Land Finance, Corporate Leverage and Debt Risk

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This paper takes the 2004—2016 non-financial listed companies on Shanghai and Shenzhen stock exchanges as research samples, combined with urban and macro-level data about land use right transfer in prefecture-level cities, and tries to capture the intrinsic link between land finance and leverage of non-financial listed companies. The study finds that the increase in local governments' reliance on land finance will increase the probability of corporate overleverage. In the case of introducing control variables that may interfere with the estimation results and using instrumental variables to alleviate the potential endogeneity, the conclusion remains robust. On this basis, this paper further studies the relationship between land finance and corporate solvency and sustainable development capability. It finds that the increase in reliance on land finance will increase the company's short-term solvency risk and future solvency pressure, while reducing the profitability and sustainability of overleveraged companies. This phenomenon is particularly evident in high-leveraged companies such as real estate companies in regions with lower collateral value, state-owned enterprises, and enterprises in the eastern region. This paper provides a new perspective for further understanding of the high leverage among non-financial enterprises and the prevention and resolution of debt risks in the context of China's supply-side structural reform.

Keywords: land finance, corporate leverage, excessive debt, debt risk

1. Introduction

Land finance, as a typical phenomenon of China's economy, is a controversial in recent years. Some scholars evaluate the positive role of land finance For instance, some scholars hold that land finance is a great institutional innovation, providing primitive accumulations for urbanization development through credit instruments (Zhao, 2014). Others point out that land finance not only promotes the investment of urban public infrastructure, but also further promotes regional economic development (Zhang and Liu, 2011). Of course, even these scholars who look at the effects of

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land finance from a positive perspective also believe that the effect of land finance changes in different stage. For instance, after playing a certain positive role, land finance may have negative effects or even its negative effects may gradually be greater than the positive ones. Land finance generally includes land transfer, land related taxes and fees and land mortgage financing, among which the scale of land mortgage financing has expanded dramatically in recent years.[1] Local governments, in order to attract investment and develop local economies, often depress local factor prices, for example, they not only drive down the prices of industrial land in the land market, but also provide preferential industrial, financial and other policy support for enterprises in their regions. On the one hand, although the urban land belongs to the state, land transfer revenue is mainly dominated by the local governments under the fiscal decentralization; on the other hand, when it comes to converting the rural collective lands into construction land, although the local government cannot control the total volume, they have almost the absolute say in the rhythm and layout. In short, the supply of land is basically monopolized by local governments, and under the background of the index assessment with GDP as the yardstick and the fiscal decentralization model, local governments have a high reliance on land finance.

While China's land urbanization is advancing at a high rate, the leverage of the non-financial enterprises has risen rapidly. If the high leverage is maintained at a higher level and the risk of default in the bond market is high, it will constrain the enterprises' debt financing, lead to the short-sighted behavior of enterprise financing, and even induce the enterprise debt crisis, increasing the financial risk of the whole society through transmission (Wang *et al.*, 2018). Both the development of local enterprises themselves and the enforcement and implementation of national policies are influenced by the strategic behavior of local governments, especially the strategic behavior of land finance, which accounts for more than half of the income of general public budgets at the local level in recent years. The price changes of factors such as land, capital and labor have great influence on the production and operation activities and the debt financing cost of an enterprise, and the government's land transfer will inevitably affect the leverage ratio of the enterprise through the redistribution effect of labor force and land. Therefore, from a holistic perspective, a core question is whether the government's reliance on land transfer squeeze out the liabilities of enterprises. What is the correlation between the local governments' land finance strategy and the rising leverage of non-financial enterprises? Has land finance induced the overleverage of the non-financial corporate sector, or has it relieved the enterprises' financing constraint and the capital shortage pressure, thus opening up the financing channel for their innovation and long-term development? Are there differentiated impacts on enterprises

[1] According to the *2015 Land Resources Bulletin of China*, as of the end of 2015, 490,800 hectares of land were mortgaged in 84 key cities with a total mortgage loan of 11.33 trillion yuan.

with different nature of property rights or in different regions?

Therefore, this paper attempts to capture the intrinsic relationship between the land finance and the leverage of non-financial listed companies by using the 2004—2016 A-share non-financial listed companies on Shanghai and Shenzhen stock exchanges as research samples, combined with urban and macro-level data such as land transfer in prefecture-level cities. In order to verify this idea, first of all, this paper introduces the variable of overleverage degree as a measure to judge whether the enterprise is overleveraged in the long-term and dynamic perspective. On this basis, the paper introduces the solvency index of the enterprise, and explores whether land finance improves the solvency of the enterprise from the current period and the long-term perspective, in order to examine the influence of land finance on the corporate leverage ratio and the possible debt risk more comprehensively. Secondly, the analysis of the channels of land finance affecting the corporate overleverage shows that the local governments' reliance on land finance may ease the debt burden of enterprises and enhance the solvency of enterprises because of the increase in the value of local real estate collateral. Under the impact of land finance, the favorable providing of bank credit resources to state-owned enterprises has indeed contributed to the overleverage of state-owned enterprises, and local government debt has significantly squeezed out the corporate leverage ratio. Finally, this paper further dives into the sample of overleveraged enterprises, trying to examine whether overleveraged enterprises have effectively improved their profitability and sustainable development capability under the impact of land finance.

