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Intergovernmental Vertical Fiscal Relations Reform and Grassroots-Level Government's Finance Guarantee: Based on Quasi-Natural Experimental Analysis

Jing Ning, Xujie Zhao*

Grassroots-level government's financial capability is crucial to the performance of financial functions of the whole country. How to adjust the intergovernmental vertical fiscal relations in order to improve grassroots-level government's finance situation is important for accelerating the establishment of a modern fiscal system. In recent years, Province-Directly-Governing-County (PGC) fiscal reform has been an important attempt to straighten out vertical fiscal relations between governments, and thus has made it possible for studying the effects of vertical fiscal relations reform on grassroots-level government's finance based on quasi-natural experimental analysis. Therefore, this article empirically analyzes the PGC fiscal reform based on nationwide county-level data applying Propensity Score Matching with Difference-in-Difference Method (PSM-DID), in order to investigate the effect of the reform on county governments' disposable revenue and identify the influence path. The results indicate that PGC fiscal reform has a significant effect on promoting fiscal disposable revenue of county governments. Furthermore, we find that the reform increased upper-government transfer payment more than county-level own revenue, which manifests the reform increase county governments' fiscal disposable revenue by means of restraining prefecture-level cities' from grabbing county-level transfer.

Keywords: intergovernmental vertical fiscal relations reform, grassroots-level government, finance guarantee

1. Introduction

As the foundation of the Chinese government's organizational structure, the grassroots-level government is the concrete implementation unit and the ultimate implementer of various policies of the central government, as well as the administrative unit that contacts the people most closely. The good functioning of grassroots-level government not only determines the people's impression of the

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state and government, but also directly relates to the long-term stability of the whole country and society. The report of the 19th National Congress of the Communist Party of China clearly put forward that "enhancing the credibility and execution of the government and building a service-oriented government which people are satisfied with". How grassroots-level government provides the high-level public services for local residents has become an unavoidable practical issue. The important prerequisite for grassroots-level government to provide adequate and sufficient public services is that the grassroots-level government has sufficient financial capacity.

Compared with the grassroots-level governments such as towns and municipal districts, county has been the most stable and important grassroots-level administrative divisions in China since ancient times. It undertakes a large number of basic public services and plays an irreplaceable role in promoting economic development and ensuring social stability. However, compared with municipal districts, the county's geographical transportation location lacks innate advantages, and it's unable to attract sufficient domestic and foreign talents and investment inflows, which leads to the weak economic development strength and lacking of sustained and stable self-income sources. Therefore, the current financial situation of the county government in China is poor with the prominent contradiction between incomes and expenditures. The gap between the average revenue and expenditure of county governments in 2016 was 1.964 billion yuan, and the ratio of revenue to expenditure was 1:2.45.[1] Moreover, in the new normal economic development situation, the fiscal revenue for both national and county government has experienced the decreasing trend. In addition, with the debt repayment burden of the county government, the financial guarantee of the future public service of the grassroots-level county government is not optimistic.

In addition to the lack of geographical advantage, an important institutional reason for the difficulty of county-level financial operation lies in the weak position of county government in fiscal decentralization after the reform of tax-sharing system in 1994 under the administrative organization system of political centralization in China. After the reform of tax sharing system, tax sources are concentrated upwards and the main categories of tax revenue are shared at different levels. It is due to the strong position of provincial and municipal governments in the administrative organizational system that leads to the small proportion of value-added tax, business tax and income tax shared by county governments. Taxes that categorized as exclusive to county governments are often small, scattered and difficult to collect. In addition, since the county-level transfer payment funds are handled by too many levels of government, the transfer payment funds of the county government are often intercepted and misappropriated.

[1] The data is calculated based on *China County Statistical Yearbook* (2016). The latest year that the *China County Statistical Yearbook* was 2017, in which the socio-economic data of 2016 at county level are collected.

In the case that the location of the county's geographic transportation is difficult to be improved in a short time, it is very important to adjust the intergovernmental vertical fiscal relations and enhance the financial status of the county governments to rapidly improve the financial security of the grassroots-level governments.

In recent years, the central and local governments have made positive attempts to adjust the intergovernmental vertical fiscal relations, as well as to improve the financial capacity of grassroots-level governments. In order to straighten out the vertical fiscal relations below the provincial level and solve the financial predicament of county government, some provinces spontaneously carry out the reform of the fiscal system that provinces directly administrate the county to fully mobilize the county's enthusiasm for self-development and increase the support of provincial government to the county government, which ensures the county government has a stable revenue source. In 2004, Anhui and Hubei took the lead in implementing the Province-Directly-Governing-County (PGC) fiscal reform, and then Henan, Jiangxi, Shanxi and Shaanxi provinces launched pilot reforms in succession. The achievement of provincial government's spontaneous reform of vertical fiscal relations has been recognized by the central government. In 2009, the "Opinions on Promoting the Fiscal Reform of PGC" promulgated by the Ministry of Finance aims to "strive to the overall goal of comprehensively promoting the fiscal reform of Province-Directly-Governing-County in addition to ethnic autonomous areas throughout the country".[1] By 2010, 970 counties in 27 provinces had carried out the Province-Directly-Governing-County[2] fiscal reform.

The implementation of this vertical fiscal relation reform has attracted wide attention of the academic community. Some scholars explore the impact of the reform on the efficiency of financial funds and administrative work from the perspective of management efficiency (Jia and Yu, 2010; Wang and Xu, 2017). There are also scholars studying the impact of reform on the local government functions and public services from the perspective of fiscal expenditure (Chen and Lu, 2014; Jia and Ning, 2015; Lu *et al.*, 2017). The empirical researches of many scholars found that the reform of PGC has not played a good role in promoting fiscal expenditure and economic growth, which indicates the overall effect of the reform is negative (Cai *et al.*, 2011; Jia *et al.*, 2013; Li *et al.*, 2016).

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[1] The main contents of the financial system reform of Province-Directly-Governing-County (PGC) include: (1) The categories of state tax and local tax revenue are directly decomposed by provincial finance to decentralize to county-level finance, and the county would directly transfer the revenue to provincial finance; (2) Fiscal transfer payments and other subsidies are directly allocated to the county by the provincial finance; (3) The base of each settlement and subsidy shall be directly approved by the provincial finance, and the funds shall be settled directly with the county at the end of the year; (4) International loans, national debt transfer funds and central government paid funds borrowed by counties shall be repaid directly to provincial governments.

[2] The data came from the Report of 2010 Central Final Accounts published by the Ministry of Finance.

At the same time, the process of the fiscal system reform of PGC has also slowed down. For example, Liaoning Province abolished the PGC fiscal management system of two counties of Suizhong and Changtu in December 2016. However, the authors suggest that the goal of the PGC fiscal reform is to improve the county financial capacity and alleviate the financial difficulties of the county government by adjusting the vertical intergovernmental fiscal relations among provinces, cities and counties. If the reform achieves the initial goal, problems arising in the process of reform should be looked at objectively and some remedial measures should be actively taken to ensure the continuation of the reform, which forms the practical significance of this study.At present, there is little literature researching on whether the reform could achieve the initial goal of the reform that enhancing the disposable financial resources of the county government, especially on how the reform affects the financial resources of the county government by identifying the different effects of the reform on the revenue of the county government and the income of the transfer payment. Therefore, based on the quasi-natural experiment of the reform of Province-Directly-Governing-County, this paper empirically analyzes how this vertical fiscal reform affects the financial capacity of grassroots-level county governments with the method of Propensity Score Matching with Difference-in-Difference Method (PSM-DID). The theoretical significance of this paper is to clarify the effecting mechanism path of the reform on the disposable financial resources of county governments through in-depth analysis of the heterogeneous impact of reform on revenue and transfer payments of county government, which provides the empirical evidence for the first link of the logical transmission chain of reform effect (namely, the reform of PGC affects fiscal revenue, which affects fiscal expenditure, which affects economic growth), as well as for the existing literature on the impact of reform on fiscal expenditure or economic growth.

2. Theoretical Framework

Many studies have shown that local governments' vertical fiscal relations have an important impact on their fiscal revenue and expenditure behavior by influencing local governments' competitive incentives (Brennan and Buchanan, 1980; Qian and Weingast, 1997; Keen, 1998; Qian *et al.*, 2006). The conclusion provides the thought and framework for the study of the impact of the vertical fiscal relations reform on county-level disposable financial resources. As a reform of intergovernmental vertical fiscal relations implemented in recent years in China, the PGC fiscal reform effects the county-level disposable financial resources mainly through the mechanism of horizontal and vertical intergovernmental financial competition.

