

Fiscal Pressure, Inter-Industrial Allocation of Land and Agglomerations Effects

Xiuye Bai, Jiankun Lu, Pei Li*

Land is a production factor that supports industrial development and also an important resource for increasing local government revenue. The scientific allocation of land has a positive effect on applying a new development philosophy. Based on the data of China's micro land transaction, this paper constructs the industrial dispersion indicator of land transfer to discuss about how short-term fiscal pressure affects allocation of land resources among industries and then analyzes its impacts on agglomeration effects. The results show that the greater the short-term fiscal pressure, the higher the dispersion of land transfer among industries, which holds true after going through a series of robustness tests. Further analyses show that the dispersion of land transfer among industries deteriorates the policy orientation of giving priority to key industries. Finally, the practice of dispersion of land transfer among industries weakens agglomeration economies. The research results of this paper show that local governments' strategy of land transfer among industries for coping with short-term fiscal pressure has the characteristics of "increasing fiscal revenues and weakening the role of industrial guidance." This means that in the new stage of development, local governments urgently need to enhance their understanding of the multiple functions of land and avoid impairing industrial development for addressing the short-term fiscal pressure.

Keywords: fiscal pressure, inter-industrial allocation of land resources, agglomeration effects

1. Introduction

The land transfer behavior of local governments has multiple functional attributes, and there are certain contradictions and conflicts between guiding local industrial development and enriching the short-term fiscal revenue. The strategic behaviors such

* Xiuye Bai, Lecture of the School of Economics, Hefei University of Technologies; Jiankun Lu, Associate Professor of the School of Public Finance and Taxation, Zhejiang University of Finance and Economics; Pei Li (corresponding author, email: lipei19@zju.edu.cn), Deputy Dean of the Department of Finance, School of Economics, Zhejiang University. Fund projects: "Policy Evaluation and Path Optimization for Greening of the Taxation System: Based on the Study on Automobile Tax Policy Changes" (72173115), a general project of the National Natural Science Foundation of China. The authors thank anonymous reviews for their valuable opinions. The paper is under the authors' own responsibility.

as weighted allocation of land resources toward certain areas and low-price transfer are important means for local governments to promote industrial agglomeration and structural changes, which played an important role in China's economic miracle (Tao *et al.*, 2009; Zhang *et al.*, 2017). However, a noteworthy fact in recent years is that the functional attribute of enriching short-term fiscal revenue under fiscal pressure seems to gradually dominate the land transfer behavior of local governments. Land resources are increasingly used as a revenue-generating tool for local governments and are increasingly allocated to areas that maximize short-term revenue of local governments (Han and Kung, 2015). This may affect the degree of adaptation of land resources allocation to industrial development, and the industrial misallocation of land resources is an important factor that causes the efficiency loss of China's industrial enterprises. The extensive land transfer model will damage industrial upgrading and the quality of economic development (Yang *et al.*, 2014; Li *et al.*, 2016; Xi and Mei, 2019).

In the new stage of development, the Chinese economy's pursuit of scale and speed has gradually turned to the improvement of quality and efficiency. The industrial allocation of land resources plays an essential role in the optimization of industrial layout and the exertion of industrial agglomeration effects in high-quality development. A large number of studies have shown that agglomeration economy plays an important and positive role in promoting high-quality development. For example, promoting energy conservation and emission reduction (Glaeser and Kahn, 2010), raising the level of innovation (Carlino and Kerr, 2015) and enterprise productivity (Combes *et al.*, 2012; Li *et al.*, 2015), and increasing labor wages (Zhao and Sui, 2015). Unlike other factors of production, the allocation of land resources among industries determines what kind of economic activities can be carried out in a limited geographical space. When land transfer is distributed in industries in a decentralized way, the expansion of the industries that dominate regional agglomeration economies will be hindered, thereby weakening the industrial agglomeration effects.

This paper empirically analyzes the land resources allocation of local governments under short-term fiscal pressure and its impact on industrial development. The result shows that the fiscal pressure makes local governments rely more on land transfer and the functional attribute of enriching short-term fiscal revenues dominates land transfer behaviors. When local governments are faced with heavy fiscal pressures in the short term, the industrial dispersion of land transfer increases. Further studies show that short-term fiscal pressure weakens the policy guarantee for local governments to give priority to land supply to key industries. By reducing the land price of the non-key industries, the land cost competitions with the key industries increase, and the large-area lands supplied to key industries reduce. The practice, namely decentralized transfer of lands among industries by local governments to make up for financial shortfalls in the short term, has weakened the agglomeration effects.

In this paper, there are the following three marginal contributions: First, from the

perspective of research, there are few analyses of land transfer behaviors under fiscal pressure from the perspective of industry, and the study on land transfer behavior requires microscopic data of land transactions. This paper constructs the industrial dispersion indexes of land transfer by using nationwide micro-land transaction data from 2007 to 2015, clearly depicts how the local governmental fiscal pressure affects the industrial allocation of land resources. Second, this paper complements the literature on agglomeration economies. Existing literatures mainly study the benefits that agglomeration effects bring to residents and firms, while there are few studies on the influence factors of agglomeration effects. This paper discusses how the industrial fragmentation of land transfer weakens the agglomeration effects, so as to explore the effects on agglomeration economy from the perspective of industrial allocation of land resources. Finally, this paper provides a policy reference for local governments to understand the multiple attributes of land resources in the new development stage. Land factor plays an important guiding and supporting role in industrial development and enriches short-term fiscal revenues. This requires local governments to fully understand the multiple attributes of land resources and avoid damaging industrial development in order to solve the urgent needs of fiscal pressure.