2. Literature Review

Land has the attributes of material capital, financial capital and consumer goods, so land finance also has many attributes. In the past, more views were expressed that local fiscal revenue and expenditure pressure increased under the tax-sharing system, which forced local governments to carry out land finance (Lu *et al.*, 2011; Sun and Zhou, 2013). The opposing view is that, from the perspective of promotion incentive, land finance is the means for local governments to pursue GDP maximization, and land finance is carried out even if there is no pressure of fiscal revenue and expenditure (Zhang *et al.*, 2011; Fan, 2015). Land finance is a means of local governments' developing jurisdictional economy, and most of the existing research only focuses its effect on local economic growth from macroscopic or regional perspective (Mei *et al.*, 2018), and pays less attention to the influence of land finance on enterprises. Since the 2008 financial crisis, the overall leverage of non-financial corporate sector has been rising (Zhong *et al.*, 2016), and once debt continues to be too high, not only will the corporate sector face cash flow problems or even bankruptcy, but the bad lending rate of financial institutions will rise, and the government's financial sustainability will also be hit. Because the huge financing scale is a double-edged sword, on the one hand it

can increase the company's market value (Kang and Huang, 2011), on the other hand it will also lead to lower performance growth, triggering debt risk (Campello, 2006). Some preliminary discussions have been made on the related problems affecting the debt financing behavior of enterprises, which are mainly from the perspective of the real estate collateral effect, credit rationing and so on.

The research on real estate collateral effect and enterprises' debt financing behavior is mainly based on the liquidity effect in asset bubble theory. Over the past few years, property prices have continued to rise, and many industrial companies have shifted funds originally used for the development of their main industries to real estate or finance with high return on investment, a phenomenon that has inevitably raised concerns in academia and policy-makers about whether China is in a bubble crisis, particularly in the real estate sector (Wang *et al.*, 2016). Asset bubbles have a more complex impact on enterprise investment and financing. On the one hand, bubble assets can act as collateral, enhance the debt financing ability of credit-constrained enterprises, and promote enterprises to invest assets in more efficient industries (Farhi and Tirole, 2011); on the other hand, asset bubbles will also cause companies to invest in the excessively exuberant real estate industry, triggering a bubble crisis similar to that of Japan in the 1990s.

The research on the rationing effect of credit resources and the debt financing behavior of enterprises is controversial. Most studies believe that under the special institutional background of China, compared with non-state-owned enterprises, state-owned enterprises have implicit guarantee from the government, thus enjoying advantages in debt financing (Chang, *et al.*, 2014; Lu *et al.*, 2015). Some scholars believe that there is no discrimination in the distribution of credit resources among enterprises, but there are mainly differences in their own resource endowments and macro-financial environment (Gou *et al*., 2014). Regardless of the point of view, it has been widely believed that the rationing of credit resources is essential to the debt financing and business development of enterprises, but it does not take into account how land finance affects the leverage of enterprises through the rationing of bank credit resources. This paper holds that the bank credit and government financing which link the production and operation of the real economy in the economic activities play an important role as a bridge in the process of realizing the financial impact of land finance on the debt financing of enterprises.

The channels of land finance affecting corporate leverage are more complicated, and the high corporate leverage ratio does not mean that enterprises have high debt risk (Lu *et al.*, 2015), so the identification of impact channels has not been properly verified. Only by sorting out how land finance of local governments with unique Chinese characteristics affects the level of enterprise debt, can we understand the phenomenon of high leverage in the non-financial corporate sector in a more comprehensive way. Compared with the existing literature, this paper is mainly different from the existing literature in the following three aspects. First, this paper does not take the actual corporate leverage ratio as an explained variable, but calculates the deviation between the target debt ratio and the

actual debt ratio of enterprises, in order to measure the overleverage of enterprises in the long-term and from a dynamic perspective, so as to understand more accurately the mystery of the high leverage of China's non-financial enterprises. Second, land finance not only impacts the enterprise's debt financing costs through affecting land or property value fluctuations, but also impacts the enterprise's investment and financing behavior through the "dual pricing strategies in supplying land",[1] and plays a leverage role under the influence of bank credit rationing. Based on the analysis of sampled regression and related influence channels (real estate mortgage, credit resource rationing and local government debt), this paper makes a comprehensive discussion on the related transmission factors of land finance affecting the corporate overleverage. Third, as the high leverage of non-financial listed companies does not mean that these companies have strong long-term development capability, this paper further discusses the relationship between land finance and corporate solvency, and examines whether the local governments' reliance on land finance has effectively improved the efficiency of debt use of overleveraged enterprises, and has in turn improved the corporate solvency and eased the high debt risk of enterprises.

3. Stylized Facts and Research Hypotheses

This section summarizes the relevant stylized facts, specifically describes the status quo of land finance and the leverage non-financial listed companies in China, and put forward the research hypotheses of this paper based on the relevant theoretical analysis.

3.1. Regional Differences of Land Finance and Characteristics of Financial Instruments

Because of regional differences in resources, transportation, history and other factors, there are also obvious differences in the reliance of local governments on land finance. As can be seen from Figure 1, the reliance on land finance shows a significant cyclical change, and comparative analysis reveals that this cycle is highly consistent with interest rate cycle, because the transmission of interest rates needs a certain market-oriented basis and the impact of interest rates on the land market is mainly reflected in the impact on land market prices and then impact on the scale of land transactions. Although the house price and land price in the eastern region are higher than those in the central and western regions, the reliance on land finance is relatively

[1] "Dual pricing strategies in supplying land" refers to the practice of local governments in driving down prices on industrial land and raising prices on residential land. In 2018, the Ministry of Natural Resources issued the *Statistics Bulletin of Land, Mineral and Marine Resources in China 2017*, pointing out that at the end of 2017, comprehensive land prices, commercial land prices, residential land prices, and industrial land prices of the country's 105 major monitoring cities were 4083 yuan/ square meters, 7251 yuan/square meters, 6522 yuan/ square meters and 803 yuan/square meters respectively.

low because of the large fiscal revenue base, especially for cities like Hangzhou and Shenzhen with better industrial transformation and upgrading, the importance of land finance is gradually declining. The eastern region has a higher degree of marketization and more abundant channels for the development of the local economy, while local governments in the central and western regions have relatively fewer financing instruments to choose from. Due to the low marketization process, low fiscal revenue, and higher interest rate of the bonds issued in central and western regions, financing through the land market becomes relatively more important, making the government or enterprise financing demand more sensitive to the cost, and land finance becomes an alternative to the debt financing that requires interest payments. Therefore, this regional differentiation of stylized facts of land finance shows that, on the one hand, land finance has the characteristic of historical stage, and on the other hand, land finance has attributes of quasi-financial instruments.