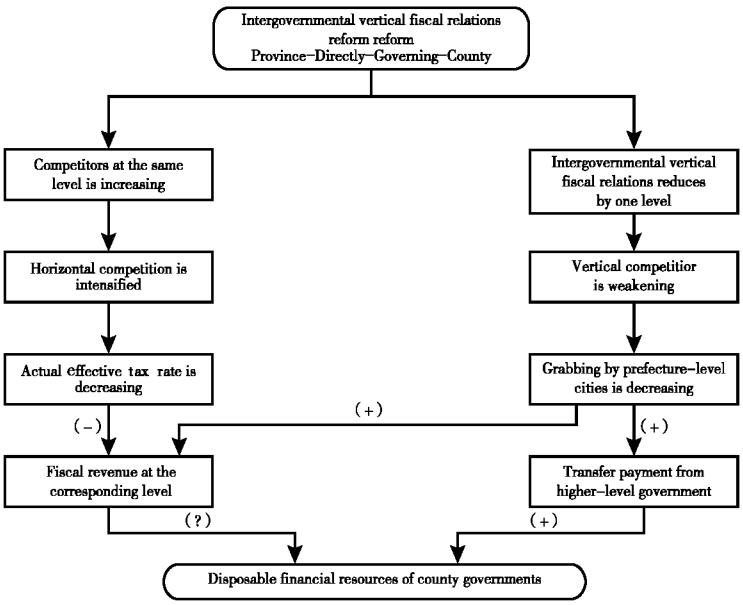

Figure 1. Theoretical Framework of the Impact of Vertical Fiscal Relations Reform (Province-Directly-Governing-County) on County-Level Disposable Financial Resources

The influencing mechanism path of the PGC fiscal reform on the disposable financial resources of county governments could be summarized as the theoretical framework of Figure 1. The left side of Figure 1 shows that the fiscal competitors faced by county-level government has a sudden increase after the vertical fiscal relations reform of PGC. The reform would reduce the actual effective tax rate at the county level by strengthening the horizontal fiscal competition of the county-level government, which further reduces the county-level fiscal revenue. The right side of Figure 1 shows that the vertical fiscal level has changed from "province-city-county" to "province-county" after the vertical fiscal relations reform of PGC. The reform reduces the seizure of county financial resources by prefecture-level cities by weakening the vertical fiscal competition between cities and counties, which increases county-level fiscal revenue and transfer payments from higher-level government. Figure 1 also shows that the final impact of the reform on county disposable financial resources depends on the comprehensive effect of the positive and negative forces. It is difficult for the simple theoretical analysis to reach the conclusion, while empirical research could find the answer through measurement methods. In view of this, this paper empirically studies the impact of the reform on the disposable financial resources of the county-level government with the national county-level financial data. In addition, in order to test the impact path of reform, this paper would also analyze the different effects of reform on fiscal revenue at the corresponding level and transfer payment at the higher level.

3. Measurement Method and Data Description

3.1. Measurement Method

This paper adopts the Propensity Score Matching with Difference-in-Difference Approach (PSM-DID).Compared with the traditional DID linear regression method, the advantages of PSM-DID method lie in the following aspects. Firstly, based on the propensity score estimated by a series of characteristic variables, it makes the treatment group matching with the control group in all aspects, constructs a control group that is infinitely close to the characteristics of the treatment group and ensures randomness of treatment group selection (Lin and Ye, 2007; Caliendo and Künn, 2011; Mendonça and Souza, 2012; Gebel and Voßemer, 2014). Secondly, it is a non-linear parameter estimation method, which relaxes the strong hypothesis of linear relationship (Persson and Tabellini, 2004).As far as the characteristics of sample data in this paper are concerned, the advantages of non-linear parameter estimation are as follows. (1) Since the criterion for selecting reform county in reform provinces is that counties should have excellent or poor economic and financial conditions, it is difficult to set characteristic variables as the correct functional form of control variables by using traditional DID linear regression method, while with no need to set function form, the PSM-DID method could ensure the randomness of treatment group selection. As long as the balance test is passed, it could be regarded that the treatment group has find the control group with similar characteristics. The criteria for selecting reform counties in reform provinces vary with different years (for example, in 2004, the criteria for selecting reform county in Henan Province is that counties should have high level of economic development, and in 2007, the criteria for selecting reform county in Shanxi Province is counties should directly under the national poverty alleviation work). Therefore, compared with the traditional DID method, the advantage of PSM-DID method is that the annual variation of selection criteria does not need to be taken into consideration since the treatment group after matching would always be compared with the control group whose characteristics are similar no matter how the selection criteria change over years.

The method of PSM-DID could be divided into three steps. In the first step, this paper constructs a binary selection Probit model with dummy variables of reform as dependent variables and the variable of county characteristic as independent variables. The estimated regression coefficient of characteristic variable is the probability of implementing reform in each county, which could be regarded as propensity score.[1]

[1] The commonly used binary selection models are Probit models and Logit models. We adopt the Probit model in benchmark analysis and Logit model is used in robustness test.

$$Probit(PGC_i = 1) = \alpha + \beta X_i^{t_0} + \varepsilon_i \quad (1)$$

The dependent variable is the dummy variable of PGC fiscal reform (PGC_i) in formula (1). The PGC_i of the county that has fiscal reform is 1 while that has no fiscal reform is 0. $X_i^{t_0}$ is the characteristic variable that affects the implementation of reform. Firstly, carefully studying the government documents of provinces on the fiscal system reform of PGC, we find that the selection of reform counties in provinces is mainly based on the county's economic development level and financial strength. Therefore, the characteristic variables selected in the benchmark analysis include the following variables. (1) Characteristic variables of economic development: this paper chooses five economic characteristic variables that included the ranking of county's real per capita GDP in the province[1], the proportion of primary industry value added to GDP, the proportion of secondary industry value added to GDP, population density (total population divided by county area) and urbanization level (the proportion of urban population to total population) to analyze the effect of economic development, the characteristics of industrial structure, population scale and urbanization on the reform probability. (2) Characteristic variables of financial strength: this paper chooses the fiscal gap (the proportion of fiscal revenue and expenditure gap to own fiscal expenditure) as the fiscal characteristic variable to analyze the impact of financial difficulties on the reform probability.[2] In addition, this paper also introduces four characteristic variables that include the dummy variable of national poverty county, dummy variable of county-level city, average elevation and average slope of the county into the Probit model for robustness test (Li *et al.*, 2016). It should also be noted that the average values from 2000 to 2002 before the reform are used to ensure the exogeneity, in order to avoid the effect of reform on these variables (Rosenbaum and Rubin, 1983; Caliendo and Kopeinig, 2008).

In the second step, the appropriate matching method is selected to match the

[1] Real per capita GDP=nominal per capita GDP/provincial consumer price index (with the year of 2000 as the base period).

[2] The reason that the variable of the ranking of the real per capita GDP of the counties in the province is selected is that the government documents of Henan, Jiangxi, Shanxi and Shaanxi provinces put forward that the economically strong counties or poor counties should be selected. The reason that population density and urbanization level are selected is that they are also reliable indicators to measure the level of economic development. The reason that the proportion of value added of primary industry in GDP is selected is that the central government document proposed that the counties that mainly produce grain, oil, cotton and pig should be included in the reform scope. The reason that the proportion of added value of secondary industry in GDP is selected is that government documents of Henan Province mentions that the industrial basis should be considered, and the proportion of secondary industry is also an important index to measure the level of economic development of a county.

treatment group (reform county) and the control group (non-reform county) after calculating propensity score, and the matching effect is evaluated by the balance test (judging whether the treatment group could find the control group with similar characteristics). The common matching methods include kernel density matching, K nearest neighborhood matching, radius matching and local linear regression matching (LLR). Since the two most commonly used methods (core density matching and K nearest neighbor matching) take into account the problem of sample size and accuracy, this paper mainly uses these two methods to match in benchmark analysis. This paper also uses radius matching method and local linear regression matching method in robustness analysis.

