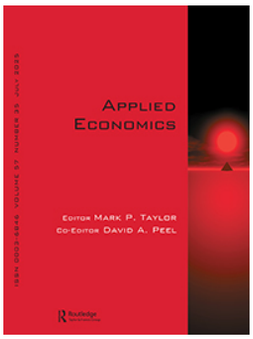

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The impact of local government bonds on land-leasing behaviours and the economic consequences: evidence from the self-issuance reforms in China

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ABSTRACT

Under the 1995 Budget Law, land finance, rather than local government bonds (LGBs), played a critical role in bridging fiscal gaps for Chinese local governments. This paper examines the impact of the self-issuance (SI) reform of LGBs from 2011 on land leasing using county-level data from 2000 to 2019 combined with land parcel data and business registration databases of China. Findings reveal that, firstly, SI reforms initially reduce land leasing but increase it by 24.86% three years later, with a preference for commercial and residential land. Reforms also raise commercial and residential land leasing prices by 14.22% and do not compel lower prices for industrial land. Secondly, based on repayment obligations, the self-issuance and central-government-repayment (SICGR) mode alleviates fiscal pressure, favouring commercial and residential land leasing, while the self-issuance and self-repayment (SISR) pattern enhances fiscal sustainability and leads to more industrial land leasing. Thirdly, mechanism analysis suggests that SI reforms increase debt burden and decrease fiscal self-sufficiency, primarily through land tender, auction, and listing mechanisms, resulting in unbalanced regional development. This research highlights the need for sustainable development patterns under the New Budget Law of 2015, balancing fiscal revenues, the land market, and local government debts.

KEYWORDS

local government bonds; self-issuance reforms; land leasing; industrial structure; investment promotion

JEL CLASSIFICATION

H72; R38; H39

I. Introduction

The issue of local government debts (LGDs) has aroused widespread attention due to its systemic risk, intergenerational taxation, and welfare implications (Ouyang and Li 2021). Since the tax-sharing reform in 1994, administrative development responsibilities were decentralized, while the power of tax revenue collection was recentralized (Pan et al. 2016), resulting in a mismatch between fiscal power and administrative power, with fiscal expenditures generally higher than revenues. Data from the National Audit Office of China shows that the scale of LGDs has accumulated to $25.5 trillion since 2020 (see Figure 1). The transfer of risk from upper to lower levels of government is evidently contributing to the rapid and continuous expansion of LGD's scale, posing a severe problem for county-level governments[1](H.-M. Wu and Feng 2014).

In the Budget Law of China (prior to the 2015 version), local governments were strictly prohibited from directly borrowing. To sustain local public finance, local governments primarily bridged the fiscal gap through land finance (tudi caizheng) (Zhu et al. 2019) and implicit government debt (J. Xu and Zhang 2014), which, in return, affects public financing risks, industrial structure and economic development (S. Chen and Li 2019; Y. Wu et al. 2014).

To regulate the default risk and liquidity risk associated with Local Government Debts (LGDs), primarily composed of Urban Construction Investment Bonds (UCIBs), the central government implemented self-issuance (SI) reforms for the issuance of Local Government Bonds (LGBs) from 2011 to 2015. These reforms, serving as another means to offset budget deficits and rebuild debt structures, may significantly influence the

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[1]According to *Interim Regulations on the Grant and Transfer of Urban State-owned Land Use Rights* in 1990 stipulated that the policy entitled the prefecture- and county-level governments (primarily the county governments) the right to regulate and allocate the land resources. Therefore, the county-level governments have incentives to be engaged in the land market.

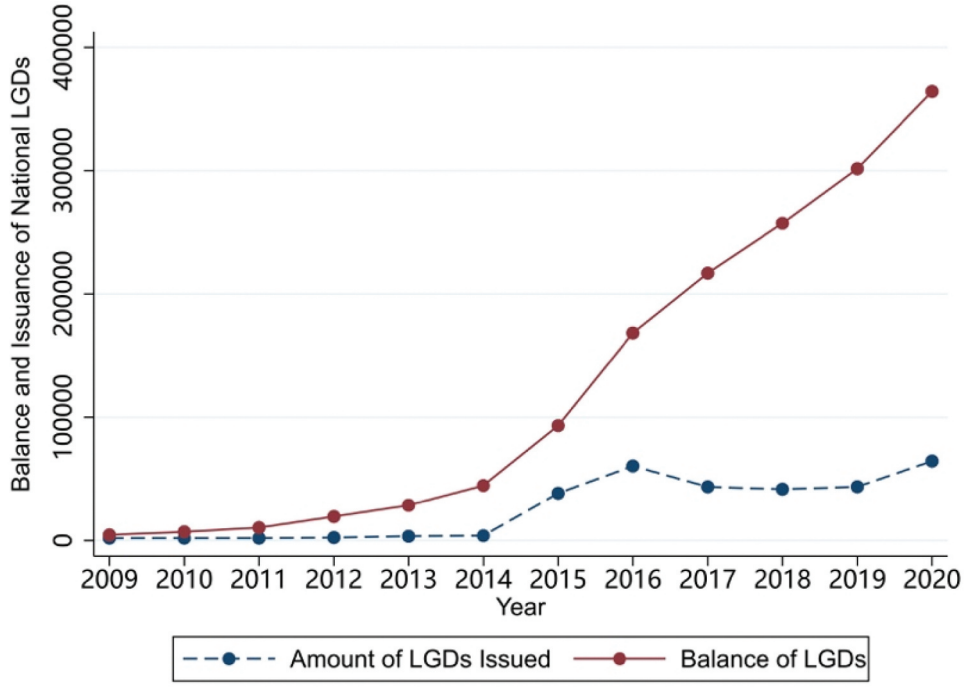

Figure 1. The balance of National local government debts (LGDs) from 2009 to 2020. Unit: 100 million yuan. The horizontal axis is the year and the vertical axis is the annual LGDs issuance and LGDs balance (including Urban Construction and Investment Bonds (UCIBs)), respectively, expressed as the cumulative rising LGDs nationwide from 2009 to 2020. Data sources: WIND database.

land-leasing behaviours of local governments, including the scale, structure, and price of leasing, which constitutes the primary focus of our paper.

This paper contributes to three strands of literature. The first strand concerns the theory of fiscal institutions, budgetary structure and county economic development (S. Li and Lin 2011; H. Xu, Deng, and Zhang 2023). Existing studies have shown that the prioritization of productive fiscal expenditures by county-level governments may affect land leasing and investment conditions (Brehm 2013; Gao et al. 2019). Our research sheds light on the significance of the self-issuance (SI) reforms from the revenue side of the fiscal equation. These reforms represent the decentralization of debt issuance and repayment obligations from the central government to local governments and have implications for land leasing, local industrial development, and economic structure, particularly in county regions. Furthermore, we extend the assessment of SI reforms across various time spans.

The second contribution pertains to the literature on LGBs' risk control and its land-leasing consequences. While there have been studies concerning the implicit debt risk of LGDs (Ouyang and Li 2021), our comparison between self-issuance and central-government-repayment (SICGR) and self-issuance and self-repayment (SISR) reveals that the debt repayment obligation of LGDs affects fiscal sustainability and lead to different industrial structures. Furthermore, we have examined the complex process of land finance, taking into account the diverse institutional conditions and sustainability concerns, in comparison with SICGR and SISR, as mentioned by Huang and Chan (2018).