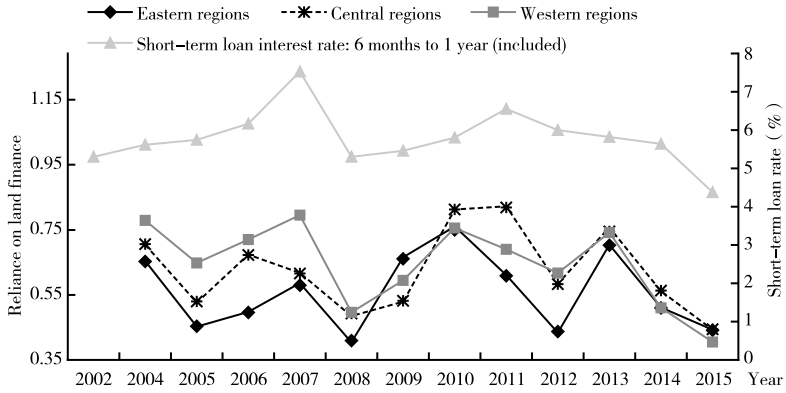

Figure 1. Urban Reliance on Land Finance and Short-Term Loan Rate

Note: Raw data of 2003 are missing.

Source: *China Land and Resources Statistical Yearbooks*, and Wind Info.

Hypothesis 1: Land finance has a greater impact on the debt financing of enterprises in the eastern region with higher degree of marketization and the governments of the central and western regions facing higher financing costs, while the impact on the leverage of enterprises in the central and western regions may have a lag effect.

3.2. Trend Analysis of Corporate Leverage Ratio

The overall debt asset ratio of non-financial listed companies has shown a slow decline since 2006, and has picked up again recently (since 2016). In terms of the ownership of enterprises, the debt asset ratio of state-owned enterprises has been much higher than that of private enterprises and foreign enterprises after 2008, and despite a slow downward trend after 2014, there has been an upward trend since 2016. The overall

debt asset ratio of private enterprises showed a downward trend, and although there was a small increase after 2011, it has shown a downward trend since 2014. From this, it can be seen that the high debt asset ratio of China's non-financial listed companies in recent years is mainly reflected in state-owned enterprises. Local governments are highly dependent on land transfer income for debt payment, which makes the risk of land finance intertwined with the risk of local debt (He and Man, 2012). After the subprime crisis, the 4 trillion-dollar stimulus package was largely directed to infrastructure and state-owned enterprises. For governments, in dealing with risk and resisting recession, state-owned enterprises are best choice to implement government intentions preferring to increase land investment and thus stabilize the economy (Yang *et al.*, 2016). For banks, the implicit government guarantee of state-owned enterprises and the large value of land assets mortgage make commercial banks more inclined to lend to state-owned enterprises, thus amplifying the leverage ratio of state-owned enterprises. However, compared with private enterprises, the operation efficiency of state-owned enterprises is relatively low. Although the government partially or fully takes the debt risk responsibility of enterprises, and such enterprises are more likely to obtain the favor of bank credit, the superposition of the enterprises' own moral hazard leads to overleverage of such enterprises, resulting in debt payment risk.

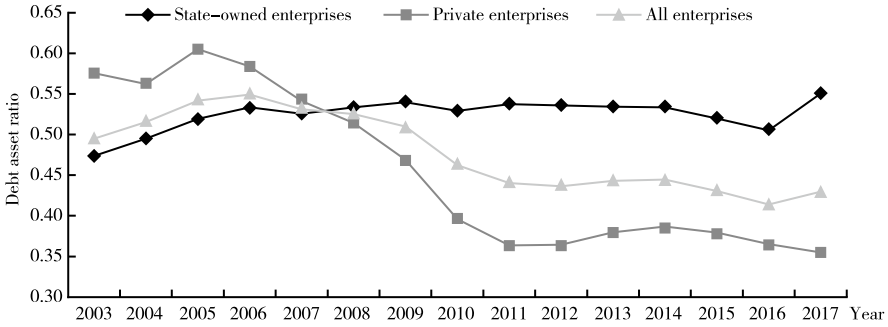

Figure 2. Debt Asset Ratio of Non-Financial Listed Companies

Source: CSMAR Database.

Hypothesis 2: Land finance facilitates the overleverage of state-owned enterprises because the state-owned enterprises function as stimulus tools during the downturn.

3.3. The Dynamic Impact of Land Finance on Corporate Leverage Ratio

The high leverage of enterprises does not mean that there may be debt crisis in enterprises in the future, and the external financing ability and internal profit level of enterprises are also important to improve the utilization of debt and alleviate the risk of debts. In the case of controlling other factors, the local government's land finance

has a great effect on the debt financing and development of local enterprises. Land finance belongs to a kind of financial instrument, a multi-functional strategy for the local government to develop the local economy. First of all, the most obvious goal is to increase land transfer revenue and other tax revenue from commercial and residential land. The second is to expand investment to increase local GDP by supplying low-priced industrial construction land. The last, which is generally overlooked, is that the increase of currency endogeneity in the process of land marketization and the increase in the transaction of land market may increase the currency liquidity of the region and the supply of funds, thus reducing interest rates and easing the financing constraints of enterprises. This shows from another point of view that land finance, under the impact of credit resource rationing, exacerbates the distortion of preferential resource allocation of industrial structure, and then affects the debt capacity of enterprises in the industry. The effects of land finance on the debt financing ability of enterprises are more complicated. On the one hand, the increase of land and wage cost leads to the huge financing impact of small and medium-sized enterprises in labor-intensive industries in the transformation of industrial structure; on the other hand, the increase of land and property value improves the enterprise's debt capacity, alleviating the financing constraints of enterprises (especially private enterprises) to some extent (Yu and Tan, 2015). If the current profit level of the enterprise continues to decline, the expected future cash flow is not adequate to repay the debt in the future, it is highly likely to trigger the future high debt risk of the enterprise.