The third step is to calculate the average treatment effect of county-level disposable financial resources on the basis of formula (2) after the matching is completed. τ_{ATT} represents the average treatment effect on the treatment group (ATT).[1] PGC is the dummy variable of the fiscal system reform of PGC, county that with the fiscal reform has the PGC value of 1 while county that with no fiscal reform has the PGC value of 0. Y_1 and Y_0 represent the disposable financial resources of treatment group and control group respectively. t_0 and t_1 represent the pre-event time point and post-event time point. Y^{t_0} is the average value of county-level disposable financial resources in 2000—2002, and Y^{t_1} is the value of county-level disposable financial resources in post-event of 2007.[2] $P(X)$ is the tendency score, W_{ij} is the weight assigned to the control group under different matching methods, S is the common support of the tendency score, N_1 is the sample number of the treatment group, and E is the expectation operator.

$$\begin{aligned}
\tau_{ATT}^{PSM-DID} &= E_{P(X)|PGC=1}\{[\Delta Y_1 \mid PGC=1, P(X)] \\
&\quad - E[\Delta Y_0 \mid PGC=0, P(X)]\} \\
&= E_{P(X)|PGC=1}\{[Y_1^{t_1} - Y_1^{t_0} \mid PGC=1, P(X^{t_0})] \\
&\quad - E[Y_0^{t_1} - Y_0^{t_0} \mid PGC=0, P(X^{t_0})]\} \\
&= \frac{1}{N_1}\sum_{i\in PGC_1\cap S}[(Y_1^{t_1} - Y_1^{t_0}) - \sum_{j\in PGC_0\cap S} w_{ij}(Y_0^{t_1} - Y_0^{t_0})]
\end{aligned} \tag{2}$$

[1] The reason that the fiscal gap is selected is that the document of Henan Province mentions that two counties with better financial and economic conditions should be selected to carry out the pilot project.

[2] In addition to ATT, the indicators for evaluating causal treatment effects of policy include ATU (Average Treatment Effect on the Untreated) and ATE (Average Treatment Effect). This paper pays more attention to the reform effect of treatment group, and thus the index of ATT is chosen.

3.2. Data Description

The samples in this paper are all county-level administrative units in China. The data sources are mainly *National Financial Statistics of Prefectures and Counties*, *China County (City) Socio-Economic Statistics Yearbook*, *China Statistical Yearbook*, *Province Statistical Yearbook* and official reform documents issued by various provinces. The original data has been processed as follows. Firstly, this paper excludes the samples of Tibet Autonomous Region where a large number of county-level data is missing. Secondly, this paper excludes the samples of municipal districts that have obvious differences in financial autonomy and support at the municipal level with counties. Thirdly, this paper excludes the county-level samples where administrative divisions have changed from 2000 to 2007 (such as the withdrawal of counties and the transformation of counties into districts, etc.). Fourthly, this paper excludes the county-level sample with the Province-Directly-Governing-County fiscal reform from 2000 to 2002 to ensure that all samples are in the same state of City-Directly-Governing-County from 2000 to 2002.[1] Fifthy, this paper excludes the sample of non-reform counties in the progressive reform province since the sample may be affected by the provincial reform policies.[2] Sixthy, this paper excludes the sample with the observed value is less than 1% or more than 99% quantiles in order to eliminate the influence of abnormal values. After the above data treatment, the final sample in this paper is the panel data of 1357 counties, of which 332 samples are the reform counties, namely the treatment group (the reform of Province-Directly-Governing-County was carried out from 2002 to 2007), and 1117 samples are the non-reform counties, namely the control group (the reform of City-Directly-Governing-County was carried out from 2002 to 2007).

County-level disposable financial resources Y is the result variable of this paper. This paper chooses the ratio of total fiscal revenue to GDP as the measure index of disposable financial resources. In addition, there are two main sources of disposable financial resources: county-level self-owned fiscal revenue and county-level transfer payment revenue from the city. As mentioned above, the mechanism of the Province-Directly-Governing-County fiscal system reform has different impact on the two sources. Therefore, this paper regards the ratio of fiscal revenue at the corresponding level to GDP and the ratio of transfer payment at higher level to GDP as outcome variables to examine the impact of reform on financial resources from different

[1] The county-level samples that have the Province-Directly-Governing-County fiscal system from 2000 to 2002 include: all counties under the jurisdiction of Beijing, Tianjin, Shanghai, Chongqing, Hainan, Zhejiang and Ningxia, as well as Jiyuan in Henan, Tianmen in Hubei, Qianjiang, Xiantao and Shihezi in Xinjiang.

[2] The provinces of progressive reform include Henan, Jiangxi, Shanxi, Shaanxi, Qinghai and Gansu provinces.

sources. The description statistics show that the level of disposable financial resources in reform counties is significantly higher than that in non-reform counties. However, it is unscientific that the increasing trend of county-level disposable financial resources is attributed to the Province-Directly-Governing-County fiscal system reform, which needs further quantitative analysis.

4. Results Analysis

4.1. Analysis of Matching Result of Propensity Score

This paper makes a quantitative regression based on formula (1) of the Probit model. Results show that the ranking of actual per capita GDP, population density, urbanization level and fiscal gap of a county have a significant impact on the implementation probability of a county's reform, which indicates that the implementation of the Province-Directly-Governing-County fiscal system reform is not a random decision. The necessity of adopting PSM-DID method is further verified in this paper. According to the regression coefficients of the variables, the probability of implementing reform in each county is obtained, which is regarded as the propensity score. Figure 2 is the distribution map of propensity score of reform counties and non-reform counties. The propensity score of the two counties presents normal distribution, which is concentrated in the interval from 0 to 0.6. Moreover, the two distribution areas basically coincide to meet the common support condition.[1]

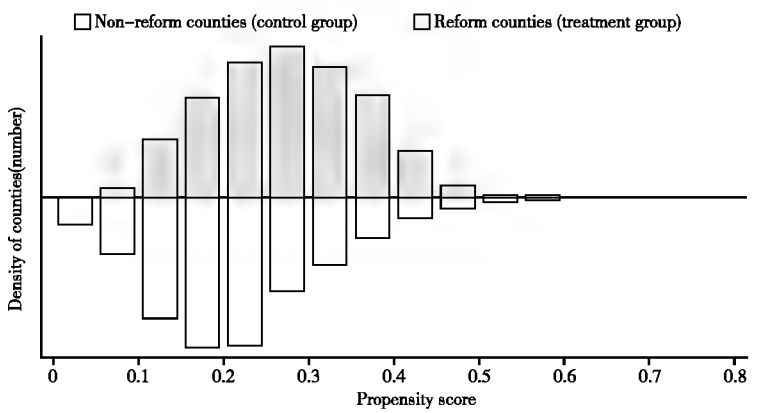

Figure 2. Density Distribution of Propensity Scores of the Control Group and the Tretment Gruop

[1] Heckman *et al.* (1997) and Lechner (2001) mentioned that if the common support condition is violated, it means that there would be more samples outside the common support area. The average processing effect estimated based on the common support area S is only a subset effect, which is not accurate and representative.

After estimating the propensity score of each county, this paper matches the treatment group with the control group by nuclear density matching method and K nearest neighborhood method. We set two kinds of kernel functions (Epanechnikov and Gaussian) with the bandwidth of 0.03 and 0.06 respectively in the kernel density matching method. Each matching method should make the treatment and control samples satisfy the conditional independent assumption (CIA).[1]

4.2. The Impact of Reform on Disposal Financial Resources at County Level

Table 1 shows the effect of Province-Directly-Governing-County fiscal system reform on county-level disposable financial resources under the nuclear density matching method and K nearest field matching method. The third column of Table 1 shows that the treatment effect estimated under the eight parameters with the two matching methods is significantly positive. The average of the treatment effect is 2.962, which indicates that the ratio of total fiscal revenue to GDP at the county level has increased by 2.962 percentage points after the reform. This also means that reform is generally conducive to the improvement of the fiscal revenue of the county-level government, which indicates that influence path that "the reform of vertical fiscal relations (PGC) weakens the vertical fisacl competition, reduces the seizure of prefecture-level cities to the county, and improves disposable fiscal revenue" in Figure 1 is more powerful. In addition, the fourth column in Table 1 shows that reform improves the ratio of income at the corresponding level to GDP by 0.105 percentage points, but the results has no statistical significance. The fifth column in Table 1 shows that reform significantly increases the ratio of transfer payments to GDP by 1.791 percentage points. It can be seen that, the growth rate of transfer payment in counties after the reform is obviously larger than revenue at the corresponding level, which indicates that the PGC fiscal reform significantly increasing the transfer payment income of county-level governments from their superiors through restricting the vertical fiscal competition of intercepting and misappropriating transfer payment at the county level by prefecture-level municipalities, which significantly increases the disposable fiscal revenue of county governments.