The following contents of this paper are arranged as follows: section 2 puts forward theoretical hypotheses based on the literature review; section 3 explains the data, measurement models and definitions of variables; section 4 reports the empirical results of this paper; section 5 summarizes the paper.

2. Literature Review and Theoretical Hypothesis

If the time is unlimited, local governments can deal with fiscal pressure in many ways, but there are limited strategies for dealing with fiscal pressure in the short run. First, there is a certain time lag in developing industries and it takes several years from the agreed transfer of industrial land for investment promotion to the increase of tax revenue of local governments (Cao *et al.*, 2007), thus it cannot make up the financial gap in the short term. Meanwhile, compared with market-based transfer, agreed transfer is usually conducted at a low price, and has few effects on increasing short-term fiscal revenue (Tao *et al.*, 2009). Second, although the practices of strengthening tax collection and increasing administrative and institutional fees are very popular and also have the effect of increasing fiscal revenue, their short-term effect are greatly limited, which is manifested as follows: 1) The collection of taxes and fees is restricted by a series of legal factors. Strengthening the collection of taxes and fees will increase the burden on enterprises and damage the business environment (Xue and Liu, 2020). 2) The space for local governments to increase the actual local tax and fee rate is restricted by horizontal competitions among governments and other factors (Tang and Yuan, 2010). 3) The debt financing space of local governments is limited. The

municipal bonds and other forms of financing are highly dependent on the repayment of land transfer income, which brings the intertwining risks of land finance and local debts and increases the risk debt repayment of local governments (He and Man, 2012; Zhang *et al.*, 2018).

In the short term, land transfer plays a unique role for local governments. There are mainly two reasons for local governments to cope with financial stress by increasing land transfer revenue in the short run: 1) It is easy to realize land resources. Local governments have the power to monopolize the expropriation of rural collective land and sell it in the primary state-owned construction land market so as to respond to short-term fiscal pressure (Tao *et al.*, 2009). 2) The income from land transfer is relatively high. The high proportion of the income from paid use of state-owned land to the general public budget has increased rapidly from 30.85% in 2007 to 84.04% in 2020.¹ In reality, it is common for local governments to use land transfer revenues to alleviate immediate short-term financial shortfalls. For example, due to the Covid-19 pandemic, Guangzhou's general public budget revenue in the first quarter of 2020 fell by 8.5% year on year, and its land transfer grew rapidly in the face of a large budget financial gap.

Land has the functional attribute of enriching short-term fiscal revenue, and can also guide the development of local industries. There is a basic trend of China's economic development, that is, the economic development becomes more and more specialized (Fan, 2004), and the industrial structure changes from homogeneous to heterogeneous (Ma *et al.*, 2021). Local industrial policies are an important driver of this trend. If local governments place greater emphasis on the role of land transfer in guiding an industry, industries that are more aligned with local industrial planning are given higher priority to, and land transfer is more likely to occur in an industry or certain industries. If an industry is a key industry supported by the local government, it tends to receive more tax incentives and R&D subsidies (Song and Wang, 2013), and also enjoy the preferential policies of local governments on land supply (Zhang *et al.*, 2017). The land supply strategy of key industries is not in line with the need to maximize short-term fiscal revenue. For example, in October 2021, Huawei Technologies Co., Ltd. purchased an industrial land of about 515,000 square meters with a 30-year use right in Fucheng Sub-district, Longhua District, Shenzhen. The comprehensive floor unit price is only RMB390.26 per square meter. This land transfer strategy has little effect on the fiscal revenue of local governments, fully reflecting the role of land transfer in guiding industrial development.

In order to make up for the short-term financial gap, local governments tend to weaken the function of land resources in guiding industrial development, and it is manifested as more decentralized land supply. In the face of the short-term budgetary

¹ The data of income from paid use of state-owned land and general public budget income are from the CEIC database.

financial gap, local governments mainly aim to maximize their fiscal revenue from land transfer. It is a fact that there are quotas for construction land in different regions. When it is imperative to enrich short-term fiscal revenue, local governments tend to weaken the preferential land policies for key industries and transfer more lands to non-key industries, thereby weakening the industrial tendency of land transfer. The proportion of key industries in each region is relatively low. It was 23.5% during the 11th Five-Year Plan period and 27.1% during the 12th Five-Year Plan period. The non-key industries take the lion's share. Therefore, it can be inferred that when local governments turn to non-key industries in order to mitigate short-term fiscal pressure, land transfer becomes more dispersed among the industries, thus weakening the guiding role of land transfer in the development of local industries.