Hypothesis 3: Land finance, while easing the financing constraints of enterprises, may also lead to the risk of debt payment of the enterprises due to the inefficient use of corporate debt.

4. Empirical Research Design

4.1. Model Settings

Based on the research purpose and research hypotheses of this paper, the following basic models are set up, which mainly tests how land finance affects the debt level of non-financial enterprises. The specific models are as follows.

$$disdebt_{ijt} \,/\, paydebt_{ijt} = \beta_0 + \beta_1 landrely_{i(t-1)} + \beta_2 Control_{t-1} + \delta_i + \mu_t + \varepsilon_{ijt} \tag{1}$$

where subscript i represents the city, j represents the Enterprise, t represents the year; the explained variable is the debt asset ratio of the enterprise, but in reality, only the debt asset ratio alone cannot judge whether an enterprise's debt level is reasonable (Lu *et al.*, 2015). Therefore, in the empirical evidence, this paper adjusts the explained variable to the degree of excessive debt $disdebt_{ijt}$, which reflects to a certain extent the

future stock market return and business risk (Caskey *et al.*, 2012), and uses the debt asset ratio as the robustness test. The main explanatory variables in this paper are the degree of prior-period reliance on land finance at the city level $landrely_{i(t-1)}$, in order to reflect how the local government's reliance on land finance affect the excessive debt of enterprises. At the same time, drawing on the analysis of the relevant literature (Zhou *et al.*, 2016), other factors that may affect the excessive debt of enterprises are controlled, and the main indicators are shown in Table 1; in addition, this paper uses bidirectional fixed effect to estimate equation (1), with all explanatory variables lagged by one period; ε_{ijt} is a compound error term.

4.2. Selection and Description of Main Variables

4.2.1. Excessive Corporate Debt

Based on the ideas of Uysal (2011) and Lu *et al.* (2015), this paper calculates the deviation degree between the target debt ratio and the actual debt ratio as the excessive debt indicator of the enterprise. According to the standard method in the above literature, the target debt ratio is estimated based on equation (2).

$$mdebt_{ijt} = \beta_0 + \beta_1 X_{t-1} + \varepsilon_{ijt} \tag{2}$$

where $mdebt_{ijt}$ is the enterprise debt asset ratio. The selection of control variables X_{t-1} in equation (2) refers to Chang *et al.* (2014), and the control variables mainly include asset return rate, the proportion of fixed assets and inventory value in total assets, company size, industry median of the debt asset ratio, and equity nature. Then the yearly sampled Tobit regression is made to predict the target debt ratio of the enterprise, and the difference between the actual debt asset ratio of the enterprise and the target debt ratio is measured by equation (2), that is, the degree of excessive debt (*disdebt*) is calculated, and the greater the value of the indicator is, the greater the degree of excessive debt of the enterprise is. In addition, this paper sets the dummy variable *odebt* of the enterprise's excessive debt (if *disdebt* is greater than 0, the variable takes the value 1, otherwise 0) as the robustness test.

4.2.2. Corporate Solvency

The setting of the indicator of excessive debt is mainly to test the debt situation of the enterprise from the long-term and dynamic perspective, and the existence of excessive debt does not mean that the enterprise has the operation risk, we also need to consider whether the enterprise's overall debt payment capacity or profitability are substantially improved. This paper selects the indicator to measure the solvency of

enterprises $paydebt_{ijt}$ from two angles of short and long term. In general, indicators to measure a company's short-term solvency include a current ratio, a quick ratio and a cash ratio, and the larger the indicators are, the stronger its short-term solvency is; indicators that measure the long-term solvency of an enterprise include interest guarantee multiples, property rights ratios, and interest-bearing liabilities ratios, and greater interest guarantee multiples and lower property rights ratios signify stronger long-term solvency, while the ratio of interest-bearing liabilities reflects the proportion of interest-bearing liabilities in corporate liabilities, and the greater its value is, the greater the pressure on enterprises to pay debt in the future is.

Table 1. Variable Definitions

Variables			Description
Corporate debt	*mdebt*	Debt ratio	Total assets/total debts
	disdebt	Degree of excessive debt	The deviation of actual debt ratio from target debt ratio
	odebt	Overleveraged or not	Take the value 1 when *disdebt* is greater than 0, otherwise 0
Corporate solvency	*flow*	Current ratio	Total current assets/total current debts
	rate	Quick ratio	(total current asset-net inventory)/ total current debts
	cash1	Cash ratio	(cash + cash equivalent)/ total current debts
	interest	Interest guarantee multiples	(net profit + income tax expense + financial expense)/ financial expense
	equity	Equity ratio	Total debts/equity
	lidebt	Interest-bearing liabilities ratio	(short-term loan + one-year long-term debt+ long-term loan+ bonds payable + interests payable)/total debts
Land finance	*landrely*	Reliance on land finance	Land transfer transaction prices/ local public revenue
	landinc	Land transfer prices	Ln (land transfer prices)
	xlandrely	Reliance on negotiated transfer	Negotiated prices/local public revenue
	zlandrely	Reliance on bidding, auction and listing	Bidding, auction and listing prices/ local public revenue
Control variables at the enterprise level	*sdroa*	Operating risk	Standard deviation of ROA in the past 3 years
	sale	Sales margins	Total profits/operating revenue
	size	Size of the enterprise	Ln (total assets)
	tax	Income tax profits	Income tax payable/ total profits
	etr	Non-debt tax shield	Depreciation in current year/operating revenue
	tobinq	Investment opportunity	Book-to-market ratio
	cash	Cash flow	Cash flow in business operations
	tang	Proportion of tangible assets	(net fixed assets + net inventory)/total assets

Variables			Description
Control variables at the city level	*lpgdp*	Per capita GDP	ln (per capita GDP)
	house	Investment in real estate	ln(investment in real estate)
	finance1	Financial development level 1	Loan balance/local GDP
	finance2	Financial development level 2	Deposit balance/ local GDP
	hba	Area of allotted land	ln(area of allotted land)

4.2.3. Land Finance

Land transfer revenue accounts for a large proportion of land revenue, and its development has gone through the process from extrabudgetary to budgetary adjustment, and this management model has given local governments great discretion in the transfer of land and access to land revenue. Therefore, in line with many scholars (Lu *et al.*, 2011; Shao *et al.*, 2016), this paper selects land transfer revenue as the agent variable of local government's land finance. The absolute scale of land finance alone is not enough to reflect the degree of government reliance on land finance and the tendency of land financing and attracting enterprises to invest in urban construction, so this paper constructs the reliance degree of local land transfer revenue as the core explanatory variable of this paper. At the same time, the absolute scale of land transfer revenue is selected for robustness test.