[1] The conditional independent assumption (CIA) refers to that the disposable financial resources have an independent relationship with the reform implementation under the condition that the tendency score is given. Satisfying CIA means that reform is conditionally exogenous and selective bias could be corrected (Lechner, 1999). Due to space limitation, the tests for CIA are not included in the paper, which are retained on request.

Table 1. The Treatment Effect of Vertical Fiscal Relations Reform on the Financial Resources in Grassroots-Level Governments

Matching method	Parameter setting	Total revenue	Revenue at the corresponding level	Transfer payment
Nuclear density matching	Kernel function of Epan; Bandwidth is 0.03	2.998*** (0.430)	0.126 (0.121)	1.773*** (0.434)
	Kernel function of Epan; Bandwidth is 0.06	2.953*** (0.425)	0.133 (0.119)	1.720*** (0.432)
	Kernel function of Gaus; Bandwidth is 0.03	2.949*** (0.425)	0.135 (0.119)	1.712*** (0.432)
	Kernel function of Gaus; Bandwidth is 0.06	2.837*** (0.424)	0.158 (0.118)	1.600*** (0.433)
K nearest neighborhoods Matching	*K* =5; Neighborhood=0.05	2.945*** (0.489)	0.058 (0.142)	1.985*** (0.502)
	K =5; Neighborhood =0.1	2.945*** (0.490)	0.058 (0.142)	1.985*** (0.502)
	K =10; Neighborhood =0.05	3.036*** (0.458)	0.087 (0.135)	1.777*** (0.471)
	K =10; Neighborhood =0.1	3.036*** (0.459)	0.086 (0.135)	1.777*** (0.471)
	Average of treatment effect	2.962	0.105	1.791
	Sample number of treatment group	314	313	312
	Sample number of control group	1,040	1,044	1,042

Notes: The numbers in parentheses are standard errors, and *, ** and *** indicate the significant levels of 10%, 5% and 1%, respectively.

4.3. Heterogeneity Analysis of the Impact of Reform on County-Level Disposable Financial Resources

The PGC fiscal reform may not have the uniform impact on all counties. The reason is that the seizure of counties by prefecture-level cities is not an inevitable phenomenon, and it mainly depends on the economic status of prefecture-level cities and counties. Yang (2009) suggested that relationship between prefecture-level city and county is different, and it could be divided into four categories: strong cities and strong counties, strong cities and weak counties, weak cities and strong counties, and weak cities and weak counties. In the relationship with the weak cities and strong counties, weak cities would not drive the economic development of strong counties while in the relationship with the strong cities and weak counties, strong cities would play a leading role in the economic development of weak counties and help to improve the public service capacity of weak counties.

4.3.1. Heterogeneity of Reform Effect: "Counties Governed in Strong Cities" and "Counties Governed in Weak Cities"

Since there is difference of economic development level of prefecture-level cities, the misappropriating behavior of different prefecture-level cities with different economic strength is also different. Prefecture-level cities (strong cities) with high level of economic development may have a weaker misappropriation of county-level financial resources than prefecture-level cities (weak cities) with low level of economic development since the strong cities have a good fiscal revenue-generating capacity. If the previous judgment on the influence path that "the reform of vertical fiscal relations (PGC) weakens the vertical fiscal competition, reduces the seizure of prefecture-level cities to the county, and improves disposable fiscal revenue" is correct, the increase of disposable financial resources of counties under the jurisdiction of "weak cities" should be greater than that of counties under the jurisdiction of "strong cities" after the PGC fiscal reform. Therefore, this paper divides the sample of the reform counties into two sub-samples: "county under the jurisdiction of the strong city" and the "county under the jurisdiction of the weak city" to compare the reform effects of different levels of economic development of prefectures and municipalities with PGC fiscal reform. Taking the ranking of the average real per capita GDP of prefecture-level cities in the provinces from 2000 to 2002 as the division criterion, this paper divides the cities that rankin the first third in the province into "strong city", while those in the last third in the province are divided into "weak city". Table 2 shows that the increase of overall financial level, especially transfer payment in the counties that under the jurisdiction of weak cities is significantly greater than that of the counties under the jurisdiction of strong cities after the reform, which indicates that the reform has greatly reduced the interception behavior of transfer payment of the counties that under the jurisdiction of weak cities, and the inference of the previous paper is verified. In addition, considering that the comprehensive economic development strength of provincial capital cities is superior to that of other non-provincial capital cities, this paper further divides the reform counties into "county that under the jurisdiction of the provincial capital cities (strong cities)" and "county that under the jurisdiction of non-provincial capital cities (weak cities)" according to the criteria of "whether they belong to the jurisdiction of provincial capital cities" in order to compare the reform effects of provincial capital cities and non-provincial capital cities. Table 2 shows that the effect of reform on total revenue and transfer payment is positive and statistically significant in the counties under the jurisdiction of non-provincial capital cities, while the effect of reform on the county under the jurisdiction of provincial capital cities is negative. This shows that the non-provincial capital cities with weak comprehensive strength have more grabbing behavior towards the counties under their jurisdiction before the reform, while the cities with strong comprehensive strength give support to

the counties under their jurisdiction before the reform. Therefore, the financial level of the former after the reform increases significantly, while the financial level, especially the transfer payment level of the latter decreases since it is no longer supported by the provincial capitals, which further verifies the previous inference.

Table 2. The Effect of Vertical Fiscal Relations Reform (PGC) on the Financial Resources of Counties that under Jurisdiction of "Strong City" and "Weak City"

Sample	Index	Total revenue	Revenue at corresponding level	Transfer payment	Sample	Index	Total revenue	Revenue at corresponding level	Transfer payment
Counties that under jurisdiction of "Strong City"	Treatment effect	1.141 (0.958)	-0.006 (0.262)	0.203 (0.919)	Counties that under jurisdiction of "Weak City"	Treatment effect	3.325*** (0.708)	0.061 (0.150)	1.886*** (0.625)
Counties that under jurisdiction of "Strong City"	Sample number of treatment group	52	50	49	Counties that under jurisdiction of "Weak City"	Sample number of treatment group	157	159	159
	Sample number of control group	1,040	1,044	1,042		Sample number of control group	1,040	1,044	1,042
Counties that under jurisdiction of "Provincial capital City"	Treatment effect	-1.577* (0.939)	-0.299 (0.354)	-2.340*** (0.612)	Counties that under jurisdiction of "non-Provincial capital City"	Treatment effect	3.149*** (0.481)	0.161 (0.121)	1.925*** (0.475)
	Sample number of treatment group	17	15	17		Sample number of treatment group	297	298	295
	Sample number of control group	1,040	1,044	1,042		Sample number of control group	1,040	1,044	1,042

Notes: The figures in parentheses are standard deviation, and *, ** and *** indicate the significant levels of 10%, 5% and 1%, respectively. The treatment effect in the table is based on the kernel density matching method.

4.3.2. Heterogeneity of Reform Effect: Strong Counties and Weak Counties

For the strong counties that are easier to be misappropriated by prefecture-level municipal governments before the reform, the PGC fiscal reform would reduce the interception of transfer payment funds from prefecture-level cities to strong counties. For weak counties, the financial jurisdiction of prefecture-level cities to weak counties has been weakened after the reform, which would naturally reduce the support for the economic development of weak counties. If the previous judgment on the influence path that "the reform of vertical fiscal relations (PGC)

weakens the vertical fiscal competition, reduces the seizure of prefecture-level cities to the county, and improves disposable fiscal revenue" is correct, the increase of disposable financial resources of strong county governments, especially transfer payments, should be greater than that of weak county governments after the fiscal reform. This paper divides the sample of the reform counties into two sub-samples of "strong county" and "weak county" to compare the reform effects of PGC fiscal reform on weak and strong counties. With the ranking of the average real per capita GDP of reform county in the prefecture-level cities from 2000 to 2002 as the division criterion, this paper divided the counties that rank in the first third in prefecture-level cities into "strong county", while those rank in the last third in prefecture-level cities into "weak county".[1] From the results of Table 3, it can be seen that the increase of transfer payment revenue in strong counties is more obvious than that in weak counties after the reform, which indicates that the misappropriationof strong counties by prefecture-level cities before the reform is mainly reflected in the misappropriation or interception of transfer payment revenue, and fiscal reform of the PGC has well restrained this vertical fiscal competition behavior.

