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Has the Reform of Land Reserve Financing Policy Reduced the Local Governments' Implicit Debt?

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Abstract: Confronted with the expansion of local governments' implicit debt and the associated risks induced by the practice of "land-based financing", substantial alterations occurred in China's land reserve financing policy during 2016–2017. These modifications led to an entire cessation of land reserve loans and the initiation of specialized bonds designated solely for land reserves. Empirical evidence, gathered through the approximate application of the difference-in-differences method, reveals that the reform of the land reserve financing policy can markedly reduce local governments' implicit debt level. Based upon this foundation, the results of the triple-difference regression demonstrate that the diminution effect of the land reserve financing policy reform on local governments' implicit debt is more pronounced in regions characterized by lower levels of marketization and more substantial legal financing constraints. This research enriches the comprehensive understanding of the impact of land reserve financing policy reform, possessing considerable referential value for the prevention and resolution of local governments' implicit debt.

Keywords: land reserve; local governments' implicit debt; land financing policy

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1. Introduction

Following the financial crisis of 2008, China's central government implemented a CNY 4 trillion stimulus plan. While it revitalized short-term economic vigor, the subsequent local government debt issue resulting from it has not yet been resolved. Both the party and the state have placed high emphasis on addressing this issue. In the report of the 19th National Congress of the Communist Party of China (CPC), the primary task among the "three major battles" was identified as "preventing and defusing major risks", and the key point of realizing the aforementioned task is financial risk prevention, especially the risk prevention of local governments' implicit debt. According to statistics of the Ministry of Finance, the amount of China's local governments' explicit debt had reached CNY 35.06 trillion until the end of 2022, the year-on-year growth rate of which was 15%, and the growth rate of total local governments' debt had increased by 12.5 times compared to the end of 2009. According to the estimation of the International Monetary Fund, the amount of implicit debt in local governments' financing platforms could reach CNY 66 trillion by the end of 2022. The transformation from the potential default risk of local governments to the national debt risk will produce seriously negative impacts on the process of China's financial and economic system. Furthermore, the enormous debt of local governments, shortage of debt collateral assets, and soft budget constraints of local governments would accelerate the aforementioned transformation. Facing the expansion of local government debt and the major implicit risk, as a macroprudential authority, the Ministry of Finance needs not only to make relevant policies relating to the enhancement of local-government-debt control and standardized regulation but also to encourage explicitness of implicit debt and make debt within the scope of regulation. Consequently, in this study we thoroughly investigate the cause of local government debt and the effect of land reserve financing policy reforms on the suppression of local governments' implicit debt.

Local governments' implicit debt principally refers to the debt incurred by local governments beyond the statutory debt limit, in violation of laws or regulations, or through disguised borrowing. With the aim of preventing and mitigating debt risks, academia has delved into the reasons behind the expansion of local governments' implicit debt. Existing studies attribute its underlying cause to fiscal decentralization, soft budget constraints, and political promotion incentives. Regarding fiscal decentralization, China's tax-sharing reform in the 1990s, which focused on "revenues going up and responsibilities going down", has led to a mismatch between fiscal authority and responsibility [1]. This phenomenon has resulted in unclear distinctions between responsibilities and expenditure obligations, as well as a growing gap between local fiscal revenues and expenditures. Consequently, local governments have been motivated to borrow [2,3]. In terms of soft budget constraints, the expansion of implicit debt fundamentally stems from an expansion of local government moral hazard [4,5]. Transfer payments, designed as a macro-control policy to balance local fiscal revenue and expenditure, have inadvertently led local governments to shift public investment costs to the central government [6,7]. This kind of transfer payments create a "common pool" effect, resulting in an imbalance in debt repayment pressures across regions [8,9]. Furthermore, it fosters local governments' reliance on central government assistance [10], leading to indirect financing through various financial tools and lowering the threshold for borrowing [11]. From the perspective of political promotion incentives, local officials focus on the development of new districts, as well as the construction of infrastructure, and promote local investment through available resources for political achievement when the mechanism of official promotions is determined by the main goal of economic growth. Consequently, the implicit debt of local government is promoted [12–14]. Term limitations further encourage local officials to engage in short-sighted and irrational borrowing behaviors [15].

In addition to fiscal decentralization, soft budget constraints, and political promotion incentives, scholars have identified land financing as a main approach for local government borrowing. The "Budget Law" issued in 1995 restricted legal financing channels for local governments. Consequently, financing platforms not only became products of local governments to bypass legal constraints, compensating the funds shortage of city construction, but also accelerated the process of urbanization. However, the "Guarantee Law" prohibited the government from providing guarantees to these financing platforms. Reserved land, injected by the government into financing platforms as quality assets, played a leveraging role in urban construction financing [16,17]. Specifically, when local fiscal revenue falls short of funding needs, local governments invest reserved land assets into financing platforms. These platforms then utilize these assets to expand financing channels through land mortgage loans or bond issuance and establish debt repayment sources through anticipated land income. This process forms a land financing chain. Empirical analyses by Jin and Yan (2012) [18] highlight that the higher the land prices, the higher the land transfer income, local government land mortgage loans, and propensity to over-borrow.

To curb the escalating risks of implicit debt resulting from land financing, the Ministry of Finance and three other departments issued the "Notice on Regulating Land Reserves and Capital Management and Related Issues" (Cai Zong (2016) No. 4) in 2016, leading to significant changes in land reserve financing policy. On the one hand, this led to "channeling and blocking", which means the adjustment of land reserve financing methods, the cessation of land reserve loans, and the issue of local government bonds for land reserves within the debt limit of local government; on the other hand, the financing functions of land reserve institutions and financing platforms were clarified. Subsequent notifications further standardized local government borrowing, introducing new local government bonds designated for land reserves ("Land Reserve Special Bonds"). These measures have had an important impact on local governments' implicit debt. The existing literature on land reserve financing policy reforms predominantly focus on policy background, impact, and countermeasures. For example, scholars have indicated that the policy to halt land reserve loans can standardize local government borrowing [19]. Additionally, the

introduction of new special land reserve bonds can ensure the funding requirements of land reserve projects [20], which helps mitigate impulsive local government financing and prevents uncontrolled growth of local government debt. Nevertheless, whether and how land reserve financing policy reforms effectively suppress local governments' implicit debt remains an area where empirical evidence and in-depth analysis are still lacking.

Based on this context, the present study employs Financial Comprehensive Document (2016) No. 4, a central policy of land reserve financing reform, as a quasi-natural experiment. Covering all 31 provinces in the nation, the difference-in-differences approach is utilized to empirically examine the impact of land reserve financing policy reform on the emergence of local governments' implicit debt. Regression results indicate that the reform of land reserve financing policy significantly reduces the scale of local governments' implicit debt, the proportion of local governments' implicit liabilities, and the rate of local governments' implicit debt. This reduction effect is significant in regions with a lower degree of marketization and higher legal financing constraints.

The subsequent sections of this paper are organized as follows: the second part elaborates on the institutional context of land reserve financing policy reform and provides a theoretical analysis of local governments' implicit debt. The third part outlines the empirical model and selection of variables. The fourth part discusses the empirical results and interprets the data. Finally, the fifth part concludes the study and offers policy recommendations.

2. Theoretical and Policy Background

2.1. Reform of Land Reserve Financing Policy

Before 2016, the funding for land reserves was primarily derived from fiscal appropriations, land reserve loans, and other sources such as land transfer fees. Among these, land reserve loans can be referred to as the funds sought by land reserve institutions from banks for land acquisition and early-stage development purposes. Due to the limited availability of fiscal appropriations and the instability of other revenue sources, land reserve loans became not only the main source of funding for land reserves but also the traditional financing method. In 2001, the State Council issued Document (2001) No. 15, which for the first time defined the sources of funding for land reserves and proposed that financial institutions offer credit support for land acquisition. This policy laid the groundwork for subsequent expansions in land financing. Furthermore, the 2007 "Land Reserve Management Measures" still permitted commercial banks and other financial institutions to issue loans for land reserves, without clear restrictions on loan amounts and terms. Although several departments jointly proposed the establishment of a directory for land reserve institutions to enhance management in 2012—allowing institutions in the directory to apply for land reserve loans with a maximum term of 5 years, and these funds could not be used for urban construction or unrelated fields[1]—land reserve institutions continued to serve the dual functions of land reserves and government financing, which results in the continued growth of land reserve loans.