The industrial allocation of land resources, which are a production factor with multiple functions such as space bearing, affects agglomeration effects. Local governments are in charge of formulating industrial policies and play an important role in regional industrial agglomeration (Hu *et al.*, 2011; Ma *et al.*, 2021). In order to meet the needs for making up for the financial gap, the practice of decentralized land transfer among different industries may weaken the agglomeration effects. Firstly, based on the regional resource endowment and development positioning, key industries are more likely to develop into industries with revealed comparative advantages and are an important force for local governments to promote local industrial agglomeration (Zhao and Chen, 2020). However, the decline in support for land transfer means that the land price for these industries has risen relatively, as a result, enterprises in these industries do not purchase land or are unwilling to purchase land. In addition, due to the rising cost of land, resources that can be used to acquire other factors are occupied, causing that the expansion and development of these industries are restricted and the degree of industrial concentration is reduced. Secondly, given the scarcity of land resources, the industrial decentralization of land transfer means that the high-quality land space available for the expansion of specific industries and the supporting extended industries is shrinking, and this expectation can lead to some investments that would otherwise be made locally for enhancing industrial agglomeration go to other places. Thirdly, the industrial decentralization of land resources allocation means the diversification of the industrial development direction. The competition for capital and labor among enterprises of more industrial types will change the factor cost of industries with higher degree of agglomeration, and the marginal growth and decline of the industrial development speed weaken the industrial agglomeration effects. In recent years, some regions have spent much on changing the land use, partly reflecting the problem of inadequate consideration of these regions in previous land transfer and excessive discretization resulting in weak agglomeration of local industries.

Based on the above analysis, two hypotheses of this paper are put forward:

Hypothesis 1: Local governments deal with fiscal pressure in the short term, making

land transfer show the characteristic of inter-industrial decentralization.

Hypothesis 2: The industrial decentralization of land transfer weakens agglomeration effects.

3. Research Design

3.1. Source of Sample Data

This paper's sample period is 2007–2015. The micro-plot transaction data are from <http://www.landchina.com>. In addition, the binary industry of the land parcel is matched with the *2017 National Economic Industry Classification Standard*, and the land for the primary industry is excluded. In data processing, we excluded the samples without key variables such as binary industry, transfer method, transfer unit price, geographical location, area and grade of land. In order to reduce the biased error of estimation coefficient caused by abnormal value of excessively high unit price of land transfer, we exclude observations with land transfer unit prices above the 99.9% quantile.

General public budget revenues for each province - month are taken from the CEIC database. The annual target figures for the general public budget revenue of each province are derived from the annual Finance Yearbooks of China. Xizang is excluded due to the serious lack of the data of its monthly general public budget revenue. The annual GDP, the size of permanent resident population and FDI of each province are taken from the CEI data. All nominal variables are deflated by using the CPI of each province.

3.2. Measurement Model

The empirical model of this paper is as follows:

$$y_{pkm} = \alpha + \beta \text{fiscalpressure}_{pkm-1} + \delta X_{pk} + \gamma_p + \theta_k + \mu_{pm} + \epsilon_{pkm} \quad (1)$$

where the explained variable y_{pkm} of this paper refers to the fiscal dependence on land, inter-industrial dispersion of land transfer, as well as land transfer price and proportions of area and number for both key industry and non-key industry in province p in month m of year k . The core explanatory variable $\text{fiscalpressure}_{pkm-1}$ is the fiscal pressure of the province p in month $m-1$ of year k . Considering that it takes some time for local governments to turn to land transfer to make up the financial gap after short-term fiscal pressure appears, this paper chooses the fiscal pressure of the previous period. X_{pk} refers to annual economic characteristics of each province. By using the practice of existing literatures for reference, this paper controls $\ln(\text{GDP per capita})$, $\ln(\text{population size})$ and the proportion of FDI to GDP. γ_p refers to provincial fixed effects, θ_k refer to yearly fixed effects, and μ_{pm} is an interaction term between province

and month, which is used to control the interference of unobservable factors at the provincial level that varies with the month. ϵ_{pkm} is an unobservable error term. This paper focuses on the effect of fiscal pressure on the explained variable, namely the coefficient β of $fiscalpressure_{pkm-1}$.

3.3. Description of Variables

Explained variable (y_{pkm}). 1) Fiscal dependence on land. By using the literatures of Shao *et al.* (2016) for reference, this paper uses the two indicators, namely provincial-monthly land transfer revenue/general public budget revenue and land transfer revenue/(land transfer revenue + general public budget revenue) to measure the degree of fiscal dependence on land. 2) Industrial distribution of land transfer. This paper uses the Herfindahl Diversification Index and Entropy Index to measure inter-industrial decentralization. The Herfindahl Diversification Index is an important indicator of industrial decentralization (Malizia and Ke, 1993). The larger the index is, the more dispersed the inter-industrial land transfer is. Entropy index is proposed by borrowing the concept of entropy in information theory. Similarly, the larger the index is, the more dispersed the inter-industrial land transfer. 3) Land transfer price and scale of key (non-key) industries. This paper uses three indicators to reflect the differences of land transfer between the key industries and non-key industries. As is seen from the price of land transfer, the provincial and monthly average unit price of land transfer of key (non-key) industries can directly reflect the price difference of land transfer between different industries. As is seen from the quantity of land transfer, the provincial and monthly proportion of area and quantity of land transfer in key (non-key) industries can reflect the scale difference of land transfer between different industries. See Table 1 for the specific indicator structure.

Core explanatory variable ($fiscalpressure_{pkm-1}$). This paper uses the annual target of the general public budget revenue of each province and the actual monthly general public budget revenue data to creatively construct the fiscal pressure indicator to reflect the short-term financial shortfall faced by local governments, aiming to explore how local governments cope with fiscal pressure in the short run by allocating land resources among industries. The calculation formula of the fiscal pressure is shown below: fiscal pressure is equal to expected accumulative completion rate of provincial-monthly general public budget revenue minus the actual cumulative completion rate of general public budget revenues. The larger the difference, the greater the fiscal pressure that local governments face for the month.