The third contribution is to provide a supplementary discussion on the causal relations between debt structure and the business attraction of local governments. Using China's national business registration database, the paper sheds light on the significance of debt structure for investment promotion and its subsequent impact on industrial structure. Additionally, while previous studies have evaluated SI reforms, such as their impacts on higher LGDs' risk due to a tighter budget constraint (Ouyang and Li 2021) and simultaneous corporate tax burden rising alongside LGBs (X. Chen 2020), we introduce new perspectives concerning land leasing and investment promotion for policy evaluation.

The remainder of this paper is organized as follows: Section II provides the institutional background and literature review. Section III introduces the framework and hypotheses. Section IV outlines the research design. Section V presents the empirical results of the baseline model with robustness checks and heterogeneous analysis. Section VI describes the mechanisms. Section VII discusses the industrial consequences of SI reforms, and Section VIII concludes.

II. Institutional background and literature review

China's self-issuance reform

The current institution of LGBs issuance and repayment has evolved through the following three stages: First, the central government took in charge and issued LGBs from 2009, and the mode could be summarized as 'central-government-issuance and repayment' (CGIR). In the second stage starting form 2011, the central government launched new policy programmes with the *Notice on Issuing the Measures for the Pilot Program on Local Government Debt* in four pilot regions, including Shanghai, Zhejiang, Guangdong, and Shenzhen. In 2013, Jiangsu and Shandong provinces joined the pilot. This policy shift to 'self-issuance and central-government-repayment' (SICGR) aimed to effectively mitigate local debt risks. However, the Ministry of Finance (MOF) was ultimately responsible for the repayment, which resulted in a soft budget constraint in LGDs, a mismatch of issuance authority and repayment responsibility in the fiscal debt structure, and a lack of incentives of fiscal sustainability (Ouyang and Li 2021; Ye et al. 2022; J. Zhang et al. 2021).

The pattern adopted in the third stage was 'self-issuance and self-repayment' (SISR) with the *Notice on Self-Issuance and Self-Repayment Measures for the Pilot Program on Local Government Debt* in 2014 and *New Budget Law* in 2015, subsequently implemented nationwide. The policy change clearly defined the debt repayment obligation of local governments (Guo 2019), which was known as the opening of 'front doors' for local governments to raise LGBs, and gradually blocked 'hidden channels' (see Table 1 and Table A1 for policy details). The latter two stages are referred to as SI reforms in our research.

Literature review

Land resources play an important role in China's urbanization development process. Due to China's decentralized financial system, local governments have the right to acquire, lease and manage land on behalf of the state (F. L. Wu 2022). Since the tax-sharing reform in 1994, the gap between fiscal revenue and expenditure has made land finance a major pathway for local governments to obtain public revenues (Z. Li, Wu, and Zhang 2021). The co-strategy for low-priced industrial land and high-priced commercial and residential land is widely applied (Gao et al. 2019). In examining the relationship between LGBs and land-leasing, most studies focus on urban construction and debt risk inflation (J. Xu and Zhang 2014; J. Zhang et al. 2021), neglecting the impact of bond issuance and repayment reform on the land leasing market.

Table 1. The institutions of China's LGBs.

Mode	Reform time	Pilot region (new)	Issuer	Repayment obligation	Credit guarantee	Supervision mechanism
Central-government-issuance and repayment	2009	Nationwide	MOF	MOF	National credit	LGBs' income and expenditure implement budget management, and report to the National People's Congress for review and approval
Self-issuance and central-government-repayment	2011	Shanghai, Zhejiang, Guangdong, Shenzhen	Local government	MOF	National credit	Centralized registration and trusteeship, listing and trading, disclosure of financial status and bond issuance results
	2013	Jiangsu, Shandong			National credit	
Self-issuance and self-repayment	2014	Shanghai, Zhejiang, Guangdong, Shenzhen, Jiangsu, Shandong, Beijing, Qingdao, Ningxia, Jiangxi	Local government	Local government	Local government credit	Carry out bond credit rating and timely disclosure of basic bond information, fiscal and economic operations, and debt situation, etc.
	2015	Nationwide				

Data sources: Compiled by the author from the MOF website.

In addition to direct land-transferring fees (Chiang, Hou, and Tsai 2022; Z. Huang and Du 2018; Tang et al. 2019), discussions on investment institutions and credit risk primarily revolve around UCIBs (L. B. Han et al. 2021). This includes their maturity mismatch (J. Xu and Zhang 2014) or credit risk due to elevated corporate bond costs and the low return on urban infrastructure projects through UCIBs (F. L. Wu 2022), which subsequently exacerbates financial instability. The term 'land finance' also encompasses land mortgages as a form of public financing leverage through Local Government Financing Vehicles (LGFVs), heavily reliant on the expected value of land, a practice that has been progressively standardized since 2011 (Gyourko et al. 2022). While most studies exploring the connection between land finance and LGDs emphasize the latter effect, few studies address the threat by examining the structure of LGBs and UCIBs in LGDs.

In China, land corresponding to different industries typically cannot be served for alternative uses, making it the benchmark carrier of industrial layout (Y. Wu et al. 2014). There are two strands of discussion around land leasing and industry development: One strand of literature find that lower industrial land prices reduce the upfront capital paid by enterprises, expediting county industrialization through increased investment attraction (S. Han et al. 2022). However, some scholars argue that a low-priced strategy may lead to inefficient land use, potentially leaving available land idle (Du and Peiser 2014). Another strand of literature on industrial development and land-leasing suggests that actions related to commercial and residential land use have a spill-over effect on the manufacturing and construction industry, as well as other service industries (Z. Huang and Du 2017). To summarize, there are few discussions on land-leasing strategies and industrial structure, particularly focusing on the relationship between LGBs and industrial layout.

As for the incentives, most of the literature is based on inter-jurisdictional competition or promotion incentives for officials (Feng, Lichtenberg, and Ding 2015). Therefore, we propose introducing a fiscal perspective on land leasing and investment promotion to assess the impact of the SI policy on regional economic development.

III. Theoretical framework and hypotheses

Under the fiscal incentives hypothesis (Weingast 2009), local governments take measures to maximize revenue generation in response to fiscal arrangements (Gao et al. 2019). Before the *New Budget Law* in 2015, the mismatch between the revenue capacity and spending responsibilities significantly increases fiscal pressure and provides clues for relying on land finance to compensate deficits (Guo 2019). For the SI reforms, local governments ingest fiscal revenue through the low-risk, low-cost, and non-resource-reliant financing channel, replacing the role of land finance. Therefore, the SI policy can temporarily alleviate fiscal pressure and decelerate the pace of land leasing behaviour. However, local governments have found it even more difficult to make ends meet since the LGFVs are rectified (Fan, Qiu, and Sun 2020), especially when repayment deadlines approach. In the long run, it is evident that local governments tend to lease more land for urgent repayment consideration, as well as in response to fluctuations in revenue and expenditure caused by debt repayment and fiscal incentives, so we propose hypothesis 1.

Hypothesis 1: The SI policy alleviates fiscal pressure and reduces land leasing in the short term. However, as the repayment deadline approaches, local governments still need to transfer land-use rights, especially for the commercial and residential land, to obtain land-transferring fees and tax revenues to compensate for fiscal deficits.

The SI reforms could be divided into two categories by repayment obligations. The lack of strict debt-repayment regulations in SICGR is influenced by the central governments' tendency to provide bail-out. Acting as an intermediary for repayment, the MOF has the flexibility to facilitate payments for debt settlements, thus making local governments dependent on the 'common pool' (Fritz and Feld 2020) to collectively share the fiscal cost and risk. Consequently, local governments have insufficient incentives to retain fiscal sustainability in the long run under SICGR, while the obligations

emphasized by SISR gradually restrain local governments' access to equalize fiscal risks from the 'common pool' and to maintain its fiscal sustainability through industrial development, which constitutes the main source of tax revenue. In summary, under SICGR and SISR, local government have different motives for developing industry due to different concerns about fiscal sustainability (Gao et al. 2019), resulting in different land-leasing behaviours in return.