In response to the unchecked growth of land reserve loans, in 2016, the Ministry of Finance and three other departments jointly issued a notice regarding the standardization of land reserves and fund management, leading to significant reforms in land reserve financing policy. These reforms were characterized by three key aspects: first, "blocking", which meant that land reserve loans have been forbidden since 1st January 2016 [19]; second, "channeling", which allowed local governments to decide and arrange for the issuance of local government bonds for land reserves within the state-approved debt limit [19]; third, "clearing", which involved optimizing land reserve institutions, removing their financing function, and returning them to their original public welfare attributes. Additionally, financing platforms were also stripped of land reserve functions. Subsequently, in May 2017, the Land Reserve Special Bond Management Measures were introduced, further detailing the "channeling" policy outlined in Document (2016) No. 4. These measures officially introduced local government bonds specifically for land reserves, with funds

designated for land reserve purposes. Guidelines for the management, budget execution, and final accounts of these special bonds[2] were also established. In the same month, the Ministry of Finance and five other departments issued a notice, reinforcing the "clearing" policy of Document (2016) No. 4. Local governments were required not to inject reserved land into financing platforms as a means of financing or debt repayment[3].

Document (2016) No. 4 marked a turning point in land reserve financing policy. It combined "channeling" and "blocking" measures, representing a shift from non-transparent land reserve loans to market-based local government bonds (special bonds for land reserves). This adjustment clearly delineated between land reserves and financing platforms, effectively closing the avenue for financing platforms to borrow against reserved land. Therefore, two documents refined the "channeling" policy and continued the "clearing" policy, respectively.

2.2. Impact Analysis of the Reform of Land Reserve Financing Policy on Local Governments' Implicit Debt

The "Blocking" policy, through the cessation of land reserve loans, effectively curtailed a significant source of local governments' implicit debt. Land reserve institutions are established under the approval of local governments and operated under the jurisdiction of land resource management departments, facilitating unified land reserve operations. Aside from a small initial capital injection, local government fiscal investment in land reserve institutions remained minimal. To meet the funding requirements for land acquisition and reserves, policies permitted land reserve institutions to secure loans by pledging reserved land to banks. However, due to the close relationship between land reserve institutions and local governments, as well as the ability of land mortgage loans to rapidly secure substantial funding, loan funds were frequently diverted toward urban infrastructure and public service facility construction. This transition rendered land reserve institutions a form of local government financing entity, and land reserve loans became a means of government financing, thereby giving rise to local governments' implicit debt.

In line with data from the 2015 "China Financial Yearbook" and the 2013 audit findings of the National Audit Office, government land reserve institution loans stood at approximately CNY 0.96 trillion[4] at the end of 2013, accounting for roughly 13.73% of local government contingent liabilities[5] at the end of June 2013. It made land reserve loans an integral component of local governments' implicit debt. However, following the land reserve financing policy reform, land reserve loans were completely discontinued, and the aspect of land reserve institutions serving government financing was completely eradicated, directly diminishing the source. According to the China Financial Yearbook, the loan balance of land reserve agencies began to markedly decline from 2016 and reached only CNY 0.23 trillion in 2018 (as depicted in Figure 1). It can be further corroborated that the policy measures of forbidding the new land reserve loans exerted a notable impact on the loan balance of land reserve agencies. As can be observed from Figure 1, the loan balance of land reserve agencies had gradually decreased since 2016.

The "Channeling" policy, which introduced special bonds for land reserves, substituted a significant portion of local governments' implicit debt. Under the old Budget Law issued in 1994, local governments lacked the authority to issue bonds. The new Budget Law issued in 2015 solely permitted local governments to issue government bonds within the sanctioned debt limit (explicit debt category). Additionally, the People's Bank of China's "Loan General Rules" explicitly prohibited local governments from directly borrowing from commercial banks. Evidently, legal financing avenues for local governments were limited, inadequately catering to the financial requirements of urban operations. Consequently, local governments frequently resorted to implicit debt. After the land reserve financing policy reform, local governments introduced new special bonds for land reserves. These bonds met the financial demands of local government operations in land reserve activities and, to some extent, acted as a substitute for the local governments' implicit debt associated with land reserves. The Wind Economic Database indicates that the national issuance of

special bonds for land reserves from 2017 to 2019 amounted to CNY 2188.83, 5892.80, and 6765.28 billion, respectively. These figures accounted for 5.02%, 14.15%, and 15.51% of the total national local government bond issuance, progressively enhancing the support offered by special bonds to meet local government financial needs.

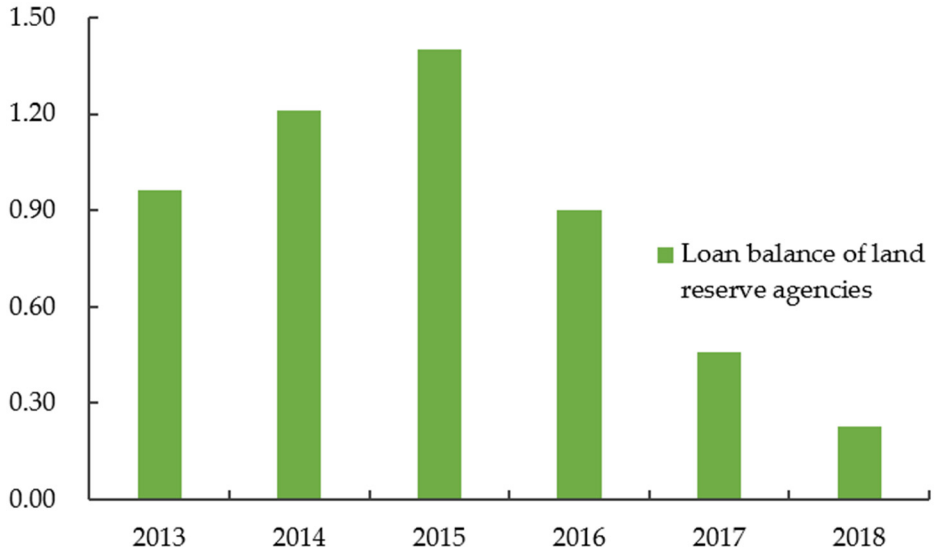


Figure 1. Loan balance of land reserve agencies at the end of 2013–2018 (unit: CNY trillion).

The "Clear" policy, by curtailing support for financing platforms, weakened the financial assistance procured by these platforms. According to the China Deleveraging Process Report of 2017, local government financing platform debt was equivalent to 40% of the GDP, totaling CNY 30 trillion. It constituted a substantial portion of the implicit debt. Financing platform debt was closely tied to reserve land, with local governments frequently and unlawfully injecting reserved land into these platforms to bolster their debt capacity. This action achieved two objectives: first, it augmented the overall asset scale of financing platforms, thereby enhancing credit and bond issuance limits offered by financial institutions [21,22]; second, it fulfilled bond issuance prerequisites. Moreover, financing platforms sought loans from financial institutions by leveraging reserve land as collateral, supported by local governments' commitment letters for financial guarantees. Land transfer fees were designated as security for collateral loans [23]. Following the land reserve financing policy reform, financing platforms were entirely stripped of their land reserve functions. The new policy prohibited local governments from not only including reserve land in the assets of financing platforms but also offering guarantees for financing platforms' debts using projected land transfer income. This policy reform weakened the asset support and guarantee capability of local governments for financing platforms. The aforementioned policy helped local governments decrease the accessible financial support of financing platforms, reduced the effect of the land reserve which can be treated as bargaining tools in financing platform debt, decreased the available financial support of financing platforms, and eventually decreased the scale of local governments' implicit debt, which was related to financing platforms.

Based on the above analysis, this paper hypothesizes that with other variables held constant, the reform of land reserve financing policy will contribute to a reduction in local governments' implicit debt. Furthermore, considering the institutional environment differences among provinces, the mitigation effect of local governments' implicit debt and the implementation of land reserve financing policy differ in regions under the influence of marketization disparities and legal financing restrictions. The differentiated empirical results are examined through heterogeneous analysis.

Considering the resolution of local governments' implicit debt and the implementation of land reserve financing policy closely related to the institutional environment, the

empirical evidence of the influence on local governments' implicit debt by land reserve financing policy reform from the perspective of regional marketization disparities and legal financing restrictions is currently being overlooked. This paper intends to test the relevant empirical results through heterogeneous analysis.