Table 3. The Treatment Effect of Vertical Fiscal Relations Reform on Financial Resources of "Strong Counties" and "Weak Counties"

Sample	Index	Total revenue	Revenue at the corresponding level	Transfer payment	Sample	Index	Total revenue	Revenue at the corresponding level	Transfer payment
	Treatment effect	2.820***	0.407	1.840***		Treatment effect	2.814***	0.161	1.171*
		(0.751)	(0.248)	(0.640)			(0.785)	(0.184)	(0.690)
Strong county	Sample number of treatment group	53	53	53	Weak county	Sample number of treatment group	138	138	138
	Sample number of control group	1,040	1,044	1,042		Sample number of control group	1,040	1,044	1,042

4.4. Counterfactual Analysis

In order to test the rationality and validity of the choice of matching variables and matching methods of the benchmark model, this section will carry out counterfactual

[1] The purpose of only dividing the sample of reform counties (treatment group) is to ensure that the sample of non-reform counties (control group) is consistent with the benchmark result of Table 1.

analysis, which means that constructing a set of counterfactual samples as treatment groups, and estimating the treatment effect of PGC fiscal reform by using the same measurement settings. If the setting of matching variables and the selection of matching methods of the above benchmark model are reasonable and effective, the treatment effect of the fiscal reform of PGC on county-level disposable financial resources based on the counterfactual treatment group estimates should be insignificant. The paper chooses all the non-reform counties under the non-reform cities in the provinces of gradual reform as the counterfactual sample group. The reason for this construction is that counterfactual treatment group must be the counties that have not implemented the PGC fiscal reform. If there are both reform counties and non-reform counties in the same prefecture-level city, the prefecture-level municipal government may intensify the misappropriation of the disposable financial resources of its subordinate non-reform counties, since the financial resources of the reform counties are not under control anymore. Therefore, the sample of counterfactual treatment group in this section does not include the non-reform counties subordinate to the prefecture-level cities that have already implemented the reform. All the non-reform counties in the prefecture-level city that have not been reformed are selected as the counterfactual treatment group to minimize the impact of the reform on the counterfactual treatment group.[1] Results[2] show that no matter what matching method is adopted, the treatment effect of PGC on county-level total financial revenue, local revenue and transfer payment that estimated with the counterfactual treatment group is not statistically significant, which indicates that the matching variable setting and matching method selection of the benchmark model in this paper is reasonable.

In addition to the above counterfactual analysis, we have conducted 500 random sampling in all non-reform counties, reconstructed 500 new counter-factual treatment groups, calculated the estimated coefficients of 500 reform treatment effects and drew the probability density distribution map in order to further verify the benchmark results of this paper (see Figure 3). The parabola of Figure 3 shows the probability density distributions of the treatment effect coefficients of total revenue, primary revenue and transfer payment after counterfactual estimating for 500 times. The vertical lines represent that the treatment effect coefficients of total revenue, primary revenue and transfer payment in the benchmark results are 2.962, 0.105 and 1.791 respectively. From Figure 3, it can be seen that the estimated coefficients of counterfactual treatment effect are concentrated around 0, which shows that the reform has no significant statistical impact on counterfactual treatment group. Moreover, the treatment effect coefficients of gross revenue and transfer payment in the benchmark results are 2.962 and 1.791 respectively, which

[1] The control group under counterfactual analysis is the same as that under baseline analysis.

[2] Due to the space limitation, the conterfactual results are not included in the paper, which are retained on request.

are obviously outside the probability density distribution curve. This means that the PGC fiscal reform has an effect on the significant increase of the county's total fiscal revenue and transfer payment, which is not caused by unobservable contingency factors.

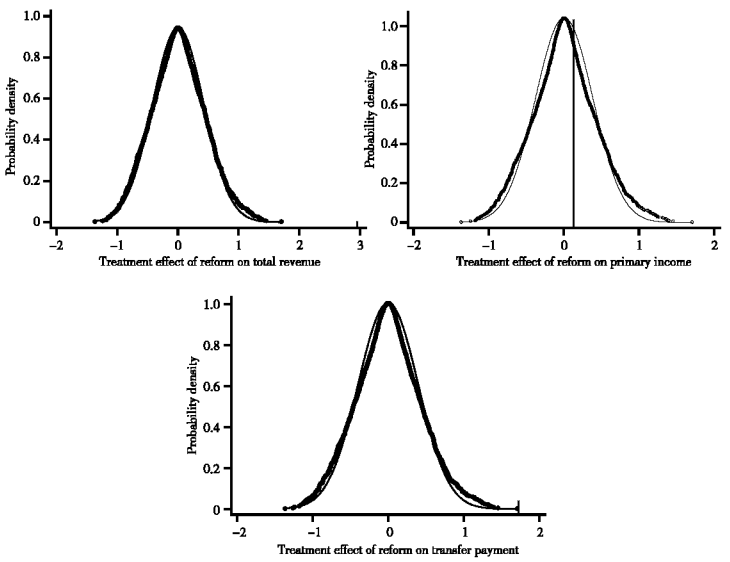

Figure 3. Counterfactual Treatment Effect Based on 500 times of Random Samples

4.5. Robustness Analysis

In order to test the robustness of the conclusion that the PGC fiscal reform is conducive to improving the financial level of grassroots-level county governments, the following analysis tests are carried out: Firstly, the last 10% of the treatment group samples with the least number of matched control groups are excluded to reduce the effect of the abnormal value samples in the treatment group on the final results when calculating the average treatment effect. Secondly, this paper clusters at the level of prefecture and provincial level to control the impact of cluster effect on the treatment effect of PGC. Thirdly, the Probit model is replaced by the Logit model for regression of propensity score equation. Fourth is to change the matching method that uses radius matching method (radius is 0.05) and local linear regression matching method (LLR) to match the treatment group with the control group, and investigating whether the treatment effect of the fiscal reform on county-level disposable financial resources is robust. Fifth is to change the measurement index of the result variable that tries to take the logarithm of the real per capita revenue of the total fiscal revenue, the revenue at the corresponding level and the transfer payment revenue as the measure index

of the financial capacity of the county-level government.[1] Sixth is to introduce four additional characteristic variables (the dummy variables of poverty-stricken counties at the national level, the dummy variables of cities at the county level, the average elevation of counties and the average slope of counties) into the Probit model.[2] The results of robustness analysis show that there is no significant difference between the effect of the reform on the total fiscal revenue, the revenue at the corresponding level and the transfer payment with that shown in Table 1, which indicates that the positive treatment effect on the county-level financial capacity is robust.[3]

5. Conclusion and Policy Suggestions

Grassroots-level government provides basic public services for local residents, and the financial level of grassroots-level government directly determines the quantity and quality of public goods, which relates to whether the public service needs of residents could be met or not. In the current fiscal decentralization system in China, the financial situation of grassroots-level county governments is generally in a dilemma. Therefore, the central and provincial governments actively take measures to adjust the intergovernmental vertical fiscal relations in order to improve the financial level of county governments. PGC fiscal reform is an important attempt to straighten out the intergovernmental vertical fiscal relations and solve the county-level financial difficulties. Based on the quasi-natural experiment of PGC fiscal reform, this paper uses PSM-DID measurement method to study the path and effect of the vertical fiscal relations reform on the financial resources of grassroots-level county governments. Econometric analysis shows that vertical fiscal reform of the PGC is beneficial to the improvement of the overall fiscal revenue and transfer payment revenue of the county government, and it has no significant impact on the revenue at the corresponding level, which indicates that influence path that "the reform of vertical fiscal relations (PGC) weakens the vertical fiscal competition, reduces the seizure of prefecture-level cities to the county, and improves disposable financial revenue" is more powerful, and the reform improves the overall financial level of the county-level government through restraining the seizure of transfer payments at the county level by the prefecture-level cities. In addition, this paper also finds that the

[1] Actual total fiscal revenue per capita (revenue at the corresponding level and transfer payment revenue) = nominal total fiscal revenue per capita (revenue at the corresponding level and transfer payment revenue) / provincial consumer price index (with the year of 2000 as the base period).

[2] This paper tries to introduce four additional characteristic variables into the Probit model one by one, and the results are not significantly different from those in Table 1.

[3] Due to the space limitation, the results of robustness test are omitted, which are retained on request.

overall financial level of the county that under the jurisdiction of the weak city has increased more than that of the county that under the jurisdiction of the strong city, and the transfer payment of the strong county has increased more than that of the weak county after the reform. The reason is that the weak city is more likely to mispropriate the county than the strong city, and the strong county is easier to be grabbed by the prefecture-level city than the weak county.[1] Based on the above analysis, this paper puts forward the following policy recommendations on how to promote the reform of vertical fiscal relations in the future.