Hypothesis 2: The repayment obligation is significant for the subsequent land leasing behaviour of local governments. Specifically, the SICGR pattern encourages local governments to lease more commercial and residential land, whereas SISR focuses on leasing more industrial land for long-term tax revenues.

IV. Research design

Data

There are three sources of our research databases. First, the land transaction data is obtained on a total of 3.09 million land parcels from the official website of China's Ministry of Land and Resources[2] (Fan, Qiu, and Sun 2020; Z. Huang and Du 2018; Wang et al. 2020; Yuan, Wei, and Xiao 2019). It mainly includes project serial number, land area, land supply pattern, usage of the land, years of leasing, and transaction price, etc. Second, following Dai et al. (2021), we employ the 2019 China national business registration database to clean and match the county administrative code according to each enterprise's registered address. We also delete the following samples and calculate the number of new-entrants in the secondary and tertiary sectors: (1) enterprises whose registered addresses are missing or cannot be located in count-level; (2) enterprises whose registration time is the same as or later than that of deregistration/revocation; (3) enterprises whose deregistration/revocation time is later than the point of time when the data are extracted (2019); (4) enterprises with a lack of important information, such as the industrial classification code.

Third, we also use several county-level variables collected from *County Statistical Yearbooks*, and *National Municipal and County-level Fiscal Statistical Data* from 2000–2019. LGBs balance data origin from *China Electronic Local Government Bond Market Access*. We adjust the code of each county to the administrative code of 2013.[3] And in all our data, we keep the sample of counties and county-level cities, and remove the counties in the provincial-level areas Xinjiang and Tibet for excessive missing values.

Effect of the SI reforms on land leasing: scale, structure, and price

SI reforms provide natural experiment conditions to identify the impact of fiscal structural policies, especially the local government bonds market reforms, on local governments' land-leasing behaviours, of which we focus on the leasing scale, price and the economic consequences. The effects of SI reforms are captured by the following difference-in-differences (DID) method:

$$y_{ct} = \alpha + \beta_1 SI_{p,t-3} + \left(Z_c \times \varphi_t\right)' \theta + \delta_c + \lambda_t + \varepsilon_{ct} \quad (1)$$

$$y_{ct} = \alpha + \beta_1 SISR_{p,t-3} + \beta_2 SICGR_{p,t-3} + \left(Z_c \times \varphi_t\right)' \theta + \delta_c + \lambda_t + \varepsilon_{ct} \quad (2)$$

Where the subscripts of c, p, and t indicate the county, province, and year respectively. There are three kinds of explanatory variables of y_{ct} in the baseline model: one is the c county's land leasing scale in year t (including total land, industrial land, commercial and residential land, and public land), we take the form of $ln(1 + scale)$ of all kinds of land (unit: hectares); another is the share of different types of land in c county in year t (unit: %). In further discussions, we also inspect the effects on land leasing prices (unit: million yuan).

The independent variable of interest is $SI_{p,t}$, a dummy variable taking the value of 1 when the

[2]Website of China's Ministry of Land and Resources, https://www.landchina.com/.
[3]2013 Administrative Code from the Ministry of Civil Affairs (MCA), https://files2.mca.gov.cn/cws/201404/20140404125552372.html.

county of p province in year t carries out the self-issuance (SI) reforms and after, and otherwise, 0. In the SI reforms, there are six pilot provinces of SICGR from 2011 to 2013, and ten pilot provinces of SISR in 2015, and provinces nationwide after 2015. The control group in the model are counties that have not yet approved the implementation of SI before 2015. In Equation (1) we use the $SI_{p,t-3}$, the 3-year time lagged variable with the following reasons: the minimum issuance period of LGBs is 3 years[4] (Tao et al. 2010); besides, there is a requirement from the central government to replace the existing LGDs with LGBs, and the deadline is also 3 year, which means we could identify the effect of LGBs reform relatively cleanly, without being disturbed by LGDs.[5]

Furthermore, there are two stages of SI reform, that is, self-issuance and central- government-repayment (SICGR), and self-issuance and self-repayment (SISR), which capture the institutional transition from central government restriction to the relatively independently self-regulation. $SICGR_{p,t}$ is a dummy variable which equals 1 when the six pilot provincial governments implementing SICGR and after, and also before they are institutionally transformed into SISR, and otherwise, 0. $SISR_{p,t}$, as a dummy variable, equals 1 when SISR is carried out in the county in t and after, and otherwise, 0. We also take a 3-year lag form of the two variables, and investigate the effects in further analysis part with Equation (2).

We incorporate control variables in Equation (1) and Equation (2). $\boldsymbol{Z_c}$ is a series of pre-treatment county-level control variables in 2000 or 2009, including: (1) the logarithm of (GDP per capita + 1) (*Lnpergdp*); (2) the logarithm of the (population +1) (*Lnpop*); (3) fiscal gap (T. Li and Du 2021) to control for the dependence of local governments' fiscal pressure on land leasing revenue, calculated as 1 - general budget balance revenue/general budget balance expenditure (*Fiscalgap*); (4) the logarithm of (output values of secondary and tertiary industries + 1) (*Lnsecon&terti)*; (5) the scale of UCIBs (in 2009[6]) with the log form (*LnUBICs*), following Cao et al. (2019) to control the impact of local government debts structure under the new statistical scope. To avoid estimation bias caused by bad control variables (Cinelli, Forney, and Pearl 2022), following Li et al. (2016), we use $\boldsymbol{Z_c}$ multiplied by year dummy variables φ_t. δ_c represents the county fixed effect, γ_t is a year fixed effect. ε_{ct} is the error term clustered at the county-level. And the descriptive statistics of variables with calculation method are shown in Table 2.

V. Baseline results

The impacts on the land leasing behavior

Table 3 shows the impact of self-issuance (SI) reforms on the land-leasing scale of different types[7] with the estimation of Equation (1), among which columns (1)-(4) include no control variables, columns (5)-(8) control county-level variables, columns (9)-(11) represent the effect of SI reforms on the share of the land-leasing scale of each type of land.

According to the results in Table 3, SI reforms significantly increased land-leasing scale after three years, with the total scale of all types growing by 24.86% (column (5)), the scale of industrial land increased by 14.43% (column (6)), commercial and residential land growing by 26.06% (column (7)), and public land growing by 19.52% (column (8)) respectively, which implies that SI reforms may change the local governments' inclinations towards leasing industrial land into commercial and residential land. Besides, the mode of these impacts has been enhanced over time (Figure 2).

Figure 2 shows that SI reforms decrease the total land-leasing scale in the adoption year, while two years after the reform (lagged by two years), the effect begins to be positive which has been proved by Table 3. The time-lagged effect of the reform indicates that local government, by implementing a low-cost and high-credit debt issuance way as

[4]*The Notice on Self-Issuance and Self-Repayment Measures for the Pilot Program on Local Government Debts* : the LGBs term is 3 years, 5 years, 7 years, and interest is paid annually.

[5]*Implementations on the Management of Local Government Debt Limits* (Cai Yu [2015] No. 225) states that the part of the local governments' stock of outstanding debts will be replaced through a transitional period of about three years, and the provincial finance departments will arrange for the issuance of LGBs within the limits.