3. Model Setting and Variable Selection

3.1. Data Source

The land reserve financing policy reforms, based on the "channeling-block-clear" approach, have enacted a dual strategy. They have brought a cessation to land reserve mortgage loans while simultaneously introducing special bonds for land reserves—a specific category of local government bonds exclusively designated for land reserves. Moreover, these reforms have definitively elucidated the interplay between land reserves and financing platforms, rectifying the practices of local governments in borrowing against reserved land and generating debt through financing platforms. Initiated under the umbrella of Financial Document (2016) No. 4, these reforms in land reserve financing policy have externally altered local governments' implicit debt landscape, thus serving as a quasi-natural experiment for the purpose of this study. To explore the extent to which the reforms in land reserve financing policy have impacted local governments' implicit debt, this study employs balanced panel data spanning from 2009 to 2019, encompassing all 31 provinces and yielding a total of 341 observations. The implementation of the policy reform has unfolded progressively since early 2016. Therefore, this study designates the period between 2016 and 2019 as the execution phase and the period from 2009 to 2015 as the pre-reform phase. Data have been sourced from reputable references including the "China Fixed Assets Investment Statistical Yearbook", "China Land and Resources Yearbook", "China Financial Yearbook", and "China Statistical Yearbook".

3.2. Empirical Strategy

This study employs the difference-in-differences (DID) approach to estimate the impact of land reserve financing policy reform on local governments' implicit debt. The policy reform was applied nationwide without pilot testing, which resulted in identifying provinces entirely unaffected by the policy reform to serve as a control group to be a challenge. Therefore, the construction of suitable treatment and control groups becomes a pivotal component of this approximate application of DID study.

Initially, it is imperative to design rational grouping criteria to identify provinces that are more significantly affected by the policy reform. This study designates areas with higher dependence on land financing as the treatment group and those with lower dependence as the control group. This kind of categorization is based on the following facts: first, when accruing implicit debt, local governments often provide reserve land for financing platforms to help financing platforms raise mortgage loans or issue urban investment bonds if the financing platforms satisfy bond issuance conditions through land assets; second, in this context, provinces with a higher reliance on land financing are more likely to incur implicit debt using this method, whereas the reform disrupts the linkage between land reserves and financing platforms, thereby obstructing this financing chain. Consequently, for provinces with an increased dependency on land financing, the policy reform's effect on implicit debt is more distinct, rendering this division logical.

Moreover, we should construct a judicious grouping method. The conventional approach partitions groups based on the average value of the key grouping variables before the policy shock for each province after 3 or 5 years [24,25]. This paper embraces this method, classifying treatment and control groups in accordance with the average dependence on land financing during the five years before the land reserve financing policy reform (2011–2015) in each province. Considering that local governments' repayment of implicit debts (including land reserve organization loans and financing platform debts) relies heavily on land transfer income, this paper measures land financing dependence by the proportion of land transfer income to local governments' implicit debts. Initially, the

average proportion of land transfer income to local governments' implicit debt for each province from 2011 to 2015 is computed, and then the median of this average value (36.30%) is determined. If a province's average proportion surpasses 36.30%, denoting a greater reliance on land financing and a more pronounced effect from the reform, it is designated as the treatment group. Conversely, if the average proportion is below 36.30%, signifying less dependence and a diminished impact from the reform, it is classified as the control group. Actually, the aforementioned control group is not perfect. However, under the policy shocks, it is hard to find an exogenous control group which is unaffected by policy. To our knowledge, this is the optimal method we could apply under this circumstance.

In order to interpret the feasibility of grouping, we plot land financing dependence (measured by the proportion of land transfer income to local governments' implicit debts) based on our samples during 2009~2019 by dividing local governments into high dependence on land financing and low dependence on land financing in Figure 2. The graph clearly shows that, while the land financing dependence for governments with low dependence on land financing is up and down, with a small margin before the reform and a flat one up to after the reform, the trend for those with high dependence on land financing changes massively.

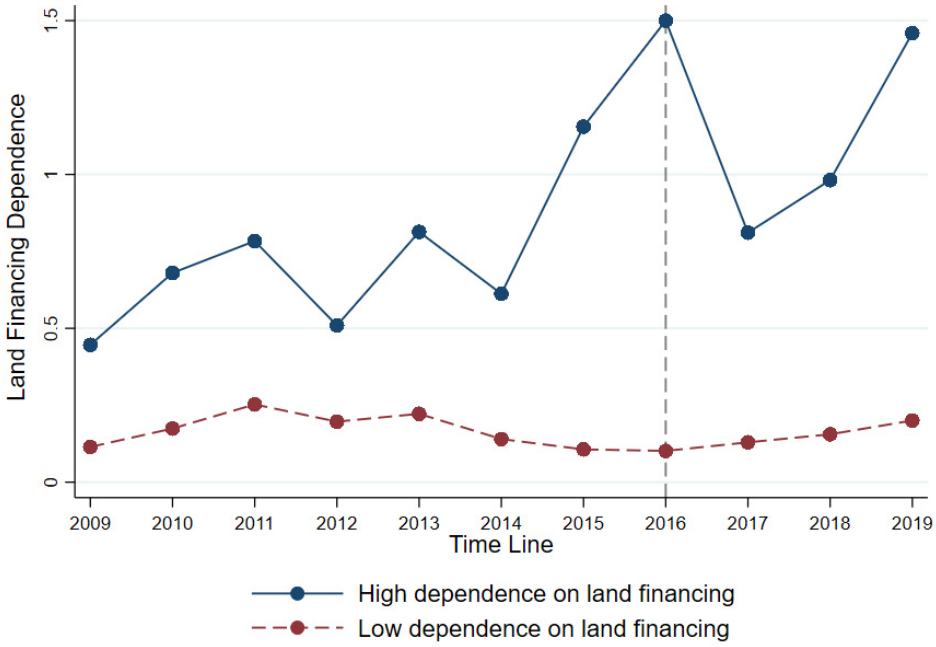


Figure 2. Land financing dependence: high/low dependence on land financing, 2009–2019. Figure presents the average share of proportion of land transfer income to local governments' implicit debts in 31 provinces, 2009–2019.

Figure 3 plots the scale of local governments' implicit debt for local governments with high and low dependence on land financing. It shows that local governments with low dependence on land financing almost have the same increase trend as those with high dependence before the reform. However, after the reform, the scale of local governments' implicit debt decreases faster in local governments with high dependence on land financing than in local governments with low dependence on land financing. These two diagrams suggest a possible association between the reform of land reserve financing policy, land financing dependence, and local governments' implicit debt, which paves the way to provide causal inferences.

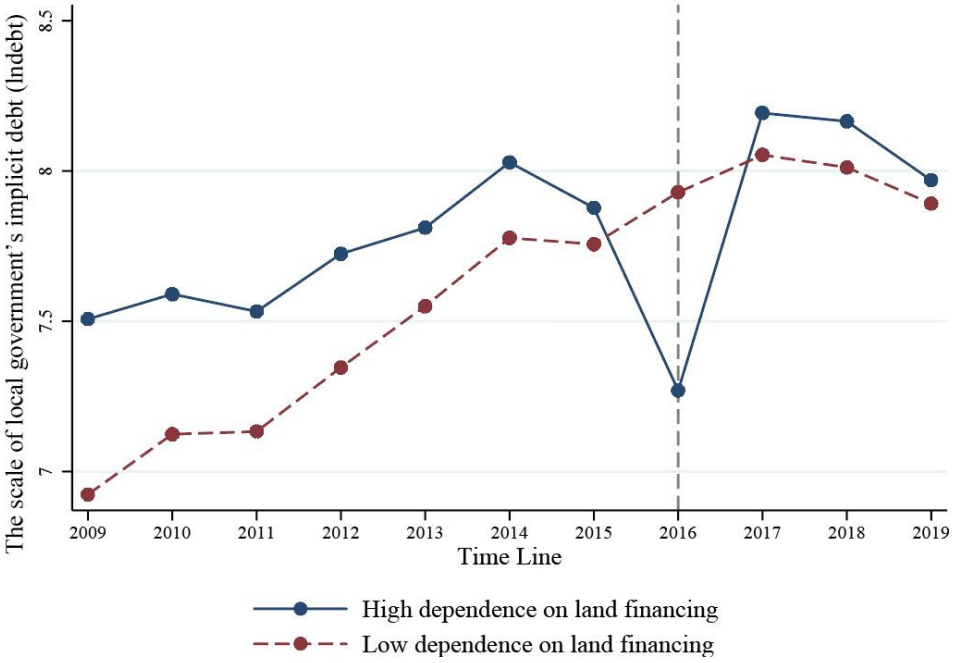


Figure 3. The scale of local governments' implicit debt: high and low dependence on land financing, 2009–2019. Figure presents the average share of the logarithmic form of local governments' implicit debt in 31 provinces, 2009–2019.