4.3. Data Sources and Descriptive Statistics

This paper takes the 2004—2016 A-share listed companies on Shanghai and Shenzhen stock exchanges as the research sample, with data from CSMAR database, the city-level land transfer revenue from *China Land and Resources Statistical Yearbooks* from 2004 to 2016, other city-level variables from *China City Statistical Yearbook* over the years. The sample began in 2004 because data at the enterprise level had to be matched with land transfer revenue data at the city level,[1] and this data has not been counted in detail until 2004. In the sample screening process, this paper removes (1) B-shares and new three-board samples, (2) ST or PT company samples, (3) financial listed companies, and (4) samples of missing or abnormal data. In order

[1] n:1 matches are made according to the city where the enterprise is registered-year and the city-level data-year.

to eliminate the interference of abnormal value, this paper winsorizes each continuous variable at the enterprise level at 1%.

5. Regression Results and Further Analysis

5.1. Benchmark Regression

5.1.1. Land Finance and Excessive Debt Ratio of Enterprises

Table 2 shows the regression results of land finance affecting the excessive debt ratio of enterprises. According to the Hausman test, the fixed effect model is selected for all regression results, and the dependent variables in columns (1) to (2) indicate the debt ratio and the excessive debt respectively, and the dependent variables in columns (3) to (6) indicate the degree of excessive debt of the enterprise. Columns (1) to (3) of Table 2 show that the increased reliance of local governments on land finance may significantly increase the amount of debt financing of enterprises and have a positive impact on the tendency of enterprises to over-indebtedness. The coefficient of land finance variable listed in column (2) is positive, with the *t* value 1.52, close to the significance level,[1] and the subsequent regression results also show that, in the long run, the result of land finance raising the excessive debt level of enterprises is robust. In general, if the reliance of local governments on land finance increases by 10%, there will be an increase of about 0.087% in the degree of excessive indebtedness of enterprises.

Land finance attracts more investment and capital by supplying industrial construction land at a low price, increases negotiated land transfer revenue and other tax revenue by supplying commercial and residential land at a high price, and eases the local enterprises' financing constraints by bank credit's increase effect of land finance, thereby enhancing the enterprises' debt financing capacity. It is worth noting that the transmission of local government's land transfer strategy behavior to the debt financing at the enterprise level may have a certain lag effect, so column (4) of Table 2 introduces the reliance on land finance lagged by two periods to further examine its impact on corporate liabilities. The regression results show that the reliance of local governments on land finance may have a sustained impact on the excessive debt of enterprises, which further verifies that the increase of local governments' reliance on land finance can lead to excessive debt of enterprises.

[1] The reason why this is not significant here may be that the setting of the explained variable is not reasonable. The basis for determining the excess liability is whether the actual debt ratio of the enterprise exceeds the target debt ratio, which may be too arbitrary, as there may be errors in classifying the sample of enterprises with the actual debt ratio slightly above the target debt ratio as overleveraged enterprises and in classifying enterprises with the actual debt ratio below the target debt ratio as underleveraged enterprises.

Table 2. Benchmark Regression: Land Finance and Excessive Debt Ratio of Enterprises

Explained variables	(1) *debt*	(2) *odebt*	(3)	(4)	(5)	(6)
			disdebt			
Land finance	0.0116*** (0.0036)	0.0231 (0.0152)	0.0087*** (0.0032)	0.0039 (0.0035)		
$Land\ finance_{t-1}$				0.0070* (0.0038)		
Ln (land transfer prices)					0.0035** (0.0016)	
xlandrely						−0.0024 (0.0029)
zlandrely						0.0086* (0.0051)
Control variables	yes	yes	yes	yes	yes	yes
Constant term	−1.0064*** (0.0996)	−0.9597*** (0.3623)	−0.3768*** (0.0933)	−0.2923** (0.1220)	−0.3928*** (0.0929)	−0.4097*** (0.1446)
N	16169	16169	16169	13424	16137	11037
Intraclass R^2	0.1402	0.0234	0.0521	0.0537	0.0522	0.0409

Notes: Bidirectional fixed effect model is used in regression, and all independent variables are lagged by one period, of which $land\ finance_{t-1}$ is lagged by two periods. Standard errors in parentheses are clustered to the city level; ***, ** and * represent significant parameters at levels 1%, 5%, and 10%, respectively. The same holds for the following tables.

To further verify the research hypothes of this paper, alternative indicator of land finance is selected for the robustness test. As shown in column (5) of Table 2, this paper uses the land transfer prices (absolute scale) instead of the degree of reliance on land transfer (relative scale) as the agent variable of land finance, and the results show that land finance has a significant positive impact on the long-term excessive debt of enterprises, which is consistent with the previous conclusion. In addition, this paper concretizes the degree of reliance on land finance as the ratio of the transfer of bidding, auction and listing to the local public revenue. Due to data limitations, this paper sets the data period to 2009—2016, and the regression results are shown in column (6) of Table 2. The results show that the greater the reliance of local governments on the land bidden, auctioned and listed, the more likely it is to cause excessive debt in enterprises in the long term.