Firstly, the reform should focus on standardizing the vertical competition between higher and lower governments. The conclusion of this paper has verified the vertical fiscal competition behavior of prefecture-level cities against counties. Although the prefecture-level municipalities could not intervene the county government in finance after the reform of PGC, they still have a certain voice in the aspect of administration and personnel. Therefore, the prefecture-level municipalities are still in an obvious dominant position in the vertical competition relationship between prefecture-level municipalities and counties. The financial interests of prefecture-level cities will be damaged after the reform, which leads to the more fierce competition between prefecture-level cities and counties in other resources. In view of the vertical competition between prefecture-level cities and counties, the provincial government fully should take the interests of prefecture-level cities into consideration in the reform to ensure that the negative impact of reform on prefecture-level cities is minimized. For example, the provincial government could implement the policy of withdrawing counties and setting districts in the reform, which means that allowing prefecture-level cities to transform some of the surrounding counties into municipal districts.[2] On the other hand, the provincial government should establish corresponding institutional norms with the prefecture-level municipal government to fundamentally restrain the bad vertical competition behavior of prefecture-level municipalities against the county. Only by securing the support and cooperation of prefecture-level cities could the

[1] Although the period of the sample is until 2007 due to the data availability of *National Financial Statistical Data of Prefectures, Cities and Counties*, the author believes that the conclusions drawn in this paper still have strong theoretical and practical significance. Firstly, the conclusion of this paper reveals the mode of vertical competition behavior among local governments at county and municipal levels below the province level, and finds that the prefecture-level municipalities do grab the fiscal revenue at county level, which provides a factual basis for the further study on the vertical fiscal relations of local governments below the province level. Secondly, the conclusion of this paper shows that the reform of the vertical fiscal relations of PGC has achieved the initial goal of alleviating the financial predicament at the county level, which provides experience support for the financial system reform of PGC in the future.

[2] At present, many provinces and municipalities have carried out the reform of setting up districts by withdrawing counties. How the vertical competition behavior of prefecture-level cities changes after setting up districts by withdrawing counties and whether setting up districts by withdrawing counties is conducive to alleviating the grabbing behavior of prefecture-level cities towards counties is a topic worthy of further study in the future.

reform of the vertical fiscal relations of PGC be carried out more smoothly in the long run.

Secondly, the reform should be tailored to local conditions. Strong and weak cities, as well as strong counties and weak counties, should be treated in different ways. This paper finds that the effect of the vertical fiscal relations reform on strong and weak cities, strong counties and weak counties is different. Therefore, the PGC fiscal system reform should take into account the difference of economic development level of prefecture-level cities in the future. For the counties under strong cities, especially those under the jurisdiction of provincial capital cities, the province could maintain the original fiscal system of Municipal-Directly-Governing-County. In addition, in considering differences of the county's economic development level, the provinces can adopt different fiscal management systems for strong counties and weak counties. For instance,implementing the PGC fiscal system reform for strong counties and implementing the City-Directly-Governing-County fiscal system reform for weak counties or encouraging prefecture-level cities to maintain their original support policies for weak counties under the PGC fiscal system reform.

Thirdly, the reform should attach importance to improving the income-generating capacity of grassroots-level county governments. According to the conclusion of this paper, the promotion of the reform of PGC to the improvement of county-level fiscal revenue is limited. Although the timely arrival of transfer payments from superiors is important to enhance county financial resources, how to cultivate the county government's own "blood-making" capacity after the provincial government governing the county finance is more important. On the one hand, provincial governments can consider setting up progressive fiscal revenue sharing ratio with counties to increase the proportion of new fiscal revenue of county governments, as well as to encourage county governments to actively develop new financial resources and fundamentally improve their own sustainable financial level. On the other hand, with the horizontal rivals of county governments having suddenly increased after the reform, provincial governments should standardize the horizontal fiscal competition among county governments to avoid the disorderly racing-to-bottom taxation of county governments, and prevent the actual effective tax rate at the county level from falling so much as to affect the fiscal revenue at the corresponding level.

References

Brennan, G., & Buchanan, J. (1980). *The Power to Tax: Analytical Foundations of a Fiscal Constitution*. Cambridge University Press.

Cai, G., & Huang, L. (2010). Research on the Influencing Factors and Economic Performance of Government Level Reform. *Management World (Guanli Shijie)*, 8, 73-83.

Cai, G., Zhang, X., & Deng, W. (2011). Will the Province-Directly-Governing-County Financial System Reform Damage the Interests of Prefecture-Level Cities? *Economic Research Journal (Jingji Yanjiu)*, 7, 65-77.

Caliendo, M., & Kopeinig, S. (2008). Some Practical Guidance for the Implementation of Propensity Score Matching. *Journal of Economic Surveys*, 22(1), 31-72.

Caliendo, M., & Künn, S.(2011). Start-Up Subsidies for the Unemployed: Long-Term Evidence and Effect Heterogeneity. *Journal of Public Economics*, 95(3), 311-331.

Chen, S., & Lu, S. (2014). Does Decentralization Increase People's Livelihood Financial Expenditure? Natural Experiment from "Province-Directly-Governing-County Fiscal System Reform" in China. *China Economic Quarterly (Jingjixue Jikan)*, 4, 1261-1282.

Gebel, M., & Voßemer, J. (2014). The Impact of Employment Transitions on Health in Germany. A Difference-in-Differences Propensity Score Matching Approach. *Social Science & Medicine*, 108(4), 128-136.

Heckman, J., Ichimura, H., & Todd, P. (1997). Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme. *The Review of Economic Studies*, 64(4), 605-654.

Jia, J., & Ning, J. (2015). Vertical Fiscal Governance Structure and Local Government Function Optimization. *Management World (Guanli Shijie)*, 1, 7-17.

Jia, J., Zhang, Y., & Guo, J. (2013). Province-Directly-Governing-County Fiscal System Reform, County Economic Growth and Fiscal Solution in Provincial Governance Counties. *China Soft Science (Zhongguo Ruankexue)*, 6, 22-29.

Jia, K., &Yu, C. (2010). The Significance, Content and Relevant Suggestions of the Financial Reform of "Province-Directly-Governing-County". *China Taxation (Zhongguo Shuiwu)*, 4, 27-29.

Lechner, M. (1999). Earnings and Employment Effects of Continuous Off-The-Job Trainingin East Germany after Unification. *Journal of Business & Economic Statistics*, 17(1), 74-90.

Lechner, M. (2001). Identification and Estimation of Causal Effects of Multiple Treatments under the Conditional Independence Assumption. *Econometric Evaluation of Labour Market Policies ZEW Economic Studies*, 13, 43-58.

Li, P., Lu, Y., & Wang, J. (2016). Does Flattening Government Improve Economic Performance? Evidence from China. *Journal of Development Economics*, 123, 18-37.

Lin, S., & Ye, H. (2007). Does Inflation Targeting Really Make a Difference? Evaluating the Treatment Effect of Inflation Targeting in Seven Industrial Countries. *Journal of Monetary Economics*, 54(8) 2521-2533.

Lu, H., Yu, J., & Zhang, N. (2017). Vertical Administrative Structure and Scale of

Local Government Financial Expenditure. *Journal of Financial Research (Jinrong Yanjiu)*, 10, 29-55.

Mao, J., & Zhao, J. (2012). An Empirical Analysis of the Promotion of County Economic Development by Province-Directly-Governing-County Fiscal System Reform. *Public Finance Research (Caizheng Yanjiu)*, 1, 38-41.

Mendonça, H., & Souza, G. (2012). Is Inflation Targeting a Good Remedy to Control Inflation? *Journal of Development Economics*, 98(2), 178-191.

Persson, T., & Tabellini, G. (2004). Constitutional Rules and Fiscal Policy Outcomes. *American Economic Review*, 94(1), 25-45.

Qian, Y., & Weingast, B. (1997). Federalism as a Commitment to Preserving Market Incentives. *Journal of Economics Perspectives,* 11(4), 83-92.

Qian, Y., Roland, G., & Xu, C. (2006). Coordination and Experimentation in M-Form and U-Form Organizations. *Journal of Political Economy*, 114(2), 366-402.

Rosenbaum, P., & Rubin, D. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika*, 70(1), 41-55.

Wang, X., & Xu, J. (2017). Can Fiscal Reform of Province-Directly-Governing-County Restrict On-The-Job Consumption of Grassroots Public Officials? *Finance & Trade Economy (Caimao Jingji)*, 6, 17-32.

Yang, Z. (2009). A Study on Province-Directly-Governing-County Financial System—From Provincial Governing Counties to Reconstructing Intergovernmental Financial Relations. *Finance & Trade Economics (Caimao Jingji)*, 11, 36-41.