[6]The UCIBs data have been more completely recorded since 2009, so data before 2009 are not used.

[7]According to (Gao et al. 2019), China's land-leasing market is discussed primarily from the following categories: industrial, commercial and residential, and infrastructure or public services.

Table 2. Variables and the descriptive statistics.

Variable names		Treatment group			Control group		
		N	Mean	SD	N	Mean	SD
Outcome variables	*Lntotal_scale*	13,422	4.49	1.42	21,748	3.80	1.73
	Lnindus_scale	11,672	3.19	1.34	16,990	3.12	1.49
	Lncom_scale	12,625	3.04	1.33	19,194	2.69	1.42
	Lnpub_scale	12,114	2.59	1.35	16,155	2.03	1.33
	Indus_share	7,625	0.44	0.24	10,528	0.48	0.26
	Com_share	7,625	0.42	0.24	10,528	0.40	0.25
	Pub_share	7,625	0.14	0.19	10,528	0.12	0.17
	Lntotal_price	13,295	6.22	1.37	21,461	5.30	1.74
	Lnindus_price	11,605	5.23	0.78	16,879	4.53	1.19
	Lncom_price	12,454	6.92	1.34	18,988	5.87	1.70
	Lnpub_price	10,240	3.79	2.47	12,914	3.26	2.37
	Lntotal_fees	13,422	9.78	2.65	22,230	7.91	3.36
	Lnindus_fees	11,672	8.21	1.88	16,990	7.29	2.49
	Lncom_fees	9,822	10.10	2.07	13,237	8.99	2.21
	FSR	19,288	26.67	15.16	5,632	5.66	3.32
	DG	19,288	49.02	17.89	5,632	45.28	10.76
	Secon_share	8,660	3.22	3.30	22,230	7.91	3.36
	Terti_share	8,293	3.06	2.66	16,990	7.29	2.49
	Terti_to_secon	8,293	1.52	2.96	30,418	1.17	1.57
	LnThiel	1,585	2.82	0.94	7,675	1.34	1.15
	Lnsecon_entry	18,705	2.69	2.23	49,535	3.11	1.56
	Lnterti_entry	19,209	3.51	2.78	50,631	3.91	1.86
Policy	*SI*	20,459	1	0	52,413	0	0
	SICGR	20,459	0.06	0.23	52,413	0	0
	SISR	20,459	0.94	0.23	52,413	0	0
Z_c	*Lnpergdp*	8,448	0.43	0.24	22,309	0.40	0.23
	Fiscalgap	14,017	0.44	0.27	36,968	0.45	0.27
	Lnsecon&terti	10,259	11.55	1.25	21,748	3.80	1.73
	Lnpop	13,373	12.59	1.40	16,990	3.12	1.49
	LnUBICs	16,448	0.98	1.49	19,194	2.69	1.42

a source of fiscal revenue, has alleviated the fiscal expenditure pressure on the borrowing side. As a result, initially, this manifested as a scale reduction in land-leasing market. However, the regression results for a lag of three periods indicate that as the debt repayment deadline approaches, local government still needs to transfer the land rights, especially the commercial and residential land, to obtain land-transferring fees in order to repay the LGBs.

Robustness checks

To address the endogeneity caused by reverse causality, upper-level implicit guarantee, and time-trend differences, we consider the three following aspects. First, not only does the policy in the LGBs market such as SI reforms have a positive impact on the land leasing market, but also the heating up of the land leasing market may, in turn, improve the governments' debt repaying capacity, enhance the collateral effect and the implicit guarantee effect of land leasing, and increase local government debts (Cheng, Jia, and Meng 2022; J. Zhang et al. 2021). However, the main debt creditors mentioned above, LGFVs, issues UCIBs which is usually considered as a significant component of LGDs with collateralized leverage function and higher default risk instead of LGBs (Pan et al. 2016). We control for UCIBs in 2009 in all our settings of regressions and include the debt risk control variable with time trend to reduce the disruption of implicit LGDs risk. Second, we have included the treatment variable multiplied by time-trend to control the possible time-variations between the treatment and control groups, and the provincial dummies multiplied by time-trend to control for the provincial guarantee variations in the following section. Third, the permutation test has been conducted to inspect that the change is driven by the exact SI reforms instead of accident.

Including time trend control variables

Although a provincial level reform of SI is relatively exogenous for county-level land markets, the estimation may be biased by ignoring treatment effects that change over time. Thus, we adopt the

Table 3. The effect of SI reform on the scales of all types of land and their shares.

	Ln(Land scale + 1)								The proportions of all types		
	(1)Total	(2) Industrial land	(3)Commercial and residential land	(4)Public land	(5)Total	(6) Industrial land	(7)Commercial and residential land	(8)Public land	(9) Industrial land	(10)Commercial and residential land	(11) Public land
SI_{-3}	0.1321***	0.0695*	0.1313***	0.2967***	0.2486***	0.1443**	0.2606***	0.1952***	−0.0153	0.0372**	−0.0219*
	(0.0353)	(0.0377)	(0.0381)	(0.0452)	(0.0547)	(0.0571)	(0.0621)	(0.0730)	(0.0175)	(0.0171)	(0.0118)
$Z_c \times \varphi_t$	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
County FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R^2	0.500	0.519	0.549	0.299	0.513	0.497	0.568	0.316	0.253	0.227	0.192
N	19833	17736	19220	17590	11321	10453	11052	10156	7151	7151	7151

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. We estimated DID model with the estimations dropping the singleton observations, because the singleton observations may exaggerate statistical significance when the robust standard errors are clustered (Cameron, Gelbach, and Miller 2008).

approach of Li et al. (2016), to include the provincial dummies of τ_p multiplied by the time polynomial function in Equation (3)[8]

$$y_{ct} = \alpha + \beta_1 SI_{p,t-3} + \left(Z_c \times \varphi_t\right)' \theta + \varphi Treatment_p \times f(t) + \tau_p \times f(t) + \delta_c + \lambda_t + \varepsilon_{ct} \tag{3}$$

Where $\boldsymbol{f(t)}$ is the function of time trend, we use the second-order polynomial here, and time trend is calculated as $year - 1999$. Other settings follow the settings in Equation (1).The estimations of Table 4 are consistent with the estimations presented in Table 3, which further prove the robustness of our results.

Including debt risk control variables

There are concerns about LGBs risk may influence local governments' fiscal pressure that may bias our estimation. We control local government debt risk at the county level, calculated as *(general budget expenditure-general budget revenue)/GDP* (Huo, Bi, and Yin 2023). The estimations of Table 5 are in line with the estimations in Table 3, which strengthen our results.

Permutation test

In order to test whether the change of land-leasing in our baseline model is driven by the SI reforms or any other accident, referring to Li et al. (2016), we conduct a permutation test to randomly assign each county to carry out the SI reforms in a randomized period. With this newly generated pseudo-SI variable, we estimate the Equation (1) with repeated 500 times. Figure 3 shows the cumulative distribution density of 500 times of point estimates of pseudo-SI, and the distribution is centred on zero with the standard deviation of 0.05774, which is significantly different from the baseline estimation of 0.2486 (Column (5) of Table 3). Thus, it indicates that the SI reforms are indeed effective, and the outcome is not driven by random factors.