5.1.2. Analysis of Impact Channels

Land finance affects the excessive debt of enterprises mainly through the following

three channels: first, by affecting the fluctuation of real estate collateral value, and then affecting the solvency of enterprises; second, the preferential rationing of bank credit, which leads to varying debt financing capacity of enterprises; third, it has an impact on the debt financing of enterprise through the expansion of local government debts. In order to verify whether the degree of excessive debt of enterprises is affected by the above channels, this paper includes an analysis of the above impact channels.

First of all, if land finance affects the degree of excessive debt of enterprises by first affecting the fluctuations of the value of real estate collateral, then in regions with high value of real estate collateral, the impact of land finance on the degree of excessive debt of enterprises will be weakened by the increase in the value of enterprise collateral. Because it is hard to obtain data of the value of real estate collateral value, and generally speaking, real estate investors will invest in places with high real estate value, we use regional real estate investment as a measure of the value of real estate collateral, and the median value of the indicator is used as a critical value (number higher than the median value means that real estate investment is more active in the region, and lower than the median value indicates that real estate investment is less active) to run a regression by groups. The results, as shown in columns (1) to (2) in Table 3, indicate that the impact of land finance on the degree of excessive debt of enterprises in the region with lower real estate investment is significantly positive, and that coefficient is negative, and not significant in the region with higher real estate investment.

Secondly, because of the preferential rationing of bank credit among enterprises, compared with private enterprises, state-owned enterprises have the advantage of debt financing, and land finance will act as an "accelerator" in the degree of excessive debt of state-owned enterprises. As can be seen from the columns (3) to (4) of Table 3, the effects of land finance on long-term excessive liabilities of enterprises are mainly reflected in state-owned enterprises. Most studies believe that the nature of corporate property rights will affect the financing costs of listed companies. State-owned enterprises generally belong to strategic key industries, which play an important role in the long-term development of the whole society and the national economy and livelihood, and are more likely to obtain the favor of bank credit as the state partly or fully assumes the debt risk responsibility of enterprises to protect these important industries and prevent the expansion of financial risks. Therefore, under the influence of the above factors, the local government's reliance on land finance is more likely to lead to excessive debt of enterprises, resulting in insolvency. Because of the imperfect bond market and legal environment restrictions and other factors, banks are not willing to bear the risk of lending to private enterprises. Even if land finance eases the financing constraints of private enterprises to a certain extent, private enterprises may not incur excessive debt in the long term due to the characteristics of private enterprises and the environment and other factors. Local governments' reliance on land finance may also have different effects on enterprises in different regions. According

to columns (5) to (6) in Table 3, the effect of land finance on the excessive debt of enterprises is mainly reflected in the enterprises in the eastern region, and there is no significant influence on the enterprises in the central and western regions. The more developed financial system and the more perfect land marketization in the eastern region enable enterprises to make use of perfect information disclosure and law as a guarantee to obtain commercial bank loans, and the local governments' reliance on land finance accelerates the process.

Table 3. Impact Channels: Land Finance and Excessive Debt Ratio of Enterprises

Grouping variable	(1) High H	(2) Low H	(3) State-owned enterprises	(4) Private enterprises	(5) Eastern region	(6) Central and western regions	(7) Gdebt High	(8) Gdebt Low
Land finance	−0.0004	0.0126***	0.0124***	0.0070	0.0085**	0.0078	−0.0200	0.0100**
	(0.0056)	(0.0046)	(0.0045)	(0.0069)	(0.0041)	(0.0049)	(0.0225)	(0.0039)
Control variable	yes	yes	yes	yes	yes	yes	yes	yes
Constant term	−0.3905**	−0.3384*	−0.2239*	−0.7117***	−0.3918***	−0.3870	−0.5936	−0.1678
	(0.1452)	(0.1891)	(0.1349)	(0.1692)	(0.1080)	(0.2421)	(0.3627)	(0.1501)
N	7694	8475	8958	6213	10806	5363	2766	9478
Intraclass R^2	0.0496	0.0543	0.0639	0.0487	0.0545	0.0647	0.0976	0.037

Notes: *H* indicates investment in real estate. The eastern region includes prefecture-level cities in 11 provinces (municipalities) of Liaoning, Hebei, Beijing, Tianjin, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong and Hainan. The central region includes prefecture-level cities in 6 provinces of Shanxi, Anhui, Jiangxi, Henan, Hubei and Hunan, while the rest are in the western region. *Gdebt* is the scale of provincial quasi-municipal bonds, and the data are from Wind database, with the period of 2008-2016. All independent variables are lagged by one period, and standard errors in parentheses are clustered to the city level.

Lastly, the increase in land transfer revenue leads to the expanded issuance of quasi-municipal bonds by local governments (Yang *et al.*, 2018), and the increase of local government debt may have an substitutive effect on the leverage of enterprises (Demirci *et al.*, 2017), thus, the impact of land finance on the degree of excessive debt of enterprises may be strengthened by the reduction of government debt burden. Because the data of local government debts are not easily available, and the quasi-municipal bonds are usually guaranteed by the land transfer revenue (Yang *et al.*, 2018), this paper uses the scale of the quasi-municipal bonds as the agent variable of local government debts, takes the top 1/3 of the index as the region with more local government debts, and runs a regression by groups.[1] As shown in columns (7) to (8)

[1] This paper also draws on Baron and Kenny (1986), using the intermediary effect stepwise test method for regression, and obtains results similar to those obtained in this paper, indicating a significant negative relationship between local government debt and the degree of excessive debt of enterprises.

of Table 3, the impact of land finance on the degree of excessive indebtedness of enterprises is significantly positive in regions where local government debt is low, while in areas with higher local government debt, the coefficient is negative and not significant.