To eliminate the differences between individuals and time, this study constructs an approximate application of DID controlling two-way fixed effects for analysis:

$$Y_{it} = \beta_0 + \beta_1 \, Treat_{it} \, * \, Time_{it} + \alpha X_{it-1} + \mu_i + \gamma_t + \epsilon_{it} \quad (1)$$

In this model, the dependent variable Y_{it} represents the level of local governments' implicit debt in province i of year t. $Treat_{it}$ is a grouping dummy variable, with the treatment group provinces taking the value of 1 and the control group provinces taking the value of 0; $Time_{it}$ is a time dummy variable, taking the value of 0 before 2016 and 1 for 2016 and afterwards; X_{it} represents a series of control variables; μ_i represents the regional fixed effects for each province, γ_t represents the time fixed effects for each year, and ϵ_{it} represents the random error term. This study mainly focuses on the coefficient β_1 of $Treat_{it} * Time_{it}$, which measures the net effect of the reform of land reserve financing policy on the implicit debt of the local government in the treatment group.

Our approximate application of the empirical method (DID) is applicable in terms of the following three aspects:

First, there are no incentives for any local governments to reform land reserve financing policy, for the reason that land transfer income makes up a large section of local governments' revenue. Owing to its unpredictability, Financial Document (2016) No. 4 is exogenous for local governments.

Second, based on empirical strategy and the different land financing capacity of 31 provinces, we expect to observe the differential behavior responses of the inherently varying samples to the experiment, which ensures the policy shock to be exogenous, and further identify the differentiated effects caused by behavior otherness of local governments. We consider the higher dependence on land financing as the treatment group and those with lower dependence as the control group and document the differential behavior responses of these two types of local governments to the reform. This kind of method could identify the effect of land financing dependence on the expansion speed of local governments' implicit debt. In other words, the DID term, measured by interaction between the reform dummy and group dummy, interprets the difference in response to the reform of land reserve financing policy between the two groups in terms of the expansion speed of implicit debt as

the impact of the policy change. As for the choice of treatment group, similar exercises have been conducted by some other influential scholars, e.g., Bhattacharya S et al. (2022) [25]. Consequently, examining the effect of the policy shock only affecting the treatment group but not the control group is feasible.

In addition, the reform of land reserve financing policy, symbolled by Financial Document (2016) No. 4, will not have any effect on the reverse approach (the local governments' implicit debt influencing the land financing dependence). Policy signals for the reform of land reserve financing policy require restrictions on implicit debt's expansion. However, when local governments' implicit debt is generated, the land reserve financing policy has no influence on the utilization efficiency and capital investment direction of the local governments' implicit debt. Therefore, in this manuscript, the reform of land reserve financing policy only affects the phenomenon that land financing dependence influences implicit debt's expansion, while there is no effect on the reverse approach. In a word, the aforementioned impact approach satisfies the policy identification conditions, indicating that the policy is an exogenous shock to local governments' implicit debt.

In Section 4.3, we run some further checks using multiple approaches to establish that the Financial Document (2016) No. 4 is not endogenous. A robustness test with a different choice of treatment group is shown in paragraph 1, a robustness test using a propensity score matching method is shown in paragraph 2, and a random grouping placebo test circumventing potential bias arising from the categorization of high and low land financing dependence is shown in paragraph 5.

Third, approximately applying the DID method should carefully control the influence of potential and unmeasurable factors on decreasing local governments' implicit debt. Actually, to enhance management, many departments jointly proposed the suggestion of establishing a directory for land reserve institutions. If the issue of this policy can effectively reduce the increase in land mortgage loan and local governments' implicit debt, it will make checking the effectiveness of land reserve financing policy's reform in 2016 more difficult. Actually, Financial Document (2016) No. 4 peeled off the land reserve function of land reserve institutions in three aspects. These three aspects, including "land reserve institutions are not allowed to include the reserved land in the corporate assets of financing platforms", "local governments are not allowed to use the expected land transfer income as a repayment guarantee for financing platforms", and "central government opens up formal financing channels for local governments to operate land reserve business", did not appear in Ministry of Land and Resources Development (2012) No. 162. As shown in Figure 1, the loan balance of land reserve agencies gradually increased from 2013 to 2015 and has decreased since 2016. Obviously, land reserve agencies were still equipped with land reserve and financing functions after 2012. Meanwhile, through the analyses of policy, we find that the land reserve financing policy in 2016 plays the most effective role in restraining local governments' implicit debt. Moreover, it is an exogenous shock to local governments' implicit debt.

To exclude the chance that the local governments' implicit debt is subject to some unobservable variables and to further interpret the externality of the reform, we run robustness tests by changing the research window in the third paragraph, advancing and lagging the policy impact year in the fourth paragraph in Section 4.3.

3.3. Variable Definition and Descriptive Statistics

The dependent variables in this study pertain to the levels of local governments' implicit debt, which are specifically identified as the scale of local governments' implicit debt (lndebt), the ratio of local governments' implicit liabilities to GDP (debtgdp), and the rate of local governments' implicit debt (debtrev). Among these variables, the scale of local governments' implicit debt (lndebt) is measured by the natural logarithm of the local governments' implicit debt, the calculation of which will be detailed later in the text. The ratio of local governments' implicit debt to GDP (debtgdp) represents the proportion of implicit debt to GDP, reflecting the economic scale's ability to bear the local governments'

implicit debt within the accounting period. Internationally, the risk control standard for the government debt ratio is often set at 60%, as stipulated by the Maastricht Treaty. The rate of local governments' implicit debt (debtrev), as a proportion of comprehensive financial capacity[6], is an index measuring the ability of local finances to cover implicit debt. Internationally, the risk control standard for the debt rate is generally set between 100% and 120%.

The core explanatory variable is $Treat * Time$, which takes the value 1 if province i belongs to the treatment group in the year 2016 or later and 0 otherwise.

The level of regional development and the financial and the monetary resources of local governments may introduce endogenic issues. Therefore, this study incorporates the following control variables: (1) Per capita land transfer income (landrev) measured by the income from per capita land transfer [23]. (2) Economic growth (pgrow) represented by the annual growth rate of GDP [2]. (3) Urbanization rate (urban) denoted by the proportion of the urban resident population to the total resident population in the region [2]. (4) Fiscal gap (fisgap) measured by the ratio of the difference between general public budget expenditures and general public budget revenues to GDP [23]. (5) Financial institution development level (finance) measured by the ratio of the sum of deposits and loans of financial institutions to GDP [23]. To reduce endogenic issues, the control variables use data lagged by one period. Descriptive statistics for these variables are shown in Table 1.

Table 1. Descriptive statistics.

Variable	Treatment Group Provinces						Control Group Provinces					
	Treatment Group before Policy Reform			Treatment Group after Policy Reform			Control Group before Policy Reform			Control Group after Policy Reform		
	Number of Samples	Mean	Standard Deviation	Number of Samples	Mean	Standard Deviation	Number of Samples	Mean	Standard Deviation	Number of Samples	Mean	Standard Deviation
Lndebt	112	7.725	0.751	64	7.899	1.885	105	7.373	1.012	60	7.971	0.871
Debtgdp	112	12.429	4.580	64	12.589	6.725	105	22.266	5.887	60	26.209	8.128
Debtrev	112	125.287	59.996	64	123.576	75.863	105	220.822	52.115	60	251.427	73.985
Landrev	112	0.331	0.200	64	0.569	0.348	105	0.113	0.058	60	0.156	0.063
Pgrow	112	10.514	2.646	64	6.955	1.759	105	11.043	2.642	60	7.101	1.648
Urban	112	60.517	14.139	64	66.099	11.221	105	45.419	8.906	60	52.292	7.702
Fisgap	112	6.777	4.525	64	8.369	4.588	105	25.376	25.198	60	28.807	25.699
Finance	112	295.054	123.349	64	347.726	122.332	105	273.564	74.024	60	350.653	99.239

3.4. Local Government Hidden Debt Calculation

In a broad sense, there are two methods for quantifying the magnitude of local governments' implicit debt:

The Direct Method: This approach originates from the perspective of fund sourcing. It involves computation based on the categorization and aggregation of implicit debt elements. These factors may encompass municipal investment bonds [26] or aggregate interest-bearing debt held by local financing platforms [27]. Alternatively, the measurement could encompass the combined sum of PPP debt, debt from state-owned enterprises, non-performing loans within local financial institutions, pension shortfalls, and local financing platform debt [28].