The test of the parallel trend assumption

One of the basic assumptions of DID design to identify the causal effect of SI on the land-leasing scale is that the natural trend of treatment group and control group parallels. Referring to Beck et al. (2010), and taking the year before the implementation of SI as the base period, we employ the event study design as Equation (4) to test the assumption indirectly,

$$y_{ct} = \alpha + \sum_{k=-5, k\neq -1}^{3} \beta_k SI_{pk} + \left(Z_c \times \varphi_t\right)' \theta + \varphi Treatment_p \times f(t) + \tau_p \times f(t) + \delta_c + \lambda_t + \varepsilon_{ct} \tag{4}$$

Where k stands for relative time of SI reform $(-5 \leq k \leq 3, k = -5 if k \langle -5, k = 3 if k \rangle 3)$. $\boldsymbol{f(t)}$ is the first-order polynomial of time trend, and time trend is calculated as $year - 1999$. Other settings follow the settings in Equation (3).

[8]Following the reviewers' advice, we have added prefectural dummies multiplied by time trends as controls to mitigate implicit upper-level guarantees. The results remain robust.:

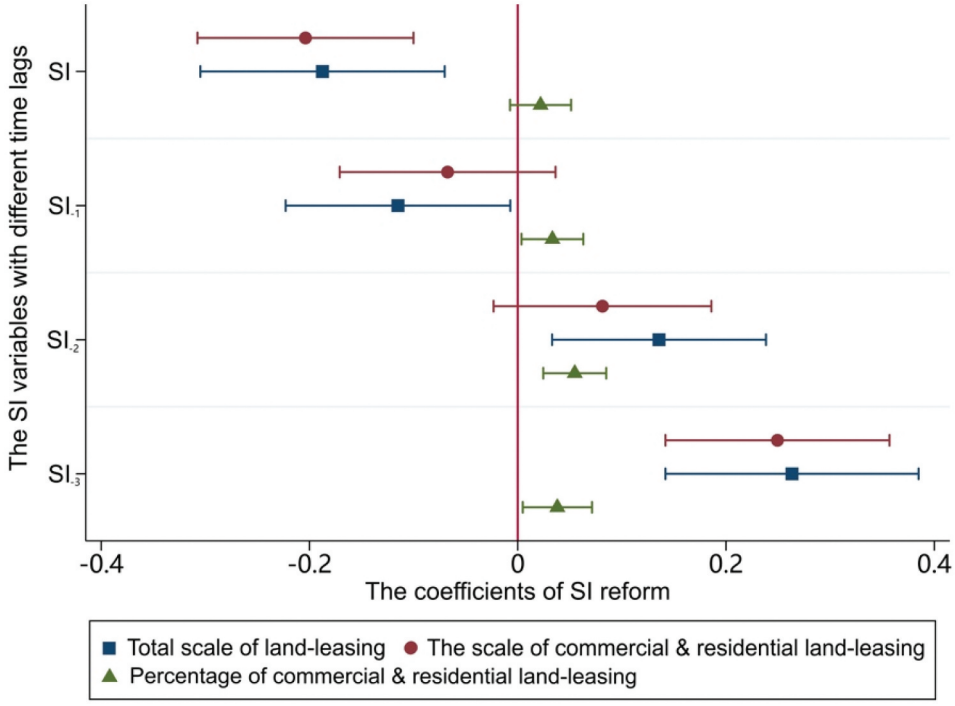

Figure 2. The coefficients of SI of each period. Each point estimate coefficient represents a baseline regression, with the vertical axis indicating the SI reforms taking the adoption year to the three-year lag respectively. The coefficients increase gradually when the time passes after the implementation of the SI reforms. The line perpendicular to the vertical axis represents the 95% confidence interval of the estimated regression coefficient.

The estimation is shown in Figure 4. The results of the parallel trend test of *SI* for various types of land-leasing scales show that the differences between the treatment and control groups prior to the implementation of SI are basically not prominent. After the implementation of the reforms, the regression coefficients β_k of SI_{pk} are significantly positive, indicating that the incremental impacts of SI reforms on the primary land leasing market is prominent.

The effect of SI reforms on land price

We further examine the effect of SI reforms on average land leasing prices. As shown in Table 6, the SI reforms increase the overall average land price by 13.96% after three year of policy adoption in column (5), and the price of commercial and residential land by 14.22% (column (7)), while the SI reforms have insignificant effect on the price of industrial land, confirming that commercial and residential land can bring high transferring-fees (Fan, Qiu, and Sun 2020), and the SI reforms don't compel local governments to lease the industrial land at a lower price.

Heterogeneity analysis

The repayment obligation of SI reforms

Table 7 reports the results of the regressions based on Equation (2). We categorize the SI reforms into two policies based on the repayment obligation: SICGR and SISR. Columns (1)-(4) denote the scales of land-leasing, and columns (5)-(7) present the shares of different land types.

From Table 7, it could be found that both SISR and SICGR have significantly positive effects on the scale of land-leasing after three years of the reform adoption (column (1)), but they have different structural effects. $SISR_{c,t-3}$ increases the proportion of industrial land by 4.80% (column (5)), while $SICGR_{c,t-3}$ has insignificant effect on industrial land scale and lays a prominent effect on the share of commercial and residential land-leasing by 5.73% (column (6)).

The above estimation indicates that SICGR encourages local governments to lease more commercial and residential land which brings higher but relatively immediate and short-term land-leasing revenue, while SISR promotes local governments to prioritize the long-term, sustainable economic growth (Gao et al. 2019), thus to lease more industrial land.

Table 4. The effect of SI reform on land leasing with provincial time trend controls.

	Ln(Land scale +1)				The proportions of all types		
	(1)Total	(2)Industrial land	(3)Commercial and residential land	(4)Public land	(5)Industrial land	(6)Commercial and residential land	(7)Public land
SI_{-3}	0.154**	0.0711	0.204***	0.0886	−0.0170	0.0343**	−0.0173
	(0.0602)	(0.0637)	(0.0631)	(0.0832)	(0.0186)	(0.0173)	(0.0127)
$Treatment_p \times f(t)$	YES	YES	YES	YES	YES	YES	YES
$\tau_p \times f(t)$	YES	YES	YES	YES	YES	YES	YES
R^2	0.571	0.562	0.632	0.416	0.380	0.362	0.323
N	11321	10453	11052	10156	7151	7151	7151

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. We estimated DID model with the estimations dropping the singleton observations. $Treatment_p \times f(t)$ is included with $f(t)$ taking the second-order polynomial of the time trend. $Z_c \times \varphi_t$, year fixed effects and county fixed effects are controlled in all the regressions with the same setting as column (5) of Table 3.

Table 5. The effect of SI reform on land leasing with debt risk control.

	Ln(land scale +1)			The proportions of land	
	(1)Total	(2)Industrial land	(3)Commercial and residential land	(4)Percentage of industrial land	(5)Percentage of commercial and residential land
SI_{-3}	0.2438***	0.1355**	0.2648***	−0.0162	0.0368**
	(0.0552)	(0.0579)	(0.0627)	(0.0174)	(0.0171)
R^2	0.516	0.494	0.566	0.254	0.228
N	10999	10168	10734	6948	6948

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. $Z_c \times \varphi_t$ include the debt risk control. Year fixed effects and county fixed effects are controlled in all the regressions with the same setting as column (5) of Table 3.