The short-term fiscal pressure index constructed in this paper is reasonable. From the perspective of rule of law related to budget, the main value orientation of the *Budget Law* before 2015 is the guarantee of fiscal revenue. Whether or not the

general public budget revenue target of local governments can be met is regarded as a mandatory requirement (Ren, 2014). In addition, the *Budget Law* stipulates that “local budgets at all levels shall be prepared on the principles of keeping expenditures within the limit of budget and ensuring balance of payments”. In addition, some documents have verified the rule of “revenue determines expenditure” (Guo and Jia, 2017). Therefore, it is important for local governments to meet the general public budget revenue targets set in their budget at the beginning of the year. In reality, the general public budget revenue targets are assessed according to the time sequence of fulfillment. By consulting the *Report on the Implementation of the Financial Budget for the First Half* of each year and news reports of each provinces, all local governments have to carry out interim assessments. This suggests that local governments need to meet their annual targets for general public budget revenues in chronological order, a task that exists not only for provincial governments, but also governments at the levels of city, district and county. In order to fulfill the tasks of the mid-year assessment of general public budget revenues, local governments monitor the completion of monthly general budget revenues. In summary, the annual target for public budget revenues are binding on local governments, and the fact that local governments fulfill their budget year targets in chronological order proves that the short-term fiscal pressure indicator constructed in this paper is reasonable.

Control variables (X_{pk}). By referring to the practices in existing literatures (Shao, 2016; Wang and Zhou, 2020), the provincial control variables added to this paper include the level of economic development, population size and degree of opening up.

Table 1. Definition of Main Variables and Descriptive Statistical Analysis

Variable name	Indicator Construction	Observed value	Mean	Standard deviation
Explained variable				
Degree of fiscal dependence on land	Fiscal dependence on land 1: Provincial-monthly land transfer revenue/general public budget revenue	3240	0.420	0.357
	Fiscal dependence on land 2: Provincial-monthly land transfer revenue/(general public budget revenue + land transfer revenue)	3240	0.262	0.143
Industrial dispersion of land transfer	Herfindahl Diversification Index: $1/\sum_{j=1} S_{ij}^2$, wherein, S_{ij} is the proportion of the land transfer area of the j th binary industry in the i th province to that of all industries.	3240	5.017	2.725
	Entropy index: $\sum_{j=1} S_{ij} \log(1/S_{ij})$, wherein, the definition of S_{ij} is shown in the Herfindahl Diversification Index.	3240	2.031	0.587

Variable name	Indicator Construction	Observed value	Mean	Standard deviation
Land transfer price and scale of key industries ¹	Average unit price of land transferred to key industries (Unit: 1,000 yuan)	2573	0.345	0.854
	Area of land transferred to key industries/Area of land transferred to all binary industries	3240	0.438	0.268
	Number of land parcel transferred to key industries/ Number of land parcel transferred to all binary industries	3240	0.408	0.260
Land transfer price and scale of non-key industries	Average unit price of land transferred to non-key industries (Unit: 1,000 yuan)	3240	1.260	1.776
	Area of land transferred to non-key industries/Area of land transferred to all binary industries	3240	0.562	0.268
	Number of land parcel transferred to non-key industries/ Number of land transferred to all binary industries	3240	0.592	0.260
Core explanatory variables				
Fiscal pressure	Expected cumulative completion rate of provincial-monthly general public budget revenues - Actual cumulative completion rate of general public budget revenues	3240	-0.035	0.055
Control variables				
Level of economic development	Per capita GDP (Unit: yuan)	3240	38795	21395
Population size	Number of permanent residents (Unit: 10,000 people)	3240	4454	2665
Degree of opening up	Proportion of FDI to GDP	3240	0.379	0.556

4. Empirical Results

4.1. Fiscal Pressure and Fiscal Dependence on Land

By using the literatures of Shao *et al.* (2016) for reference, this paper uses the two indicators, namely provincial-monthly land transfer revenue/general public budget revenue and land transfer revenue/ (land transfer revenue + general public budget revenue) to measure the degree of fiscal dependence on land. We expect that the fiscal dependence on land increases in the context of the short-term financial gap. Columns (1)-(3) of Table 2 show the results of using indicator 1 of fiscal dependence on land. Specifically, column (1) is added with provincial and annual double fixed effects, column (2) further controls the provincial and monthly interaction terms to control the effects of seasonal factors on land transfer, while column (3) is added with province-level characteristics affecting land transfer on the basis of columns (1)-

¹Please refer to the literatures of Wu and Zhu (2015) for selecting key industries and non-key industries in the secondary and tertiary industries.

(2). The regression results in the first three columns show that, if other conditions remain unchanged, the greater the short-term fiscal pressure local governments face, the higher their dependence on land finance. Take column (3) as an example, when the fiscal pressure of local governments increases by 100% in the short term, the fiscal dependence on land increases by 13.63%. With the gradual addition of control variables, the estimated coefficients decrease slightly but remain positively significant. Columns (4)-(6) of Table 2 use alternative indicators of fiscal dependence on land. Similarly, under the fiscal pressure, local governments will increase their fiscal dependence on land in the short term.