The Indirect Method: This technique stems from the viewpoint of fund application. Given the fundamental principle of expenditure equating income, local government debt can be ascertained by subtracting the budgeted funds from the total investment in fixed assets within the municipal domain [29,30]. This process is followed by deducing explicit debt from the result to obtain implicit debt. The direct method carries the risk of unclear fund source attribution and potential omission of fund components. On the other hand, the indirect method's criteria for classification are more standardized. Consequently, this

article adopts the indirect method to evaluate local governments' implicit debt, employing the specific formula presented below:

$$\begin{aligned} &Investment\ in\ Fixed\ Assets\ in\ the\ Municipal\ Field \\ &\quad = Budgeted\ Funds\ for\ Municipal\ Construction \\ &\quad + Local\ Government\ Explicit\ Debt\ Funds \\ &\quad + Local\ Government\ Implicit\ Debt\ Funds \\ &\quad + Land\ Transfer\ Income\ for\ Municipal\ Construction \\ &\quad + Profit\ Cash\ In\ flow\ of\ Municipal\ Projects \end{aligned} \tag{2}$$

$$\begin{aligned} &Local\ Government\ Implicit\ Debt \\ &\quad = Investment\ in\ Fixed\ Assets\ in\ the\ Municipal\ Field \\ &\quad - Budgeted\ Funds\ for\ Municipal\ Construction \\ &\quad - Land\ Transfer\ Income\ for\ Municipal\ Construction \\ &\quad - Profit\ Cash\ Inflow\ of\ Municipal\ Projects \\ &\quad - Local\ Government\ Explicit\ Debt \end{aligned} \tag{3}$$

Items in the formula are calculated as follows:

Investment in Fixed Assets in the Municipal Domain: This value is determined by aggregating fixed asset investment data from locally governed sectors[7]. These sectors comprise public administration, water, electricity, and gas supply; postal, warehousing, and transportation industries; environmental facilities, water conservation, and public infrastructure; the central government's shared affordable housing and shed reform, calculated at 20%[8] of construction industry fixed asset investment; health and social security; education; geological exploration; and scientific research.

Budgeted Funds for Municipal Construction: The calculation initially involves deriving the proportion of fixed asset investment in the municipal domain relative to the overall social fixed asset investment. This proportion is then multiplied by the data for total budgeted funds within the realm of social fixed asset investment. The result approximates the budgeted funds allocated for municipal construction investment.

Land Transfer Income for Municipal Construction: This involves netting the income from land transfers against costs such as land requisition compensation and development arrangements. This income serves as a pivotal funding source for local government infrastructure projects. This article approximates this income as 30% of the net income obtained from land transfers for municipal construction[9].

Profit Cash Inflow from Municipal Projects: This largely arises from the depreciation of fixed assets [29]. Zuliu et al. (1997) [31] and Young (2003) [32] categorized fixed asset investment into construction, equipment, and other industry classifications, with respective depreciation rates of 6.90%, 14.90%, and 12.10%. The comprehensive depreciation rate for each province in the current year is computed through weighted averaging. This rate is then multiplied by the previous year's fixed asset investment within the municipal domain of each province. The results yield the profit cash inflow from municipal projects.

Local Government Explicit Debt: this is gauged based on the local governments' debt income[10] from the "China Finance Yearbook".

Employing the aforementioned methodologies, this article computes the newly accrued local government debt, explicit debt, and implicit debt data across 31 provinces from 2009 to 2019. The aggregated figures for each province are presented in Table 2. Assuming a local government debt repayment term of 5 years[11], estimates indicate that the balances for local governments' debt, local governments' explicit debt, and local governments' implicit debt at the end of 2019 stand at CNY 62.74 trillion, CNY 12.72 trillion, and CNY 50.03 trillion[12], respectively. These estimates are substantially aligned with calculations conducted by authoritative institutions both domestically and internationally. Consequently, they can

be regarded as consistent with the actual scenario in gauging the scale of newly accrued local governments' implicit debt[13].

Table 2. Total amount of new implicit debt of local governments from 2009 to 2019 (unit: CNY 100 million).

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
New Debt	46,957	54,028	51,946	62,622	72,861	93,251	112,030	129,144	143,446	131,170	111,640
New Explicit Debt	2000	2000	2000	2500	3500	4000	28,137	35,260	23,693	22,278	17,798
New Implicit Debt	44,957	52,028	49,946	60,122	69,361	89,251	83,893	93,885	119,753	108,892	93,841

4. Analysis of Empirical Results

4.1. Baseline Regression Results

This study employs three distinct regression analyses, utilizing the size of local governments'implicit debt, the local governments'implicit liability rate, and the local governments'implicit debt rate as dependent variables. These estimations are presented in Table 3. Notably, irrespective of the inclusion of variables such as per capita land transfer in-come, economic growth, urbanization rate, fiscal gap, financial institution development level, and other control factors, it is evident that the estimated coefficient for Treat*Time remains consistently significant and negative.

Table 3. Impact of land reserve financing policy reform on local governments' implicit debt.

Variables	Lndebt		Debtgdp		Debtrev	
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Time	−0.424 *	−0.481 **	−3.784 ***	−2.923 **	−32.316 ***	−34.599 ***
	(0.169)	(0.173)	(0.859)	(0.921)	(7.644)	(8.357)
Control variables	No	Yes	No	Yes	No	Yes
Regional effect	Yes	Yes	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes	Yes	Yes
Sample size	341	341	341	341	341	341
Adjusted R^2	0.049	0.226	0.217	0.304	0.292	0.347

Note: *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Parentheses contain standard errors.

These results underscore that subsequent to the reform of the land reserve financing policy, regions within the treatment group (characterized by higher reliance on land financing) have experienced notable reductions in the size of local governments' implicit debt, the local governments' implicit liability rate, and the local governments' implicit debt rate in comparison to the control group (regions with lower dependence on land financing). The prohibition of land reserve loans as stipulated by Financial Comprehensive Document (2016) No. 4 directly affects land reserve loans, a critical component of local governments' implicit debt. Consequently, the absolute magnitude of newly accrued local governments' implicit debt has been impacted, thereby inducing a rational recalibration of the implicit debt scale.

Concurrently, the reform of land reserve financing policy has exerted influence on both the local governments' implicit liability rate and the local governments' implicit debt rate, which are metrics designed to assess economic capacity and the local government's ability to manage implicit debt. This influence stems from the explicit delineation of implicit debt through mechanisms such as the "opening the front door and blocking the side door" function of special land reserve bonds, as well as the curbing of borrowing potential within local financing platforms. As result of this policy reform, risks associated with local governments' implicit debt have become more aligned with regional economic development and financial resilience. The regression findings in Table 3 affirm that the

reform of the land reserve financing policy has effectively mitigated the level of local governments' implicit debt.

4.2. Parallel Trend Test

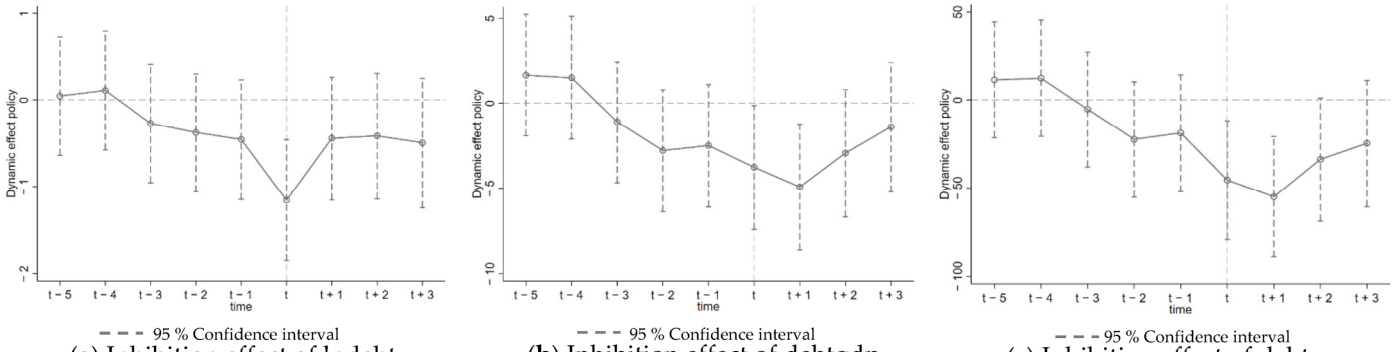
The baseline regression analysis revealed a negative effect of land reserve financing policy reform on the level of local governments' implicit debt. However, this result assumes an important potential hypothesis that the control and treatment groups have parallel trends prior to policy implementation. Specifically, in this study, the treatment group had a consistent trend in local governments' implicit debt with the control group before the reform of land reserve financing policy (before 2016), without any significant difference. If this assumption is violated, the trend difference before policy implementation will cause bias in the assessment of policy effects. To quantitatively test whether parallel trends are present, the regression model of our article approximately applies the event study method established by Jacobson et al. (1993) [33]:

$$Y_{it} = \beta_0 + \beta_k \sum_{k \geq -7}^{3} Treat * Year_{2016+k} + \alpha X + \mu + \gamma + \varepsilon \quad (4)$$