The heterogeneous effect according to implicit debts

Considering the potential impact of implicit debt, we divide the sample into groups: the group with more implicit debts (above the median) and the group that issues less (below the median). As shown in columns (1) and (4) of Table 8, it is found that SI has significantly increased land leasing by 38.68% in the lower implicit debts group. This may be attributed to the fact that, within this group, local governments have more limited access to unofficial financing through LGFVs, and the impact of SI

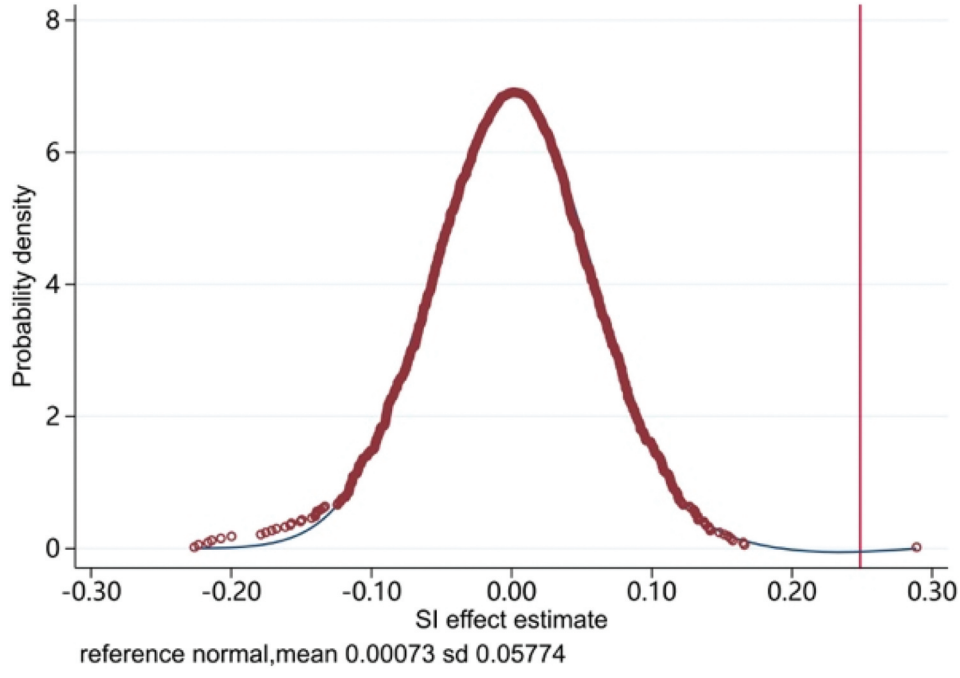

Figure 3. Permutation test with pseudo-SI. The figure shows the cumulative distribution density of the estimated coefficients is from 500 simulations randomly assigning the SI status to counties. The red vertical line presents the result of column (5) in Table 3.

will be less influenced by the implicit debts in this group.

VI. Mechanisms

The way of the conveyance of land use rights

Local governments adopt different strategies by the ways of transferring the use right of state-owned land. For Table 9, the SI reforms increase land scale whether by negotiation or tendering, auction and listing (Zhao Pai Gua) in columns (1) and (4), while commercial and residential land prefer leasing via a public auction or tendering process. (column (5)) For Table 10, SICGR dominates land leasing by negotiation (columns (1)). While SISR has increased the land scale offered by tendering, auction and listing, and promotes industrial, commercial and residential land leasing in a more market-oriented manner (column (4)-(6)), which offers more room to control the land market.

Fiscal sufficiency and debt burden

Four indicators are employed in this sector to explore the effect of series forms of SI, SICGR and SISR. First, the fiscal self-sufficiency rate (FSR), which reflects the fiscal sustainability and could be calculated as finance incomes/finance expenditures (Shu et al. 2018). Enhancing the durability of budget and optimizing the budgeting environment could promote fiscal sustainability, especially for SISR. Second, debt-to-GDP ratio (DG), which represents regions' debt burden (J. Xu and Zhang 2014). We also take debt risk and fiscal risk into consideration (Huo, Bi, and Yin 2023), which are calculated as LGBs balance/general budget revenue and (general budget expenditure-general budget revenue)/GDP. Columns (1)-(3) of Table 11 show the regressions of land-transferring fees of different types, columns (4)-(5) show the regressions of debt risk and fiscal risk, columns (6)-(7) show the regressions of FSR, and columns (8)-(9) show the DG's regressions. The estimations indicate that SI reforms significantly increase land-transferring fees

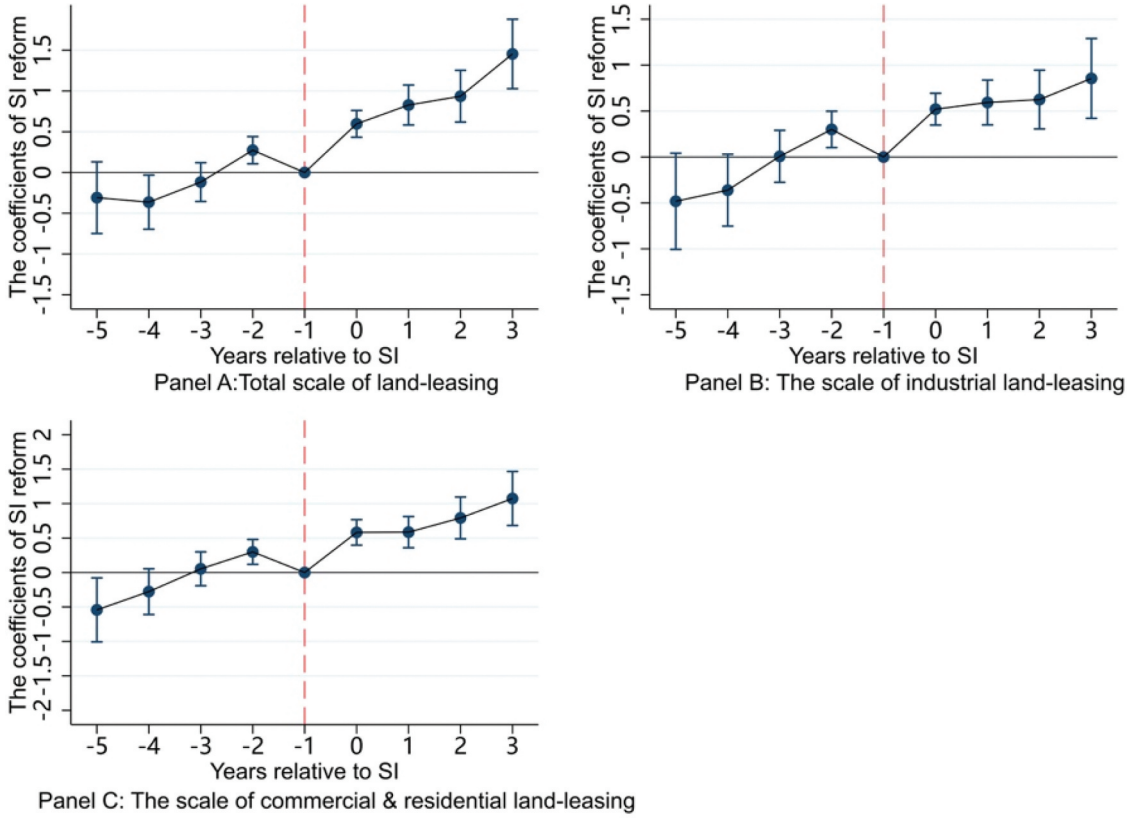

Figure 4. The results of event studies. The line perpendicular to the horizontal axis represents the 95% confidence interval of the estimated regression coefficient, and the horizontal axis represents the year of policy implementation. The settings of regressions are the same as the column (1)-(3) of Table 4. The joint tests of the coefficients from period -5 to -2 of all panels have been conducted, and they are insignificant with F-stat of 0.0001.

Table 6. The effect of SI reform on the land prices.