Table 2. Impacts of Fiscal Pressure on Fiscal Dependence on Land

	(1)	(2)	(3)	(4)	(5)	(6)
	Indicator 1 of fiscal dependence on land			Indicator 2 of fiscal dependence on land		
<i>Fiscal pressure</i>	0.1657*** (0.0523)	0.1574** (0.0579)	0.1363** (0.0592)	0.0900*** (0.0271)	0.0860*** (0.0283)	0.0697** (0.0284)
Provincial FE	Yes	Yes	Yes	Yes	Yes	Yes
Yearly FE	Yes	Yes	Yes	Yes	Yes	Yes
Provincial * Monthly FE	No	Yes	Yes	No	Yes	Yes
Provincial characteristics	No	No	Yes	No	No	Yes
Observed value	3240	3240	3240	3240	3240	3240
R ²	0.4881	0.5787	0.5819	0.5755	0.6423	0.6472

Note: ***, ** and * mean significant at the significance levels of 1%, 5% and 10%, respectively; the data in parentheses are robust standard errors of clustering at the provincial level.

4.2. Fiscal Pressure and the Guiding Role of Land Transfer in the Industry

Based on the above analyses, local governments tend to indeed turn to land finance to make up for the shortage of fiscal funds when facing short-term fiscal pressure. Next, we focus further on the land transfer strategy of local governments and discuss how local governments balance the allocation of land among different industries.

4.2.1. Fiscal Pressure and Industrial Dispersion of Land Transfer

Benchmark Results. Table 3 shows the regression results of the impact of the short-term fiscal pressure on local governments on industrial dispersion of land transfer. Whether the Herfindahl index or the entropy index is used to express the degree of inter-industrial dispersion of land transfer, it is found that land transfer occurs extensively

among industries in order to alleviate the short-term financial pressure. Taking the results in columns (1)–(3) of Table 3 as an example, this paper constructs the Herfindahl Diversification Index by aggregating provincial-monthly land transfer areas to the industry level. The result show that, if other conditions remain unchanged, the larger the short-term fiscal pressure on local governments, the more decentralized the distribution of land transfers among industries. This result is significant at the level of 5% even if the provincial characteristics have been controlled. In columns (4)–(6) of Table 3, the entropy index is used to measure the degree of industrial dispersion, and the finding remains unchanged. Therefore, the first hypothesis of this paper has been preliminarily validated.

Table 3. Impact of Fiscal Pressure on Industrial Dispersion of Land Transfer

	(1)	(2)	(3)	(4)	(5)	(6)
	Herfindahl diversification index			Entropy index		
<i>Fiscal pressure</i>	2.9065*** (0.9474)	3.6092*** (1.3021)	3.3346** (1.3531)	0.4826 (0.2962)	0.9078** (0.4129)	0.8199** (0.3904)
Provincial FE	Yes	Yes	Yes	Yes	Yes	Yes
Yearly FE	Yes	Yes	Yes	Yes	Yes	Yes
Provincial * Monthly FE	No	Yes	Yes	No	Yes	Yes
Provincial characteristics	No	No	Yes	No	No	Yes
Observed value	3240	3240	3240	3240	3240	3240
R ²	0.0651	0.1656	0.1687	0.1546	0.2532	0.2706

Note: ***, ** and * mean significant at the significance levels of 1%, 5% and 10%, respectively; the data in parentheses are robust standard errors of clustering at the provincial level.

In order to ensure the robustness of the results, this paper carries out robustness tests in terms of index construction of core explanatory variables, removal of some samples, and treatment of endogenous problems, and finds that the conclusion is still tenable.¹

Heterogeneity analysis. The practice, that is, local governments transfer lands to industries in a decentralized way so as to deal with short-term fiscal pressure, may vary according to the use of land. This is because that local governments' strategy to transfer different types of land is heterogeneous, including obtaining land transfer fees from high-priced commercial and residential land, and attracting investments with low-priced industrial land (Tao, *et al.*, 2009). Commercial & resident land can be converted into local financial resources in a short period of time for local

¹ Due to space constraints, specific results of the robustness test are not shown and can be obtained from the author if required.

governments to deal with emergencies, so the industrial dispersion of land transfer may be higher. On the contrary, as industrial land is mainly sold at low prices, it cannot make up for the short-term financial shortfall of local governments, and inter-industrial dispersion of land transfer will not significantly rise. The empirical results in columns (1)-(2) of Table 4 confirm the hypotheses of this paper. The results in column (1) of Table 4 show that, for commercial & residential lands, the larger the short-term fiscal pressure, the more likely local governments are to decentralize land sales across industries to meet their immediate needs. By contrast, as a low industrial land price does not bring a large amount of land transfer fees to make up for the financial shortfall, the short-term fiscal pressure on local governments did not significantly disrupt the allocation of industrial lands in different industries, as shown in column (2), Table 4.

In addition, this paper distinguishes the size of the financial gap and tests whether the inter-industrial dispersion of land transfer of local governments is more significant in regions with large short-term financial gaps. The regression results in columns (3)-(4) in Table 4 have confirmed the hypotheses of this paper. Compared with the degree of inter-industrial dispersion of regions under smaller financial pressure, that of regions under greater pressure is much higher, with a coefficient that is 4.8 times the regions under smaller financial pressure. As the central and western regions have a bigger financial gap in the short term, local governments will use more land resources to obtain fiscal revenue, thereby weakening the function of industrial guidance.

