2)	(3)	(4)	(5)	(6)
	Economic growth pressure		Financial pressure		Higher government financial pressure	
	High	Low	High	Low	High	Low
LT	0.0581	0.0149	0.0143	0.0249	0.1010**	-0.0198
	(0.0357)	(0.0373)	(0.0376)	(0.0172)	(0.0422)	(0.0238)
LF	0.2285***	0.1112	0.1975***	-0.0456	0.1431**	0.1092*
	(0.0569)	(0.0723)	(0.0657)	(0.0324)	(0.0724)	(0.0595)
Control variable				Yes		
N	1973	1546	1758	1760	1750	1769
R^2	0.177	0.240	0.224	0.290	0.219	0.249

5. Heterogeneity Diagnosis

Initially, local governments are classified based on their reliance on "revenue generation through land sales" and "land finance." If the former outweighs the latter, it falls under the category of strong revenue generation through land sales. Conversely, if the latter surpasses the former, it is considered strong land finance. To further explore the influence of coordinated development between “revenue generation through land sales”and land finance on local government debt, the median value of the coupling coordination degree between these two financing modes is used as a grouping variable for heterogeneity tests.The findings from estimates (1) to (2) in Table 6 reveal that when local governments heavily rely on revenue generation through land sales, they tend to adopt land finance as a financing method. On the other hand, when there is a strong dependence on land finance, financial policy regulations restrict the interaction between land finance and local government debt leverage. Consequently, local governments resort to revenue generation through land sales for financing.Estimates (3) to (4) demonstrate that a high degree of coupling between the two land financing modes enables efficient and rational coordination, which reduces the extent of debt risk associated with land financing.

Table 6. Heterogeneity diagnosis

	(1)	(2)	(3)	(4)
	Degree of dependence		Degree of fiscal and financial coupling	
	High-LT	High-LF	High	Low
LT	0.0271	0.1010**	-0.0001	0.0307
	(0.0321)	(0.0495)	(0.0719)	(0.0283)
LF	0.2452***	0.0192	0.2847**	0.1266***
	(0.0601)	(0.0956)	(0.1179)	(0.0458)
Control variable			Yes	
N	2664	855	880	2639
R^2	0.203	0.236	0.345	0.157

6. Conclusions and Policy Recommendations

The research investigates the interactive relationship and underlying mechanisms between land financing modes and debt risk:

Firstly, the land financing approach chosen by local governments significantly influences the increase in local debt leverage. Notably, "land finance" poses a significantly higher level of debt risk compared to "getting revenue by selling land".

Secondly, the relationship between land financing and local debt risk is influenced by regional economic competition and fiscal conditions. Local governments, are incentivized to borrow to achieve short-term political performance goals and alleviate financial pressures.

Thirdly, local governments' land financing practices are regulated by fiscal and financial policies, showing heterogeneous characteristics. Moreover, the level of synergy between these two land financing methods is inversely related to the extent of debt risk escalation associated with them.

Based on the above conclusions, we have the following policy suggestions for enhancing China's fiscal and financial coordination and alleviating local government debt risks caused by land financing.

Firstly, to mitigate local government debt risks effectively, it is crucial to establish a seamless connection and interaction between risk prevention and control measures and land use patterns.

Secondly, establishing a comprehensive and diversified evaluation system for local government performance is essential. By doing so, we can prevent local governments

from neglecting the necessary land use patterns for long-term regional development.

Thirdly, establishing a land development and utilization system that aligns with regional economic development and fiscal resources is crucial. This system should recognize the inherent functional distinctions between land finance and economic development.

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