In this model, $Year_{2016+k}$ is a time dummy variable, taking a value of 1 for that year and 0 for other years; other variables are consistent with Equation (1). This study takes the first year of the sample statistics (2009) as the reference group, and β_k measures the difference in local governments' implicit debt between the treatment group and the control group in different years. If β_k is not significant when $k \leq -1$, it indicates that before the reform of land reserve financing policy, the treatment group and the control group had no significant difference in local governments' implicit debt, and Equation (1) passes the parallel trend test. β_k with $k \geq 0$ measures the inhibitory effect of the reform of land reserve financing policy on local governments' implicit debt; if this coefficient is statistically significant, it demonstrates a substantial impact on the treatment group's local governments' implicit debt.

Figure 4 plots the estimated coefficients of β_k for $-5 \leq k \leq 3$ and their 95% confidence intervals. Observing the portion for $-5 \leq k \leq -1$ (i.e., 2011—2015), Figure 4a–c all show β_k values close to 0, and their 95% confidence intervals all include zero, indicating that β_k is not significantly different from zero at the 5% level. The treatment and control groups' trends in local governments' implicit debt before the reform of land reserve financing policy are consistent, thus passing the parallel trend test. Observing the part for $0 \leq k \leq 3$ (i.e., 2016—2019), Figure 4a shows a sharp decline in the size of local governments' implicit debt in the treatment group in 2016, but the inhibitory effect disappears in the subsequent year. Given that land reserve loans constitute a critical component of local governments' implicit debt and that Financial Regulation (2016) No. 4 has specifically impeded these loans, they have caused a direct impact on the absolute scale of new local governments' implicit debt. The policy effect was particularly pronounced in 2016. After a one-year buffer period, local governments started to adjust their debt structure in 2017, accommodating some of the funding needs for land reserve projects through the issuance of special land reserve bonds (classified under explicit debt). Consequently, the impact of the policy that blocked land reserve loans began to diminish. Figure 4b,c demonstrate that, during 2016–2017, the inhibitory effect on both the local governments' implicit liability rate and the local governments' implicit debt rate in the treatment group notably intensified. However, this effect gradually waned and vanished by 2018. This diminishing effect might be attributable to factors beyond Financial Comprehensive Document (2016) No. 4, which altered land reserve financing methods. Financial Planning (2017) No. 62 also rendered land reserve assets explicit through a market-based issuance disclosure mechanism, thus precluding fraudulent financing practices under the pretense of land re-reserving. Furthermore, Financial Planning (2017) No. 50 elucidated the relationship between reserve land and financing platform borrowing. Therefore, the impact on the local governments' implicit liability rate

and local governments' implicit debt rate was amplified in 2017, substantiating the earlier analysis of inhibitory effects.



(**a**) Inhibition effect of lndebt (**b**) Inhibition effect of debtgdp (**c**) Inhibition effect of debtrev

Figure 4. Parallel trends test using the difference-in-differences approach. Parallel trends tests for (**a**) lndebt, (**b**) debtgdp, and (**c**) debtrev through the difference-in-differences approach.

4.3. Robustness Testing

Robustness test by altering the construction method of treatment and control groups. In the baseline regression model, this paper designates provinces displaying the highest 1/2 dependency on land financing and the lowest 1/2 dependency on land financing as the treatment and control groups, respectively. To ensure the robustness of the conclusions, this paper further modifies the grouping methodology for testing. It designates provinces with the highest 1/3 dependency on land financing as the treatment group and the lowest 1/3 as the control group. The regression results are presented in Table 4. If the construction methodology of the treatment and control groups is robust, empirical results will manifest a dose effect [34]: the newly defined treatment and control groups will exhibit a greater disparity in land financing dependency prior to the policy shock, consequently amplifying the impact of the land reserve financing policy reform. The results in columns (1) to (3) of Table 4 demonstrate that, whether gauged by the scale of local governments' implicit debt, the implicit liability rate, or the implicit debt rate, the coefficients for $Treat_{C1-C3} * Time$ are all remarkably negative at the 1% significance level. Moreover, the regression coefficients are smaller than those in the baseline regression, signifying the constrain effect of the land reserve financing policy reform on intensified local governments' implicit debt, aligning with the anticipated dose effect.

Difference-in-differences robustness test using propensity score matching method. The provinces within the treatment group, displaying higher dependency on land financing, typically lack random selectivity. However, to preempt potential omitted variable bias, this paper executes a robustness test employing the second-order kernel density function and the first-order nearest neighbor matching method. First, we compute propensity score values influencing the local financing level and structure. This encompasses per capita land transfer income, economic growth rate, urbanization rate, fiscal gap, financial institution development level, and time dummy variables as covariates. Second, we identify control group samples that closely align with the treatment group samples in terms of propensity score values. Third, we perform the double-difference test again, advancing from the premise that the average treatment effect on those treated (ATT) successfully passes the significance examinations. The results, as depicted in columns (4) to (6) of Table 4, signify that the reform pertaining to land reserve financing policy has curtailed the risk associated with local governments' implicit debt. This further bolsters the conclusions presented within this paper.

Table 4. Robustness test of difference-in-differences approach with changes in treatment and control group construction method and propensity score matching.

Variables	Change in Treatment and Control Group Construction Method			Propensity Score Matching		
	(1)	(2)	(3)	(4)	(5)	(6)
	Lndebt	Debtgdp	Debtrev	Lndebt	Debtgdp	Debtrev
$Treat_{C1–C2} \times Time$	−0.769 *** (0.237)	−4.082 *** (1.148)	−38.894 *** (11.289)			
Treat × Time				−0.778 ** (0.254)	−4.892 *** (1.040)	−51.811 *** (10.122)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Regional effect	Yes	Yes	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes	Yes	Yes
Sample size	220	220	220	211	211	211
Within-group R^2	0.409	0.477	0.474	0.350	0.452	0.507

Note: *** indicates significance at the 1% level, ** at the 5% level. Parentheses contain standard errors.

Counterfactual test to exclude time trend. This study employs a placebo test to mitigate the influence of temporal trends. The temporal placement of the land reserve financing policy reform is adjusted to a point before 2016; consequently, the sample period is recalibrated from 2009 to 2015. This reassessment seeks to examine whether the dampening effect on local governments' implicit debt persists. As discussed earlier, a fundamental precondition for the difference-in-differences approach is the absence of substantial dissimilarity in the behaviors of local governments with respect to incurring implicit debt prior to the reform of the land reserve financing policy. Thus, by artificially advancing the timing of the land reserve financing policy reform and excluding samples subsequent to the actual reform implementation, the coefficient estimation of the pivotal explanatory variable, named as $Treat * Time$, would lose its statistical significance. Conversely, the persistence of statistical significance in the estimated coefficient of the hypothetical $Treat * Time$ variable implies the presence of latent unobservable factors instigating the reduction in local governments' implicit debt. This implies that the reduction is not merely attributed to the suppressive effect emanating from the land reserve financing policy reform. To bolster the robustness of the empirical findings, this study considers various instances of policy shock, specifically in the years 2010, 2011, 2012, and 2013. The resultant regression results are detailed in Table 5. In accordance with Table 5, the estimated coefficient of $Treat * Time$ lacks statistical significance. Consequently, this observation helps mitigate the potential influence of other latent factors on the magnitude of local governments' implicit debt.

Table 5. Counterfactual test results.