	(1)Average land price	(2) Industrial land	(3)Commercial and residential land	(4)Public land	(5)Average land price	(6) Industrial land	(7)Commercial and residential land	(8)Public land
SI_{-3}	0.0897*	−0.0214	0.0005	0.1548	0.1396**	0.0502	0.1422*	−0.1505
	(0.0524)	(0.0301)	(0.0544)	(0.1443)	(0.0679)	(0.0389)	(0.0775)	(0.1875)
$Treatment_p \times f(t)$	NO	NO	NO	NO	YES	YES	YES	YES
R^2	0.540	0.610	0.579	0.343	0.529	0.627	0.595	0.357
N	12076	10414	11005	8282	11285	10414	11005	8282

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. We estimated DID model with the estimations dropping the singleton observations. $f(t)$ is the third-order polynomial of time trend, $\boldsymbol{Z}_c \times \varphi_t$, year fixed effects and county fixed effects are controlled in all the regressions with the same setting as column (5) of Table 3.

Table 7. The effects of SICGR and SISR on land leasing of local government.

	Ln(Land scale + 1)				The proportions of all types		
	(1)Total	(2)Industrial land	(3)Commercial and residential land	(4)Public land	(5)Industrial land	(6)Commercial and residential land	(7)Public land
$SISR_{-3}$	0.5082***	0.5519***	0.4194***	0.3372***	0.0480*	−0.0077	−0.0403**
	(0.0879)	(0.0826)	(0.0917)	(0.1178)	(0.0250)	(0.0237)	(0.0200)
$SICGR_{-3}$	0.1388**	−0.0281	0.1940***	0.1328	−0.0437**	0.0573***	−0.0136
	(0.0615)	(0.0663)	(0.0658)	(0.0821)	(0.0196)	(0.0192)	(0.0137)
R^2	0.513	0.499	0.568	0.316	0.254	0.227	0.192
N	11321	10453	11052	10156	7151	7151	7151

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. We estimated DID model with the estimations dropping the singleton observations. $\boldsymbol{Z}_c \times \varphi_t$, year fixed effects and county fixed effects are controlled in all the regressions with the same setting as column (5) of Table 3.

Table 8. SI mainly affects the group with less implicit debts.

	More implicit debts			Less implicit debts		
	(1)Total	(2)Industrial land	(3)Commercial and residential land	(4)Total	(5)Industrial land	(6)Commercial and residential land
SI_{-3}	0.0529	−0.0465	0.1413	0.3868***	0.1211	0.4127***
	(0.0832)	(0.0884)	(0.0880)	(0.0740)	(0.0797)	(0.0768)
R^2	0.502	0.495	0.587	0.564	0.553	0.643
N	7173	6671	7032	4145	3762	4012

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. We estimated DID model with the estimations dropping the singleton observations. $\boldsymbol{Z}_c \times \varphi_t$, year fixed effects and county fixed effects are controlled in all the regressions with the same setting as column (5) of Table 3.

Table 9. The effects of SI on the scale of land leasing through land use conveyance.

	Ln(negotiation land scale + 1)			Ln(tendering, auction, and listing land scale + 1)		
	(1)Total	(2)Industrial land	(3)Commercial and residential land	(4)Total	(5)Industrial land	(6)Commercial and residential land
SI_{-3}	0.2144**	0.0187	0.0738	0.1644***	0.0846	0.2088***
	(0.1010)	(0.1271)	(0.1043)	(0.0533)	(0.0576)	(0.0625)
R^2	0.306	0.315	0.311	0.633	0.514	0.542
N	6680	3072	4995	11122	9996	10835

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. , year fixed effects and county fixed effects are controlled in all the regressions with the same setting as column (5) of Table 3.

Table 10. The effects of SICGR and SISR on the scale of land leasing through land use conveyance.

	Ln(negotiation land scale + 1)			Ln(tendering, auction and listing land scale + 1)		
	(1)Total	(2)Industrial land	(3)Commercial and residential land	(4)Total	(5)Industrial land	(6)Commercial and residential land
$SISR_{-3}$	0.1120	0.0016	0.0525	0.5114***	0.5205***	0.5368***
	(0.1415)	(0.1615)	(0.1911)	(0.0783)	(0.0863)	(0.0833)
$SICGR_{-3}$	0.2558**	0.1019	0.0063	0.0169	0.0803	−0.1070
	(0.1145)	(0.1058)	(0.1449)	(0.0584)	(0.0706)	(0.0654)
R^2	0.306	0.311	0.315	0.634	0.543	0.516
N	6680	4995	3072	11122	10835	9996

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. , year fixed effects and county fixed effects are controlled in all the regressions with the same setting as column (5) of Table 3.

with a rise of 27.05%, 16.23%, and 17.69% respectively for total land, industrial land, and commercial and residential land in columns (1)-(3). The SI reforms enhance both the debt risk and fiscal risk with 12.2% and 2.98%. As for the FSR, the SI reforms significantly decrease the rate by 2.62% in column (4), SISR reform improves the FSR by 1.01%, which verifies that SISR reform further regulates the debt repayment responsibility and incentivizes local governments to place greater emphasis on the sustainability of fiscal revenue. For DG, both SICGR and SISR reforms enhance the DG significantly.

VII. Industrial development consequences

We check the industrial consequences from the perspectives of regional industrial structure, and investment promotion of local governments in different sectors.

Table 12 explores the impacts on new-entrants in secondary (columns (1)-(2)) and tertiary sectors (columns (3)-(4)). We include the number of incumbent firms in each industry in the last year to control for the business agglomeration effect on new investment (Long and Zhang 2011). It could be found that the SI reforms significantly increase the number of new-entrants in the tertiary industry by 10.25% and crowd out the new firms in the secondary industry by 13.9%. For the different types of SI, SISR reform promotes new business in both secondary and tertiary industries, helps the economy to be more fiscally sustainable, while SICGR supports incumbent firms more in their new projects.

Table 13 mainly investigates the industrial structure, and columns (1)-(4) are the regressions with the dependent variables as the shares of secondary and tertiary sectors in GDP respectively; columns (5)-(6) examine the impacts on the ratio of value added in the tertiary sector to that in the secondary sector; columns (7)-(8) present the effects on the Thiel index in a logarithmic form.

According to Zhang and Wang (2023), we calculate the Thiel index with Equation (5). The larger the Thiel index is, the greater the deviation of the indicator distribution.

$$Thiel = \sum_{j=1}^{3} \frac{Y_{i,j,t}}{Y_{i,t}} \times \ln\left(\frac{Y_{i,j,t}/Y_{i,t}}{L_{i,j,t}/L_{i,t}}\right) \quad (5)$$

Where $L_{i,j,t}/L_{i,t}$ denotes the share of employment to total employment in industry j (%) in area i; $Y_{i,j,t}/Y_{i,t}$ denotes the share of output value in industry j to total output value (%).

Table 13 exhibits SI reforms significantly lead to a 35.49% increase in the share of tertiary sector in columns (3), while SICGR reform promotes local governments to give more priorities to tertiary sector, and SISR reform enhances the joint development of secondary and tertiary sectors. In columns (7) and (8), the series reforms of SI bring about a widening gap in population and land matching, which reflects the variation characteristics and imbalance of the employment and industries among and within counties.

VIII. Discussion and conclusions

Further discussion

We can derive implications from the impacts of SI policies on regional economic development for regulators, decision-makers and investors. Regulators of central government need to analyse the methods of scrutinizing LGBs within the

Table 11. The effects of series reforms of SI on fiscal related indicators.