Zheng, X., Wang, H., & Zhao, Y. (2011). Can Province-Directly-Governing-County Financial System Promote Economic Growth. *Management World (Guanli Shijie)*, 8, 34-44.

Do Institutional Investors Drive Financialization of Real Sectors?

Wei Liu, Yuqiang Cao*

The trend that China's economy is being "off the real to the virtual" is a typical fact in recent years. A large number of firms invest and hold financial assets, the investing and profit-generating channels of the real sectors are becoming more and more financialized. By utilizing sample of Chinese A-share manufacturing firms from the year of 2007 to 2015, and using fixed effect model, this paper investigates the driving factor of the financialization of real sectors. The results show that: (1) institutional investors, overall, drive the financialization of real sectors; (2) institutional investors are heterogeneous, that is, long-term institutional investors do not show a significant correlation with the financialization of real sectors; however, short-term institutional investors significantly drive the financialization of real sectors; (3) the results of further investigation show that the driving effect of institutional investors on financialization is more significant in state-owned firms than that in private firms. The findings have implications as follows: guiding the investment behavior of institutional investors, leading financial sector to serve the real economy, promoting financial structure reform.

Keywords: institutional investors, "off the real to the virtual", real sectors, financialization

1. Introduction

In recent years, the development level of China's financial market has been significantly improved, and the structure of financial assets has been significantly perfected (Yi and Song, 2008), and financial deepening has also promoted economic development (Tan, 1999). However, in the capital market, there is a phenomenon of funds flowing out of the real economy and "idling" in the financial field. The financial industry and real estate industry are overheated and their return on net assets is significantly higher than that of the real economy. Figure 1 shows that since the financial crisis, the return on net assets of the financial and real estate industries

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has been significantly higher than that of manufacturing industries. Due to the significant difference of asset return rate among these industries, the "off the real to the virtual" of companies in real economy has become a typical fact. The relationship between financial sector and real economy is becoming more and more delicate. The financialization of economy is accelerating (Zhang and Zhang, 2015). A large number of domestic real companies are actively investing in financial assets. Figure 2 shows that the proportion of financial assets held by manufacturing companies has continued to rise since 2011, and the proportion of financial investment return to operating profit has also risen sharply since the financial crisis.

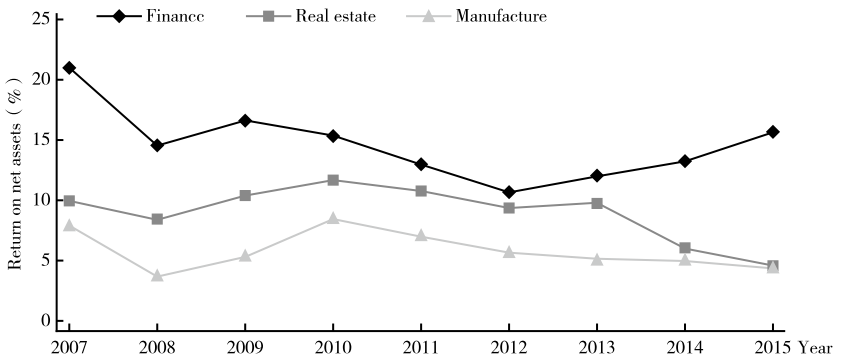

Figure 1. Return on Net Assets of the Industry

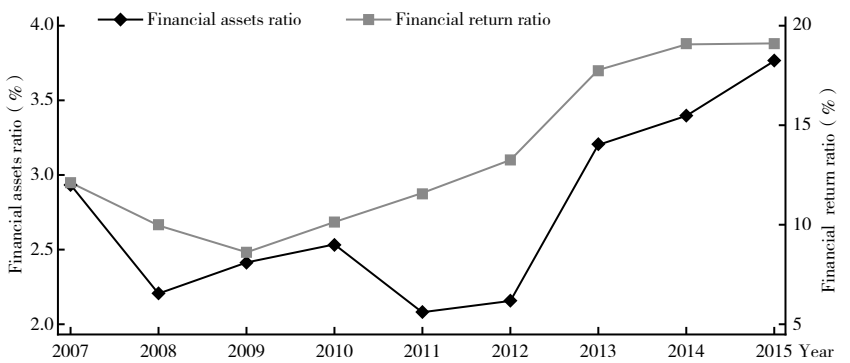

Figure 2. Financial Assets Ratio and Financial Return Ratio

Notes: The data of ROE in Figure 1 are from CSMAR Database. This paper calculates the average ROE of financial industry, real estate industry and manufacturing industry according to the industry classification guideline of the Securities Regulatory Commission of the 2012 edition. The original data in Figure 2 are from the CSMAR database, financial assets ratio is the proportion of financial assets to total assets, financial return ratio is the proportion of financial return to total operating profits. The specific algorithm can be found in the section "Definition and Calculation of Key Variables" below. Graphics are drawn by the author through Stata software.

Unlike mature foreign capital markets, institutional investors in China's capital markets mostly pursue short-term interests. As Chinese institutional investors are more

inclined to focus on short-term interests, their position turnover rate is higher, which brings pressure on companies with poor short-term performance to decrease their stock prices. Under the pressure of falling stock prices, managers will allocate more capital to financial assets with shorter profit cycles in order to maintain short-term performance. Therefore, from the short-sighted point of view of institutional investors, institutional investor ownership may drive corporate financialization. What impact will institutional investors have on corporate financialization? This is the focus of this paper.

Based on the sample data of A-share manufacturing companies from 2007 to 2015, this paper studies the driving factors of real companies' financialization from the short-sighted perspective of institutional investors. This paper may have the following contributions. Firstly, most of the existing literature focused on the measurement and economic consequences of financialization, but paid less attention to the driving factors of corporate financialization. This paper studies the driving factors of corporate financialization from the short-sighted perspective of institutional investors, which is a supplement to the literature on the driving factors of corporate financialization. Secondly, the results of this study show that short-term interest concerns of institutional investors will drive corporate financialization. Therefore, this paper also enriches the research on economic consequences of institutional investor ownership. Thirdly, the theoretical analysis and empirical evidence provided in this paper will help us to understand the impact of institutional investors' short-sighted behavior on corporate management's short-sighted financial investment behavior, which is of positive significance for regulatory authorities to guide institutional investors' investment behavior rationally, stabilize the market, actively guide the financial industry to return to the origin of supporting the real economy and promote the reform of financial structure.

2. Literature Review and Research Hypotheses

2.1. Literature Review

There is no strict and unified definition of financialization in academic circles. The definition of financialization varies with the scope of defining. It can be either financial deepening at the macro-level (Krippner, 2005) or the financialization of corporate investment channels at the micro-level (Demir, 2009). The perspective of this paper is micro-level financialization.

Since the 1980s, the investment and profit channels of companies have become more and more financialized in developed countries and some emerging market countries. Epstein and Jayadev (2005) took the non-financial enterprises of OECD member countries as samples, and found that in the early 20th century, more and

more non-financial enterprises invested in financial assets. Demir (2009) studied listed companies in Mexico, Argentina and Turkey, and found that firms' investment in fixed assets decreased significantly, but their investment in short-term financial assets increased significantly. Zhang and Zhang (2015) analyzed financial data of Chinese A-share non-financial and non-real estate listed companies from 2004 to 2013, and found that the proportion of non-financial enterprises' earnings from financial channels to net profits increased year by year and accelerating. It can be seen that the financialization of real sector companies is a common phenomenon in both developed capital markets and emerging markets.

As for the issue of corporate financialization in real sectors, the previous literature focuses more on how to design the measurement indicators of financialization, which can be summarized as macro-level measurement and micro-level measurement. At the macro-level, the existing literature mainly measures financialization from the perspectives of the proportion of employment in the industry, the proportion of output value in the industry and the proportion of profit in the industry (Krippner, 2005). At the micro-level, most of the existing literature measures the financialization of the economy from the perspective of investment channels and profit channels of non-financial companies (Demir, 2009; Song and Lu, 2015). This paper will measure the degree of corporate financialization in real sectors at the micro-level.