Variable	Lndebt				Debtgdp				Debtrev			
	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013
Treat × Time	0.01 (0.07)	0.07 (0.07)	0.04 (0.08)	−0.06 (0.07)	−0.03 (1.14)	1.70 (1.15)	1.24 (1.16)	−0.77 (1.12)	11.53 (9.88)	14.76 (10.01)	13.28 (10.13)	0.16 (9.75)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample size	217	217	217	217	217	217	217	217	217	217	217	217
Within-group R^2	0.74	0.74	0.74	0.74	0.38	0.39	0.39	0.39	0.56	0.56	0.56	0.56

Note: Parentheses contain standard errors.

Use an ex ante and ex post approach to prove that the reform is not endogenous. Local governments' implicit debt is likely subject to some unobservable factors, e.g., ethical or political issues, and the generated intervention. In order to control for such events, we use an ex ante–ex post approach to prove that the reform is not endogenous. In other words, we assume the reform of land reserve financing policy is released predate or postdate 2016 and

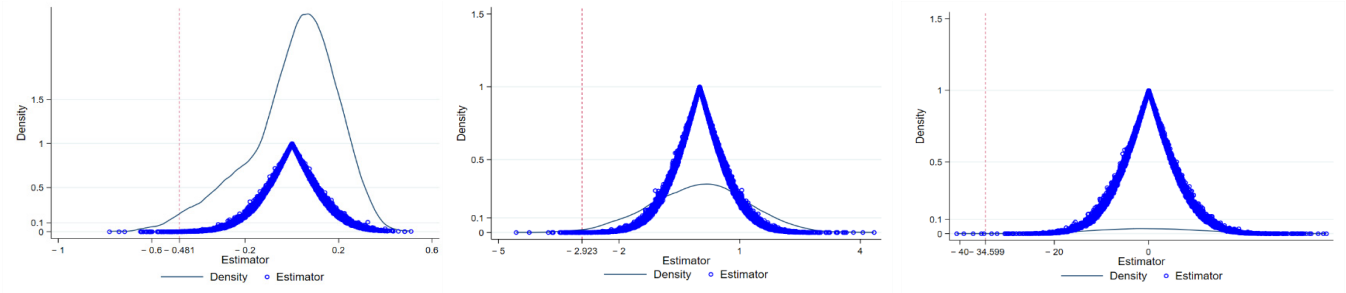
evaluate our benchmark specification again. We check for the robustness of our results in Table 6. The sample period is set to 2009–2019. Our results show that the coefficients of the DID term are insignificant in the regression where policy is issued in advance. However, in the regression where the policy issue time is lagged, the coefficients of the DID term are significant and negative and increase over time. Consequently, the real policy shock is consistent with the transformation of local governments' behavior. Moreover, this behavior transformation happens after the policy shock in 2016.

Table 6. Use of an ex ante and ex post approach to prove that the reform is not endogenous.

Variable	Lndebt				Debtgdp				Debtrev			
	2014	2015	2017	2018	2014	2015	2017	2018	2014	2015	2017	2018
Treat × Time	−0.09	−0.06	−0.49 **	−0.50 **	−0.25	−0.26	−3.20 ***	−3.78 ***	−6.86	−6.50	−34.60 ***	−34.72 ***
	(0.19)	(0.22)	(0.17)	(0.16)	(1.15)	(1.18)	(0.88)	(1.12)	(10.58)	(10.01)	(8.66)	(8.69)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample size	341	341	341	341	341	341	341	341	341	341	341	341
Within-group R^2	0.23	0.23	0.21	0.21	0.32	0.31	0.29	0.35	0.35	0.34	0.32	0.31

Note: *** indicates significance at the 1% level, ** at the 5% level. Parentheses contain standard errors.

Random grouping placebo test. To circumvent potential bias arising from the categorization of high and low land financing dependence, this study undertakes a random grouping approach on the complete sample. Precisely, by randomly selecting 50% of the initial treatment group observations from the overall sample as the treatment group and allocating the remaining sample observations to the control group, the regression analysis is then re-executed employing Equation (1). If the misclassification rate attributable to random grouping is appreciably high, leading to statistically insignificant regression coefficient results, it substantiates the appropriateness of grouping based on land financing dependence. This procedure is iterated 5000 times, and the ensuing Figure 5 graphically portrays the distribution of regression coefficients. These coefficients are juxtaposed with the coefficients presented in Table 3, which elucidate the impact of the land financing reform policy on the risk of local governments' implicit debt, as evaluated via three distinct methodologies (specifically, −0.481, −2.923, −34.599). The estimated coefficients obtained through random sampling conform to a normal distribution and evince notable disparities from the coefficients and levels of significance in the foundational regression analysis. This divergence underscores that the findings derived are improbable consequences of grouping bias.



(**a**) Regression coefficient distribution plot of lndebt (**b**) Regression coefficient distribution plot of debtgdp (**c**) Regression coefficient distribution plot of debtrev

Figure 5. Five thousand placebo tests. Five thousand placebo tests of (**a**) lndebt, (**b**) debtgdp, and (**c**) debtrev. The circles represent the estimators, the blue lines represent the densities, and the red dotted lines represent the coefficients presented in Table 3.

4.4. Heterogeneity Analysis

To further delve into the mechanisms through which the reform of the land reserve financing policy curtails local governments' implicit debt, this study takes inspiration from

Zhang (2023) [35] and Fan et al. (2020) [36] and constructs a triple-difference approach. The objective is to empirically examine whether the effects of the land reserve financing policy reform on local governments' implicit debt exhibit variations. The specific model is outlined as follows:

$$Y_{it} = \beta_0 + \beta_1(Treat_{it} * Time_{it} * Group_{\mathrm{it}}) + \beta_2(Treat_{it} * Time_{it}) + \beta_3(Treat_{it} * Group_{\mathrm{it}}) + \beta_3(Time_{it} * Group_{\mathrm{it}}) + \alpha X_{it-1} + \mu_i + \gamma_t + \epsilon_{it} \quad (5)$$

Here, $Group$ signifies dummy variables for the levels of marketization and legal financing constraints. The remaining variables adhere to Equation (1). The study places primary emphasis on coefficients β_1, β_2 and their associated significance. In particular, the dummy variable for marketization level is formulated based on the "Government and Market Relationship Index" from the "China Provincial Marketization Index Report (2018)" compiled by Wang et al. (2019) [37]. If a region's "Government-Market Relationship Index" ranks within the top 15 nationwide in 2015, the marketization degree is designated as 1, representing higher marketization where the market's role in resource allocation is pronounced. Conversely, it is set at 0 to indicate lower marketization where the market's role is diminished. The dummy variable reflecting the extent of constraints on local government legal financing is derived from the average ratio of the difference between the local governments' debt limit and the prior year's outstanding debt to the current year's fixed-asset investment during 2016–2019. If a province's average ratio surpasses the national median, it is set as 1, indicating weaker legal financing constraints. Otherwise, it is assigned 0, indicating stronger constraints. Notably, local government bonds constitute the sole avenue for legal financing, with outstanding debt representing the accrued debt from issuing local government bonds (i.e., explicit debt). The debt limit serves as a stringent constraint enforced by the central government on local government outstanding debt. In light of the new Budget Law, local governments are permitted to incur debt within the confines of the debt limit established by the State Council. This limit hinges on considerations such as local government debt risk and fiscal robustness. Breaching the debt limit could adversely impact local government credit. Hence, the disparity between the debt limit and the preceding year's outstanding debt gauges the available legal borrowing space for local governments during that year. Meanwhile, the extent of regional fixed-asset investment reflects the comprehensive financial requisites of local governments. The ratio of these two metrics offers insight into the degree of legal financing constraints. Data pertaining to debt limits and outstanding debts are sourced from the Ministry of Finance's official website, the CEIC database, and "Local Fiscal Research".

The estimated results are displayed in Table 7. Leveraging the negative significance of the coefficient within the double-difference term $Treat * Time$, the regression coefficient pertaining to the interaction between the marketization degree's dummy variable and $Treat * Time$ is notably positive. This implies that, relative to regions with heightened marketization levels, the impact of the land reserve financing policy reform on reducing local governments' implicit debt is more potent in areas with diminished marketization levels. In regions characterized by advanced mechanisms such as credit ratings, flexible pricing, information transparency, and debt oversight, where the market wields a substantial influence over resource allocation, local governments are incentivized to adopt prudent debt risk management behaviors. This phenomenon simultaneously curbs the impulse to indiscriminately escalate debt levels. As a consequence, it aids in mitigating the issue of local government financing through land collateralization. Conversely, in areas with reduced marketization, characterized by imperfect investment and financing mechanisms for urban development, limited formal financing channels, elevated financial pressure on infrastructure ventures, and heightened local government intervention in credit resource allocation, a heavier reliance on land collateralized loans emerges to fulfill financial requirements. Moreover, the probability of transferring land usage rights to financing platforms, thereby extending guarantees for platform debt, surges. This engenders heightened risks associated with local governments' implicit debt.