5.1.3. Robustness Test

Generally speaking, one factor at the enterprise level is less likely to have an impact on variable indicators at the city level, with weaker reverse causality (Sheng and Wang, 2013). Although this paper controls as much as possible the indicators that may affect the excessive debt of enterprises at the city and enterprise level, as well as the annual virtual variables, and uses fixed effect regression to alleviate the errors caused by missing variables to a certain extent, it is still possible that there are some macro or urban policy factors that affect corporate debt and land finance at the same time, which leads to errors of missing variables, for example, local institutional contexts may affect both land finance and corporate leverage. In order to alleviate endogeneity to a certain extent, this paper adopts the following two complementary approaches: first is to introduce in turn control variables that may interfere with the regression results, such as the degree of marketization, and the level of financial development; second is to try to select instrument variables.

First of all, the marketization level of a region or the degree of independent decision-making of enterprises may affect the local government's reliance on land finance and the enterprise's debt financing at the same time, so this paper introduces "government-enterprise relations" proposed by Fan Gang, Wang Xiaolu and others in their study on marketization index as the control variable to test whether the impact of land finance on the degree of enterprise debt will be weakened by the level of regional marketization. The results are shown in column (1) of Table 4 that the coefficient of land finance variables decreased from 0.0087 to 0.0057, a slight decrease, but remains significant at the statistical level of 5%. Second, the higher the level of financial development in a region is, the more convenient it is for local governments and enterprises to engage in lending and mortgage activities. Therefore, this paper further introduces the regional financial development level as the control variable, taking the ratio of bank deposit and loan balance to regional GDP as the measure of financial development level. Results as shown in columns (2) to (3) of Table 4 that the level of regional financial development does have a significant positive impact on the degree of corporate indebtedness, but the effect of land finance on the degree of excessive debt of enterprises still exists. Furthermore, the larger the area of land allotted is, the greater the reliance of local governments on land finance is, and the debt financing costs of enterprises may also change, hence this paper further introduces the area of allotted land (taking natural logarithm) as a control variable. As shown in column (4) of Table 4, the area of local land allotted does not significantly affect the degree of excessive debt

of the enterprise, which creates the conditions for this paper to use this variable as an instrument variable of land finance. Finally, the above 3 control variables are put into the model at the same time, and the results are shown in column (5) of Table 4 that the effect of land finance on the degree of excessive debt of enterprises still exists, and the robustness of the conclusion of this paper is verified again.

Table 4. Robustness Test: Land Finance and Excessive Debt Ratio of Enterprises

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Estimation method	Bidirectional fixed effect					Instrument variable estimation	
Dependent variable	*disdebt*					Land finance	*disdebt*
Land finance	0.0057**	0.0086***	0.0077**	0.0084**	0.0060**		0.0656***
	(0.0026)	(0.0032)	(0.0032)	(0.0032)	(0.0027)		(0.0160)
Marketization index	0.0038*				0.0045*		
	(0.0023)				(0.0024)		
finance1		0.0018**			0.0019*		
		(0.0009)			(0.0010)		
finance2			0.0045**				
			(0.0022)				
ln(area of allotted land)				0.0019	0.0003	0.0506***	
				(0.0014)	(0.0009)	(0.0018)	
Other control variables	yes	yes	yes	yes	yes	yes	yes
Constant term	−0.2760**	−0.3822***	−0.4104***	−0.3451***	−0.2705**	2.6765***	−0.0218
	(0.1203)	(0.0924)	(0.0937)	(0.1021)	(0.1278)	(0.0744)	(0.0542)
N	14268	16134	16134	15715	13811	15715	15715
Intraclass R^2	0.0431	0.0527	0.0529	0.0518	0.0435		

Notes: Due to the data limitation, the selection period of the marketization index is 2004-2014, and the index is at the provincial level; *finance1* is the ratio of bank loan balance to regional GDP, and *finance2* is the ratio of bank deposit balance to regional GDP. All independent variables are lagged by one period, and standard errors in parentheses are clustered to the city level.

As can be seen from columns (4) to (7) of Table 4, area of local land allotted does not directly affect the degree of excessive debt of enterprises, and is closely related to the local government's reliance on land finance, so it can act as an instrument variable of land finance to a certain extent. The first-stage *F* statistic is 753.892, which can eliminate the problem of weak instrument variables. Compared with the benchmark model, after controlling the potential endogeneity with instrument variables, land finance significantly increases the degree of excessive debt of enterprises, and further

verifies the robustness of the above analysis of the relationship between land finance and the degree of excessive debt of enterprises.

5.2. Further Research

5.2.1. Land Finance and Corporate Solvency

An analysis of the local government's reliance on land finance and excessive debt ratio of the enterprises is made in the previous section, but the question worthy of more concern is: will the enterprises which may incur excessive debt in the long term effectively improve the efficiency of their use of funds in the current period and then improve their debt payment capacity because of local governments' reliance on land finance? Or, as some scholars say, does land finance has make some enterprises with strong financing capacity tend to invest in the real estate industry with higher investment return through the "dual pricing strategies in supplying land", thus squeezing out the enterprises' innovation and R&D investment and increasing the potential risk of enterprises? Next, this paper will analyze how the local government's reliance on land finance affects corporate solvency from the perspective of the long-term and short-term solvency of enterprises.

In Table 5, the current ratio, the quick ratio and the cash ratio are selected as the three indicators to measure the short-term solvency of the enterprise, and the interest guarantee multiples, the equity ratio and the interest-bearing debt ratio are selected as the three indicators to measure the long-term solvency of the enterprise. The selection of the above indicators can help to better understand how land finance affects the short-term and long-term debt status of enterprises. Columns (1) to (3) of Table 5 report the impact of land finance on short-term solvency of enterprises, and columns (4) to (6) report the impact of land finance on the long-term solvency of enterprises. The results show that, both in the short and long term, land finance reduces the ability of enterprises to repay their debts. This result provides further evidence for the above-mentioned conclusion that land finance may trigger the risk of excessive debt of enterprises. In addition, with the exception of column (6), land finance has no significant impact on the long-term debt payment level of enterprises, and the possible explanation is that the three indicators that measure the long-term solvency of an enterprise reflect the financial position of the enterprise from different angles (the equity ratio focuses on the tolerance of the enterprise's internal funds for debt risk, and the interest-bearing debt ratio reflects the future debt payment pressure of the enterprise to a certain extent), so the effect of land finance on the long-term solvency of the enterprise is different. To be precise, the higher the reliance of local governments on land finance is, the greater the future pressure of local enterprises to pay debt is, which further strengthens the possibility of land finance to trigger the future debt risk of enterprises.