Table 4. Analysis of Heterogeneity

	(1)	(2)	(3)	(4)
Explained variable: Herfindahl Diversification Index				
	Commercial & residential land	Industrial land	Large fiscal pressure	Small fiscal pressure
<i>Fiscal pressure</i>	0.8222*** (0.2532)	-2.0525 (2.0721)	9.4427* (4.8804)	1.9690 (1.9280)
Provincial FE	Yes	Yes	Yes	Yes
Yearly FE	Yes	Yes	Yes	Yes
Provincial * Monthly FE	Yes	Yes	Yes	Yes
Provincial characteristics	Yes	Yes	Yes	Yes
Observed value	3239	3211	1916	1324
R ²	0.1333	0.3001	0.2476	0.2653

Note: ***, ** and * mean significant at the significance levels of 1%, 5% and 10%, respectively; the data in parentheses are robust standard errors of clustering at the provincial level. In columns (3)-(4), regions with greater than median fiscal pressure are defined as regions with greater fiscal pressure, while regions where fiscal pressure is less than the median are defined as regions with smaller fiscal pressure.

4.2.2. Fiscal Pressure and Industrial Support Tendency of Land Transfer

This section further analyzes whether the short-term financial gap affects the policies for supporting specific industries. The key industries are those for which local governments provide more lands. Preferential price is an important means used to support specific industries (Tao *et al.*, 2009; Cai and Zhang, 2013; Wang and Yang, 2016). Meanwhile, key industries are provided with lands with greater area and quantity (Zhang *et al.*, 2017). In view of this, we can make an in-depth analysis of how inter-industrial dispersion of land transfer affects the industrial support policy of local governments under short-term fiscal pressures from the aspects of land transfer price and scale.

Table 5 shows the impacts of local governments' short-term response strategies for key and non-key industries under fiscal pressure. The results in columns (1)-(2) of Table 5 show that short-term fiscal pressure will cause the unit price of land for non-key industries to drop significantly, while that for key industries to rise moderately. It indicates the fact that local governments sell more lands to make up for their short-term financial gap will reduce the land transfer price for non-key industries but make no obvious adjustment to the land transfer price for key industries. As is seen from the scale of land transfer, column (3) of Table 5 shows a significant negative correlation between short-term fiscal pressure and the proportion of land transfer area for key industries to the total. The results in column (5) of Table 5 show that the short-term fiscal pressure is negatively correlated with the number of land transfer to key industries, but not statistically significant, which indicates that the short-term fiscal pressure weakens the land transfer of the local government to key industries. In contrast, column (4) of Table 5 shows that short-term fiscal pressure is significantly and positively correlated to the proportion of the area of land parcels transferred to non-key industries to the total. Column (6) shows that short-term fiscal pressure is positively correlated to the number of land parcels transferred to non-key industries, but not statistically significant, indicating that short-term fiscal pressure enables non-key industries to acquire land resources with a larger area.

Generally speaking, under the fiscal pressure, local governments tend to make adjustments to the existing preferential land supply strategy for key industries. On the one hand, they will appropriately reduce the price of land transferred to non-key industries, thereby increasing the land use cost competition with key industries. On the other hand, local governments tend to reduce the land transfer area on the premise of keeping the amount of land transferred to key industries unchanged. Both indirectly reducing the price of land transferred competitors and directly reducing the area of land transferred suggest that local governments will weaken the policy on supporting land use of key industries in the short run so as to address their immediate needs, providing evidence for Hypothesis 1 of this paper.

Table 5. Differences of Land Transfer between Key Industries and Non-key Industries under Fiscal Pressure

	(1)	(2)	(3)	(4)	(5)	(6)
	Price		Proportion of area to the total		Proportion of number of land parcels to the total	
	Key industries	Non-key industries	Key industries	Non-key industries	Key industries	Non-key industries
<i>Fiscal pressure</i>	0.1836 (0.4609)	-3.8919** (1.8593)	-0.5291* (0.3109)	0.5291* (0.3109)	-0.3435 (0.3565)	0.3435 (0.3565)
Provincial FE	Yes	Yes	Yes	Yes	Yes	Yes
Yearly FE	Yes	Yes	Yes	Yes	Yes	Yes
Provincial * Monthly FE	Yes	Yes	Yes	Yes	Yes	Yes
Provincial characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Observed value	2573	3240	3240	3240	3240	3240
R ²	0.2862	0.6294	0.4502	0.4502	0.5193	0.5193

Note: ***, **, * mean significant at the significance levels of 1%, 5%, and 10%, respectively; the data in parentheses are robust standard errors of clustering at the provincial level.

4.2.3. Industrial Decentralization and Agglomeration Effects of Land Transfer

Local governments tend to sell lands to different industries so as to address the short-term financial shortfalls. However, did this have an adverse impact on the industrial development? Compared with land transfer, industrial development lags behind (Tao *et al.*, 2007; Wang and Yang, 2016). The empirical model of this paper is intended to test how inter-industrial dispersion of land transfer in the lag period affects the industrial agglomeration effects in the current period. Based on the micro data of China's second national economic census in 2008, this paper totals up the numbers of employees of each enterprise at the provincial-industrial level to construct the indicator of industrial agglomeration and make it an explained variable. Industrial agglomeration indicators are constructed at the provincial-industrial level. The specific calculation

formula is location entropy $_{ij} = \frac{E_{ij} / E_i}{E_j / E}$, wherein, E_{ij} refers to the number of employed persons in province i and industry j . E_i represents the total number of employees in all industries in the province i . E_j represents the number of employees in the industry j in all provinces. E represents the number of employees in all provinces and all industries. The greater the location entropy, the higher the degree of industrial agglomeration. The indicator of industrial dispersion of land transfer in this paper is the average value of industrial distribution of monthly land transfer of each province in 2007.