	Ln(Land-transferring fees + 1)			Debt risk	Fiscal risk	Fiscal self-sufficiency rate (FSR)		Debt-to-GDP (DG)	
	(1)Total	(2)Industrial land	(3)Commercial and residential land	(4)	(5)	(6)	(7)	(8)	(9)
SI_{-3}	0.2705***	0.1623**	0.1769**	0.1220***	0.0298***	−0.0262***		2.9794***	
	(0.0798)	(0.0715)	(0.0899)	(0.0228)	(0.0022)	(0.0036)		(0.2193)	
$SICGR_{-3}$							−0.0426***		3.9767***
							(0.0038)		(0.3019)
$SISR_{-3}$							0.0101***		0.7798***
							(0.0038)		(0.2495)
R^2	0.675	0.559	0.684	0.772	0.893	0.977	0.977	0.893	0.894
N	12921	11594	10106	10527	6987	6987	6987	6987	6987

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. We estimated DID model with the estimations dropping the singleton observations. $Z_c \times \varphi_t$, year fixed effects and county fixed effects are controlled in all the regressions with the same setting as column (5) of Table 3.

Table 12. SI reforms' effects on new-entrants in secondary and tertiary sectors.

	Ln(size of new-entrants in secondary sector)		Ln(size of new-entrants in tertiary sector)	
	(1)	(2)	(3)	(4)
SI_{-3}	−0.1390***		0.1025**	
	(0.0468)		(0.0460)	
$SICGR_{-3}$		−0.2790***		−0.1301***
		(0.0399)		(0.0321)
$SISR_{-3}$		0.1531*		0.5928***
		(0.0919)		(0.1038)
The number of related incumbent firms	1.2755***	1.2817***	1.4054***	1.4088***
	(0.0688)	(0.0692)	(0.1059)	(0.1057)
R^2	0.901	0.902	0.900	0.902
N	8879	8879	8940	8940

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. $Z_c \times \varphi_t$, year fixed effects and county fixed effects are controlled in all the regressions with the same setting as column (5) of Table 3; besides, we control the number of related incumbent firms.

Table 13. SI reforms' effects on industrial structure.

	The proportion of secondary sector in GDP		The proportion of tertiary sector in GDP		The ratio of value added in tertiary sector to that in the secondary sector		Ln(Thiel index)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SI_{-3}	−0.0046		0.3549***		0.0883***		0.1149***	
	(0.0683)		(0.0463)		(0.0302)		(0.0248)	
$SICGR_{-3}$		−0.1396**		0.2648***		0.0989***		0.0786***
		(0.0613)		(0.0390)		(0.0289)		(0.0241)
$SISR_{-3}$		0.3246***		0.5825***		0.0618		0.1405***
		(0.1179)		(0.0724)		(0.0446)		(0.0283)
R^2	0.837	0.837	0.877	0.877	0.572	0.572	0.971	0.971
N	11576	11576	11472	11472	10088	10088	2916	2916

*** denotes significance at the 1% level, ** at the 5% level, and * at the 10% level. Robust standard errors clustered at the county level are in parentheses. $Z_c \times \varphi_t$, year fixed effects and county fixed effects are controlled in all the regressions with the same setting as column (5) of Table 3.

specific institutional context in which they were established. First, we offer a perspective on debt decentralization within the framework of fiscal decentralization, guided by the frequently discussed incentive hypothesis (Weingast 2009). Second, both research and practice have highlighted the importance of regulations aimed at curbing illegal debt financing vehicles to avoid implicit guarantees and excessive issuance of LGBs (Z. Li, Wu, and Zhang 2021). This is consistent with our analysis, which primarily focuses on enhancing self-regulation to facilitate long-term tax revenue, jobs creation and fundamental industrial construction.

For decision-makers of local governments, our discussions revolve around how the uneven landscape of land marketization has been reshaped by the reshuffling of central-local power within fiscal institution. As a result, local governments may work to mitigate practices that lead to distort the utilization of industrial land. Local governments, which accounts for a small share of the budgetary revenue, must bear the majority of expenditure for public services (Hu and Qian 2017). This situation leaves them with no direct incentive to supply social infrastructure (Gao et al. 2019). Recognizing this, literature suggests that local governments should continuously coordinate the fiscal sustainability and independence (Bo et al. 2022). Inspired by this literature, we adapt these principles to our specific institution context. Our innovation recommends scheduling industrial arrangements aligned with LGBs institution and avoiding indiscriminate allocation of debt-issuance capital to productive infrastructure projects characterized by a low return on investment.

Finally, SI reforms also bring about business opportunities for downstream corporate investors. With increasing fiscal independence and multiple market supervision, SI reform will promote fair competition among enterprises without implicit guarantee (X. Chen 2020). Furthermore, local governments may implement more supportive measures for new entrants capable of enhancing tax generation, and our findings address the contradictions in policy and

regulatory frameworks that may hinder the synergistic allocation of secondary and tertiary sectors, a challenge well-documented in the literature (Zhou, Huang, and Chong 2022).

Conclusion and implication

Since the tax-sharing reform in 1994, the vertical fiscal imbalance resulting from the centralization of tax revenue and budgetary allocation authority, alongside the decentralization of expenditure responsibilities, has been reinforced. This has made land revenue a critical fiscal resource for county-level governments, resulting in economic consequences. From the initiation of SI reforms in 2011 until the enactment of the *New Budget Law* in 2015, the issuance of local government bonds represented a partial decentralization of the government borrowing authority. The paper investigates the effect of SI reforms on land leasing behaviours, as well as exploring the industrial consequences. The findings reveal that:

First, SI reforms reduce land leasing and alleviate the fiscal pressure in the adoption year and one year later. After three years, local governments enhance their land leasing behaviours with a 24.86% increase in scale and a 13.96% increase in price, and show a greater preference for commercial and residential land. Heterogeneity analysis suggests that SICGR pattern favours commercial and residential land leasing, while SISR pattern increases industrial land leasing to maintain fiscal sustainability. Second, we find that the mechanisms through which SI reforms affect land leasing, as carried out by SICGR and SISR, mainly manifest through the land-use conveyance mode, debt burden, and fiscal sufficiency rate. Third, SI reforms have significant industrial consequences, such as promoting the development of tertiary industries and enhancing business attraction in the tertiary sector.

The evidence implies that the decentralization of government borrowing authority is beneficial for alleviating the fiscal pressure on local governments and reducing their short-term reliance on land finance. However, in the long term, granting borrowing authority to local governments requires strengthening constraints on local government debts repayment obligations to ensure fiscal sustainability. First, clarifying debt ownership boundaries will make 'auditability' and 'accountability' crucial aspects of debt governance. Second, local governments should redirect future investments to county regions (where LGBs are utilized) and fully revitalize county resources to advance towards a path conductive to the development of secondary and tertiary industries. In conclusion, local governments should adopt a sustainable development pattern based on the balance between fiscal revenues, the land market, and local government debts. Moreover, it inspires future research to examine the general equilibrium effects of changes in local government debt structure from the perspective of land allocation and land financing.

Abbreviation

DID	Difference-in-Differences
FE	Fixed Effect
SI	Self-issuance
SICGR	Self-issuance and Central-government-repayment
SISR	Self-issuance and Self-repayment
LGBs	Local Government Bonds
LGDs	Local Government Debts
UCIBs	Urban Construction and Investment Bonds
LGFVs	Local Government Financial Vehicles
GDP	Gross Domestic Product
FSR	Fiscal Self-sufficiency Rate
DG	Debt-to-GDP Ratio

Disclosure statement

No potential conflict of interest was reported by the author(s).

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