Table 7. Triple-difference regression results.

Variable	From the Perspective of Marketization			From the Perspective of Legal Financing Constraints		
	(1)	(2)	(3)	(1)	(2)	(3)
	Lndebt	Debtgdp	Debtrev	Lndebt	Debtgdp	Debtrev
Treat × Time × Group	0.318 ***	1.028 *	9.649 **	1.308 ***	6.312 ***	53.888 ***
	(0.100)	(0.531)	(4.871)	(0.304)	(1.642)	(14.883)
Treat × Time	−2.477 ***	−9.329 ***	−92.607 ***	−1.237 ***	−6.442 ***	−65.407 ***
	(0.658)	(3.465)	(31.983)	(0.237)	(1.280)	(11.606)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Regional effect	Yes	Yes	Yes	Yes	Yes	Yes
Time effect	Yes	Yes	Yes	Yes	Yes	Yes
Sample size	341	341	341	341	341	341
Within-group R^2	0.349	0.406	0.441	0.382	0.427	0.463

Note: *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level. Parentheses contain standard errors.

In Table 7, the regression coefficient associated with the dummy variable denoting the extent of legal financing constraints interacting with $Treat * Time$ displays a significantly positive trend. It points to the fact that, when contrasted with regions exhibiting lower levels of legal financing constraints, the impact of the land reserve financing policy reform is more pronounced in diminishing local governments' implicit debt in areas constrained by higher legal financing limits. The presence of debt ceilings confines the permissible legal borrowing scope for local governments, potentially leading to incongruences between local debt quotas and their funding necessities. As a result, disparities in the levels of legitimate financing constraints emerge across different regions. In contexts where more stringent legitimate financing constraints prevail, lower debt quotas and restricted legal borrowing space impede meeting the financial requisites for urban operations. Consequently, these regions grapple with amplified risks associated with explicit debt excesses. The results derived from the triple-difference regression analysis reveal that the attenuating influence of the land reserve financing policy reform on local governments' implicit debt gains greater traction in regions marked by lower marketization levels and elevated legitimate financing constraints.

5. Conclusions

This paper centers on the pivotal policy of the land reserve financing reform, encapsulated within Document (2016) No. 4, the Comprehensive Financial Guidelines. It encompasses an analysis of 31 provinces as the subjects of research and approximately applies DID to empirically assess the impact of this reform on local governments' implicit debt. The findings elucidate the following:

(1) The reform of the land reserve financing policy significantly reduces the dimensions of local governments' implicit debt, comprising implicit debt size, implicit liability rate, and implicit debt rate. Both conventional trend tests and rigorous robustness checks substantiate this noteworthy suppressive effect.

(2) The extent of reduction attributed to the land reserve financing policy reform on local governments' implicit debt is more pronounced in regions marked by lower levels of marketization. This phenomenon could stem from restricted formal financing avenues and heightened financial pressures of infrastructure projects in the region where the low marketization results from geographical characteristics and disparities in resource endowment. Consequently, policies that curtail land reserve loans and diminish local government backing for financing platforms accentuate local governments' reduced involvement in land reservation and intervention in financial resource allocation.

(3) The impact of the land reserve financing policy reform on reducing local governments' implicit debt is relatively more potent in areas grappling with heightened legitimate

financing constraints. This trend might arise from the fact that these regions contend with narrower debt quotas and constrained legal borrowing space. As a consequence, they rely more on land reserve loans and other concealed forms of debt. Consequently, the influence of new reform policies is accentuated.

It is crucial to underscore that this study undoubtedly provides a scientific reference for other countries or regions to reform the land system in the future, and it proves that the use of land reserve special bonds can effectively solve the funding needs of land reserve projects. However, the specific effect of the land reserve special bonds to help the unified budget management is also constrained by local government debt quotas and repayment capacity and greatly affected by national policies[14]. Therefore, the extent or mechanism of the impact of changes in the land reserve system on local governments' implicit debt may vary. Nevertheless, we believe that our discussion over reform of land reserve financing policy may be useful for certain countries or regions to make efforts to prevent financial risk subject to local governments' implicit debt through government intervention. The macroprudential policies administrated by macroprudential authorities to effectively keep order in high-quality economics and sustainable economic development will contribute to systemically decreasing financial risks existing in the market.

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Data Availability Statement: Data are contained within the article.

Conflicts of Interest: The authors declare that there are no conflict of interest.

Notes

1 "Notice on Strengthening Land Reserves and Financing Management" (Ministry of Land and Resources Development (2012) No. 162), http://www.gov.cn/zwgk/2012-11/16/content_2267756.htm.

2 "Local Government Land Reserve Special Bonds Management Measures (Trial)" (Ministry of Finance Forecast (2017) No. 62), http://www.gov.cn/xinwen/2017-06/01/content_5198939.htm#1.

3 "Notice on Further Standardizing Local Government Debt Financing Behavior" (Ministry of Finance Forecast (2017) No. 50), http://www.gov.cn/xinwen/2017-05/03/content_5190675.htm.

4 Data derived from the 2015 "China Financial Yearbook," extrapolated based on the balance data at the end of 2014 and the annual growth rate, same below.

5 Data sourced from the 2013 audit results of the Audit Office, local government contingent liabilities = debt guaranteed by the local government + debt for which the local government might undertake certain rescue responsibilities, both being classified as local governments' implicit debt.

6 Comprehensive fiscal power is the sum of general public budget income, governmental fund income, transfer income, and state-owned capital operating income. Since it is difficult to obtain continuous and reliable data for the latter three items, this article uses general public budget income as a proxy for local government comprehensive fiscal strength.

7 In 2018 and 2019, investments in fixed assets in the municipal field were calculated as a proportion of the total fixed asset investments in each province based on the average proportions in 2015–2017 and 2016–2018. Meanwhile, the total fixed asset investments in each province were proportionally allocated based on the average proportions for 2015–2017 and 2016–2018 of the national total fixed asset investments for 2018 and 2019.

8 According to the Ministry of Housing and Urban–Rural Development, the monetized resettlement areas accounted for 13.4% and 18.1% of commercial housing sales areas in 2015–2016 and were expected to reach 19.3% in 2017. Based on the shantytown renovation plan confirmed by the State Council on May 24, 2017, the monetized resettlement areas are expected to account for 17.3% of the demand for commercial housing in 2018–2020. Therefore, this article assumes that 20% of the fixed asset investment in the construction industry is the amount undertaken by local governments for shantytown renovation and affordable housing.

[9] Based on the Wind Economic Database, the proportion of national land cost expenditures was calculated according to the actual income from land transfer and net profit from land transfer. From 2008 to 2018, the cost expenditures accounted for 60% to 80% of the land transfer fees. Therefore, this article assumes that the cost expenditures account for 70% of the land transfer fees, and the remaining 30% is the net income from land transfer used for municipal construction.

[10] Before 2014, the Ministry of Finance acted as the agent for issuing local government bonds.

[11] According to Lv Jian's (2014) inference, the repayment period for local government debt is approximately five years.

[12] This article assumes that local governments do not have the situation of early debt repayment; thus, the debt balance at the end of 2019 originated from 2015 and later. By summing the new debts from 2015 to 2019, the debt balance at the end of 2019 can be estimated.

[13] According to the International Monetary Fund (IMF) 2020 Article IV consultation report, China's total government debt in 2019 was CNY 80.09 trillion, including CNY 42.17 trillion of local governments' implicit debt. According to the Ministry of Finance's "December 2019 Local Government Bond Issuance and Debt Balance Situation," the government debt (within the scope of explicit debt) at the end of 2019 was CNY 37.95 trillion, including CNY 21.31 trillion of local government debt balance (within the scope of explicit debt).

[14] For example, the regulatory authorities' requirement in 2020 that local government special bonds for the year should not be used for land reserves and the regulatory layer's proposal in 2021 that special bonds for land reserves could be issued for the year but only used for the construction of public rental housing.

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