Table 6 shows the regression result of the effects of industrial dispersion of land transfer on industrial agglomeration. The column (1) shows the results at the

provincial-two-digit-code industrial level. Local governments did lower the level of industrial agglomeration in the short run so as to deal with the fiscal pressure, which was significant at the level of 1%. To test the robustness of the results, this paper also constructs the industrial agglomeration indexes for provincial-three-digit-code and four-digit-code industrial level, and the regression results are shown in columns (2) and (3) of Table 6. The Hypothesis 2 of this paper has been tested. Considering that land transfer is dominated by municipal or district/county governments, this paper also constructs the index of industrial dispersion of land transfer and the index of industrial agglomeration at the city level to test the robustness. Column (4) gives the regression result at the city-two-digit-code industry level. Column (5) shows the regression results at the city-three-digit-code level. Column (6) constructs industrial agglomeration indicators at the city-four-digit-code industrial level. The regression results in columns (4) - (6) also proves that the inter-industrial decentralization of land transfer by local governments weakens the level of industrial agglomeration at the city level. Based on the one-digit-code industrial data of the China City Statistical Yearbook 2007–2015, column (7) further constructs industrial agglomeration index to test the robustness, and it is found that the results of this paper remain unchanged. The Hypothesis 2 of this paper has been verified.

Table 6. Impact of Industrial Dispersion of Land Transfer on Agglomeration Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Explained variables: industrial agglomeration						
	Provincial- two-digit- code industries	Provincial- three- digit-code industries	Provincial- four- digit-code industries	City-two- digit-code industries	City-three- digit-code industries	City-four- digit-code industries	City-one- digit-code industries
<i>Industrial dispersion of land transfer</i>	-0.0555*** (0.0196)	-0.0546** (0.0207)	-0.0574** (0.0225)	-0.1322** (0.0656)	-0.3019*** (0.0706)	-0.3676*** (0.0697)	-0.0108** (0.0050)
Industrial FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provincial characteristics	Yes	Yes	Yes	No	No	No	No
City FE	No	No	No	No	No	No	Yes
Yearly FE	No	No	No	No	No	No	Yes
Urban characteristics	No	No	No	Yes	Yes	Yes	Yes
Observed value	2087	9046	20137	16234	56740	111777	38488
R ²	0.6222	0.2305	0.1396	0.0452	0.1639	0.3353	0.1252

Note: ***, ** and * indicates significant at the significance level of 1%, 5% and 10%, respectively; the contents in the parentheses of columns (1)- (3) are robust standard errors clustered at the provincial level, while those in columns (4)-(7) are robust standard errors clustered at the city level. Provincial and urban characteristics include ln (road mileage per 10,000 people), employment in mining as a share of total population, FDI as a share of GDP, and ln(green area of municipal districts per 10,000 people).

5. Conclusion

From the perspective of short-term fiscal pressure, this paper explores local governments' inter-industrial allocation strategy of land transfer, and further analyzes the influence of the decentralized inter-industrial allocation of land resources on industrial agglomeration. It finds that, under the short-term fiscal pressure, local governments transfer land to different industries, and the result remains robust after changing indicator construction of financial pressure, cancelling some samples and conducting regression by using instrumental variables. Local governments have impaired the function of industrial guidance of land resources and changed the policy orientation of providing more lands for key industries. Finally, inter-industrial dispersion of land transfer has significantly weakened the effects of economic agglomeration.

The research of this paper has rich policy implications. Firstly, in the process of promoting high-quality economic development, local governments should fully understand the multi-functional attributes of land resources, optimize the supply management of land resources with systematic thinking, and make overall planning on the economic and social development of all localities. To promote market-based reform of factors, local governments should give full consideration to the impacts of land on other aspects other than fiscal revenue, particularly the function of guiding industrial agglomeration, thereby making land transfer actively serve high-quality development. Secondly, local governments should attach importance to the persistent local fiscal pressures. Local governments undertake multi-dimensional governance tasks. Fiscal pressure may cause local governments to be “out at elbows” and adversely influence high-quality development. By establishing a more balanced vertical fiscal relationship, or providing local governments with more financing means by central government, the dependence of local governments on land finance may be reduced.

References

- Cai, H., Henderson, J. V., & Zhang, Q. (2013). China's Land Market Auctions: Event of Corruption? *Land Journal of Economics*, 44 (3), 488–521.
- Cao, G., Yuan, F., & Tao, R. (2007). Land Finance, Industrial Structure Evolution and Excessive Tax Growth - An Analytical Perspective of China's Revenue Growth Puzzle. *China Industrial Economics (Zhongguo Gongye Jingji)*, 12, 13–21.
- Carlino, G., & Kerr, W. R. (2015). Agglomeration and Innovation. *Handbook of Regional and Urban Economics*, 5, 349–404.
- Combes, P. P., Duranton, G., Gobillon, L., Puga, D., & Roux, S. (2012). The