Table 5. Land Finance and Corporate Solvency

	(1)	(2)	(3)	(4)	(5)	(6)
	Short-term solvency indicators			Long-term solvency indicators		
Dependent variables	*flow*	*rate*	*cash1*	*interest*	*equity*	*lidebt*
Land finance	−0.1561***	−0.1305***	−0.0882***	0.0989	0.0336	0.0237***
	(0.0420)	(0.0347)	(0.0272)	(2.0262)	(0.0262)	(0.0080)
Control ariable	yes	yes	yes	yes	yes	yes
Constant term	7.8974***	6.6469***	4.1737***	−49.8749	−7.5992***	−1.1295***
	(0.8948)	(0.7755)	(0.7363)	(35.5507)	(0.7536)	(0.2068)
N	16169	16169	14239	16169	16169	14331
Intraclass R^2	0.0398	0.0523	0.0383	0.0026	0.0958	0.0947

Notes: (1) All independent variables are lagged by one period, and standard errors in parentheses are clustered to the city level. (2) All indicators are positively correlated with corporate solvency except that *lidebt* and *equity* are negatively correlated with corporate solvency.

5.2.2. Land Finance and Sustainable Development Capability of Enterprises

In order to achieve sustainable development, enterprises should not only enhance their profitability, but also improve their operational efficiency (Ru, 2018). Next, this paper analyzes whether over-indebted enterprises will improve the efficiency of loan or capital use due to the local government's reliance on land transfer from the perspective of sales growth rate, return on net assets, R&D investment and per capita prime operating revenue. If the over-indebted enterprises perform better on profitability and sustainable development indicators, then this kind of debt is efficient. Otherwise, it is the land finance that distorts the allocation of resources—increased indebtedness is more allocated to inefficient businesses.

This paper selects the sample of over-indebted enterprises (*odebt*>0), and examines the relationship between land finance and the sales growth rate, the return on net assets, R&D input[1] and per capita prime operating revenue based on the amount of real estate investment, the nature of equity and the location of the enterprises. The regression results show that on the whole the high debt of enterprises caused by land finance does not significantly improve the operating efficiency of enterprises, but reduces the profitability of over-indebted enterprises to a certain extent. According to Table 3, the phenomenon of excessive debt caused by land finance is particularly evident in enterprises located in regions with low value of real estate collateral, state-owned enterprises or enterprises in the eastern region. The regression analysis provides further evidence for the emergence of this phenomenon. Specifically, in the sample of over-indebted enterprises, land finance significantly reduces the sales growth

[1] The starting time of the R&D investment data of listed companies in CSMAR database is 2007. Due to the space limitation, the results are not included in the paper, which are retained on request.

rate of enterprises in areas with lower real estate investment, thus exacerbating the debt level of enterprises in areas with low real estate collateral value. Secondly, compared with private enterprises, land finance significantly reduces the per capita prime operating revenue of employees of state-owned enterprises; Lastly, in terms of regional differences, as the eastern region has a more developed bank credit system and higher asset return expectations, while local land finance enhances the financing capacity of enterprises, it may aggravate the long-term leverage of enterprises. Under the influence of land finance, enterprises in the central and western regions have a significant decline in their prime operating revenue and lower business efficiency.

6. Conclusion and Policy Implication

This paper finds that the increase of local governments' reliance on land finance may lead to overleverage of enterprises, and increase the short-term debt payment risk of enterprises and long-term debt payment pressure, while reducing the profitability and sustainable development capability of over-indebted enterprises. This phenomenon is particularly evident in enterprises located in regions with low value of real estate collateral, state-owned enterprises or over-indebted enterprises in the eastern region, which shows to some extent that the resource distortion effect of land finance leads to the allocation of the excessive debt to enterprises with low operating efficiency.

According to the research conclusion of this paper, the following policy suggestions are put forward.

Firstly, the central and local relations should be adjusted appropriately to improve the national financial governance system. finance may trigger long-term debt risk for enterprises. The favorable policies of real estate and infrastructure construction, while enhancing the financing capacity of local enterprises to a certain extent, also squeeze out the profitability of the real economy and the emergence of innovative new industries, new business forms and new products. Therefore, the vertical supervision of local government in the land market should be perfected. The local government should adjust the land transfer strategy reasonably, establish an open and transparent land financial income and expenditure system, reduce the factor price distortion behavior in the land market, create a good market competition environment, and provide a sustained impetus for the long-term development of local enterprises.

Secondly, deleveraging should take into account the negative externalities of systemic risk, and the micro-policy of deleveraging should be more targeted to resolve the financial risks of listed companies securely. Therefore, efforts should be made to prevent new risks from arising from the disposal of risks in deleveraging. Under the "New Normal", as the structural problems are outstanding, the policy is bound to be more diversified and more precise, and it is not possible to adopt a one-size-fits-all policy on the issue of deleveraging. In real estate industry, industries with high

pollution, high energy consumption and overcapacity, and industries facing local governments' budget soft constraints, the goal of deleveraging should be clear and targeted measures of supporting fiscal and tax policies should be adopted to prevent the debt risk in related areas from escalating. For some industries or enterprises with development prospects and strong budgetary constraints, we should adopt a policy of steady leverage to avoid the debt crisis or credit crunch of the whole society. For a growing enterprise, high leverage is not a problem in itself, while high leverage and low return on investment are the problem. Enterprises should try to avoid the situation where debt is growing while the return on investment is declining. Listed companies should also choose the optimal leverage level under the premise of controlling financial risks to ensure that the overall debt burden is appropriate to the fundamentals of the enterprise.

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