- Productivity Advantages of Large Cities: Distinguishing Agglomeration from Firm Selection. *Economy*, 80 (6), 2543–2594.
- Fan, J. (2004). Market Integration, Regional Specialization and the Trend of Industrial Agglomeration - On the Impact of Regional Disparity. *Social Sciences in China (Zhongguo Shehui Kexue)*, 6, 39–51+204–205.
- Glaeser, E. L., & Kahn, M. E. (2010). The Greenery of Cities: Carbon Dioxide Missions and Urban Development. *Journal of Urban Economics*, 67 (3), 404–418.
- Guo, J., & Jia, J. (2017). Is the Budget of Local Governments Determined by Revenue? - A Theoretical Hypothesis of Structural Causality. *Economic Research Journal (Jingji Yanjiu)*, 52 (10), 128–143.
- Han, L., & Kung, J. K.-S. (2015). Fiscal Incentives and Policy Choices of Local Government: Event from China. *Journal of Development Economics*, 116, 89–104.
- He, Y., & Man, Y. (2012). Risk Control of Local Government Debt Financing – An Analysis from the Perspective of Land Finance. *Finance & Trade Economics (Caimao Jingji)*, 5, 45–50.
- Hu, C., Cheng, H., & Yu, B. (2011). Promising Government and the Evolution of Agglomeration Economic Circle - An Analytical Framework Based on the Agglomeration Economic Circle in the Yangtze River Delta. *Journal of Management World (Guanli Shijie)*, 2, 61–69+80.
- Li, L., Huang, P., & Ma, G. (2016). Land Resources Mismatches and Productivity Difference of China's Industrial Enterprises. *Journal of Management World (Guanli Shijie)*, 8, 86–96.
- Li, X., Li, P., Lyu, D., & Jiang, F. (2015). Economic Agglomeration, Selection Effect and Enterprise Productivity. *Journal of Management World (Guanli shijie)*, 4, 25–37+51.
- Ma, C., Zhu, Y., & Li, T. (2021) Regional Industrial Distribution against the Backdrop of Competitions of Local Governments. *Economic Research Journal (Jingji yanjiu)*.
- Malizia, E. E., & Ke, S. (1993). The Investment of Economic University on Unity and Stability. *Journal of Regional Science*, 33 (2), 221–235.
- Ren, X. (2014). Mission of Financial Budget, *Tianjin Academy of Social Sciences Press*. (in Chinese)
- Shao, C., Su, D., & Deng, H. (2016). Characteristics of Housing Prices, Land Finance and Urban Agglomeration: The Road to Chinese-style Urban Development. *Journal of Management World (Guanli Shijie)*, 2, 19–31+187.
- Song, L., & Wang, X. (2013). Key Industrial Policies, Resource Reallocation and Industrial Productivity. *Journal of Management World (Guanli Shijie)*, 12, 63–77.
- Tang, Y., & Yuan, C. (2010). Incomplete Taxation Right, Government Competition and Tax Growth. *China Economic Quarterly (Jingjixue Jikan)*, 10 (1), 33–50.
- Tao, R., Lu, X., Su, F., & Wang, H. (2009). China's Transition in the Context of Evolving Regional Competitions: Reflections on Fiscal Incentives and Development

- Models. *Economic Research Journal (Jingji Yanjiu)*, 44 (7), 21–33.
- Tao, R., Lu, X., Su, F., & Wang, H. (2009). Regional Competition, Land Transfer and Local Fiscal Effects: An Analysis Based on Panel Data of Chinese Prefectural Cities from 1999 to 2003. *The Journal of World Economy (Shijie Jingji)*, 10, 15–27.
- Wang, Y., & Yang, G. (2016). Intervening for Economic Growth: An Analysis of the Land Transfer Strategy of Local Governments. *Journal of Management World (Guanli Shijie)*, 5, 18–31.
- Wang, Z., Zhang, Q., & Zhou, L. (2020). Career Incentives of City Leaders and Urban Spatial Expansion in China. *Review of Economics and Statistics*, 102 (5), 897–911.
- Wu, Y., & Zhu, X. (2015). Why Does China Enter Redispersion Prematurely? Industrial Policy and Economic Geography. *The Journal of World Economy (Shijie Jingji)*, 38 (2), 140–166.
- Xi, Q., & Mei, L. (2019). Industrial Land Price, Selection Effects and Industrial Efficiency. *Economic Research Journal (Jingji Yanjiu)*, 54 (2), 102–118.
- Xue, W., & Liu, J. (2020). The Impact of Tax Collection & Management Pressure on Corporate Tax Burdens. *Taxation Research (Shuiwu Yanjiu)*, 6, 104–109.
- Yang, Q., Zhuo, P., & Yang, J. (2014). Bottom Line Competitions of Industrial Land Transfer and Investment Introduction - Empirical Study Based on Panel Data of China's Prefectural-level Cities from 2007 to 2011. *Journal of Management World (Guanli Shijie)*, 11, 24–34.
- Zhang, L., Nian, Y., & Liu, J. (2018). Land Market Fluctuation and Local Government Bonds - Taking Municipal Bonds as an Example. *China Economic Quarterly (Jingjixue Jikan)*, 17 (3), 1103–1126.
- Zhang, L., Zhu, G., Li, X., & Wang, X. (2017). Key Industrial Policies and Resource Allocation of Local Governments. *China Economic Quarterly (Zhongguo Gongye Jingji)*, 8, 63–80.
- Zhao, J., & Chen, Z. (2020). Comparative Advantages and the Effects of Industrial Policy: Regional Differences and Institutional Causes. *China Economic Quarterly (Jingjixue Jikan)*, 19 (3), 777–796.
- Zhao, W., & Sui, Y. (2015). Agglomeration Types, Labor Market Characteristics and Wage-Productivity Disparities. *Economic Research Journal (Jingji Yanjiu)*, 50 (6), 33–45+58.