With increasingly obvious phenomenon of economic financialization in recent years, scholars have studied the influencing factors of economic financialization. Demir (2009) found that under the condition of uncertain macroeconomic risk, the difference between the income rate of financial assets and real assets is the cause of corporate financialization. Davis (2013) studied non-financial companies in the United States, and found that the deep-rooted values of shareholders, fluctuations in demand at the corporate level and the size of the company would affect the fixed asset investment rate of non-financial companies. At the same time, some scholars studied the financialization of China's non-financial companies. Zhang and Zhang (2015) put forward threefold motives of economic financialization: the decline of profit margin in traditional productive industries, the opening of trade and finance, and the aging of economy. Zhang and Sun (2014) studied the listed manufacturing companies in China and found that the mismatch between financial and real economic development and the increase of resources supply in financial sector are the reasons for the financialization of China's economy. Although some literature studied the influencing factors of financialization, most of them was based on macro-level analysis, and relatively few were based on micro-level research.

2.2. Research Hypotheses

It has been found that institutional investors are concerned about short-term

interests, so institutional investor ownership may drive short-sighted investment behavior of corporate management. In fact, there are two preconditions for institutional investors to focus on short-term interests to drive short-sighted investment behavior of corporate management. First, institutional investors are concerned about company's current earnings. After controlling momentum, institutional investors' trading behavior is very sensitive to earnings news (Lang and MacNichols, 1997). When the company's earnings fall, institutional investors are motivated to sell the company's shares because they are subject to fiduciary responsibility, as fund sponsors use earnings as a criterion to judge whether fund managers are smart in their investment strategies (Badrinath *et al.*, 1989). Because of information asymmetry, institutional investors often use current earnings as the value proxy of a company. They make trading decisions according to the changes of current earnings (Froot *et al.*, 1992). In China's capital market, Yao and Liu (2008), Cai and Song (2010), Liu and Xu (2012) found that the fundamental reason of institutional investors having increased the volatility of the securities market is that institutional investors pursue short-term interests. Second, the company's management is concerned about the stock price. Because falling stock prices may lead to undervaluation of companies, managers are motivated to adopt short-term investment strategies to maintain short-term performance to avoid undervaluation (Stein, 1988, 1989), such as reducing R&D expenditure (Bushee, 1998). As far as China's capital market is concerned, there are several reasons why managers are concerned about stock prices. (1) Listed companies often have the need to use open market for timing financing, too low share price is not conducive to corporate financing. (2) Managerial equity incentive is directly linked to stock price, and too low stock price will reduce managers' exercising benefits. In order to maximize exercising benefits, managers may implement opportunistic behavior. (3) Stock exchange is one of the common payment methods for mergers and acquisitions of listed companies in China (Sun *et al.*, 2013). Mergers and acquisitions often take place through stock exchange to a certain extent, or the actual transaction price is directly related to the stock price, so too low share price will make the acquisition operation cost too high, and may also make the company become the target of competitors' acquisition. Therefore, from the short-sighted perspective of institutional investors, the short-term interest concerns of institutional investors will cause pressure on corporate management to decrease stock prices; in order to avoid falling stock prices, managers will make short-sighted investment decisions and allocate more capital to financial assets with shorter earnings cycle. Based on the above analysis, this paper proposes the following hypothesis.

H1: There is a significant positive correlation between the proportion of institutional investor ownership and the degree of corporate financialization.

The existing literature shows that institutional investors are heterogeneous (Bushee,

1998; Chen *et al.*, 2007). The proportion of short-term institutional investors in a company is higher, the management will reduce R&D expenditure to avoid the decline of current earnings level (Bushee, 1998). Only institutional investors with independence and long-term investment in companies can play a supervisory role (Chen *et al.*, 2007). Meanwhile, institutional investors in China's capital market also are heterogeneous. Short-term institutional investors exacerbate market volatility while long-term institutional investors play a role in stabilizing the market to a certain extent (Liu and Xu, 2012). In this regard, this paper argues that the long-term institutional investors hold shares for a relatively longer time and pay more attention to the long-term value of the company, so they will not drive corporate financialization; while the short-term institutional investors hold shares for a relatively shorter time and pay more attention to the current performance of the company, which will drive the company's financialization. Based on the above analysis, this paper proposes the following hypotheses.

H2a: There is no significant correlation between the proportion of long-term institutional investor ownership and the degree of corporate financialization.

H2b: There is a significant positive correlation between the proportion of short-term institutional investor ownership and the degree of corporate financialization.

The difference of property rights is a typical feature of Chinese listed companies. The operating objectives of companies with different property rights are different, which determines the significant difference in behavior decision-making between state-owned enterprises and private enterprises. In addition to pursuing economic benefits, state-owned enterprises also need to bear social responsibilities such as employment, taxation, earthquake relief and so on. It is also the main tool for the implementation of macro-control and industrial policy. Therefore, state-owned enterprise executives can not only focus on current earnings. Compared with private enterprises, the executives of state-owned enterprises are more insensitive to the changes of current earnings. Therefore, in state-owned enterprises, institutional investor ownership will play a smaller role in driving the financialization of companies, while in private enterprises, the driving role will be greater. Based on the above analysis, this paper proposes the following hypothesis.

H3: Compared with the state-owned enterprises, the positive correlation between the proportion of institutional investor ownership and the degree of corporate financialization is more significant in private enterprises.

3. Research Design

3.1. Sample Selection and Data Sources

This paper chooses all manufacturing companies in China's A-share market from

2007 to 2015 as the research sample. [1]At the same time, this paper uses the existing research (Bushee, 1998; Song *et al.*, 2012; Cai and Rao, 2015) to reflect the level of institutional investor ownership by using the proportion of fund holdings in the listed companies' outgoing shares. The financial data of listed companies are from CSMAR database. Detailed data of fund shareholding are from Reiss database, and half-yearly data are used. Property right data are from CCER database. The office addresses of listed companies and fund management companies are from the Wind database. The M2 growth rate data are from the official website of the People's Bank of China. This paper deals with the data as follows. (1) In order to control the impact of abnormal value, this paper excludes the sample of companies whose asset-liability ratio is greater than 1; (2) Excludes the sample of missing key variables; (3) Shrinks the tail of continuous variables on the scale of 1% and 99%. After the above data processing, totaling 6770 companies, annual observations of 1156 A-share manufacturing companies are obtained in this paper.

3.2. Model Design

In order to analyze whether institutional investor ownership drives corporate financialization, this paper constructs the following fixed-effect models for empirical testing by synthesizing the existing literature on the driving factors of corporate financialization (Song and Lu , 2015; Xie *et al.*, 2014; Zhang and Zhang, 2015):

$$FinAsstRt_{it} = \alpha + \beta O_{it}\left(LIO_{it}, SIO_{it}\right) + \gamma Controls + FIRM + YEAR + \varepsilon_{it} \quad (1)$$

Among them, subscriptions i and t represent company i and the year t respectively; $FinAsstRT_{it}$ represents the proportion of financial assets held by the company; IO_{it} represents the total proportion of institutional investor ownership; LIO_{it} represents the proportion of long-term institutional investor ownership; SIO_{it} represents the proportion of short-term institutional investor ownership. [2] *Controls* represent all control variables.

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[1] The basis of sample selection is as follows. Firstly, since 2007, China has implemented new accounting standards for enterprises. There are great differences between the old and new accounting standards. In order to maintain the comparability of data, the data after 2007 are selected as the research sample. In addition, the detailed data of "other liquid assets" and "long-term equity investment" subjects which are the basic data for calculating the financialization of real sector companies have been disclosed in the annotations to the annual report since 2007. Secondly, Huang (2017) put forward a framework for the classification of real economy. The first level of real economy is manufacturing industry, which is the core of real economy. Therefore, this paper uses Huang's division method and uses manufacturing industry to represent the real economy.

[2] In column (1)~(3) of Table 3, *IO*, *LIO* and *SIO* are used as explanatory variables. In order to further compare the impact of long-term and short-term institutional investor ownership on financialization, this paper refers to Yan and Zhang (2009), Liu and Xu (2012). In the model of column (4), *LIO* and *SIO* are used as explanatory variables to examine whether there are differences in the impact of long-term and short-term institutional investor ownership on financialization.

Song and Lu (2015) found that there was a U-shaped relationship between corporate financialization and the return on operating assets. Therefore, this paper includes the return rate on operating assets and its square term in the control variables. Demir (2009) found that the difference between the return rate of financial assets and real assets was the cause of corporate financialization. Zhang and Zhang (2015) also believed that the long-term decline of profit rate of traditional productive industries was one of the main reasons for the financialization of real economy. Therefore, the difference between the average *ROE* of financial industry and real estate industry and the average *ROE* of manufacturing industry is included in the control variables. Zhang and Zhang (2016) found that monetary policy would affect the industrial investment rate of companies (corresponding to the investment in financial assets). Therefore, the growth rate of M2 is included in the control variables in this paper. Meanwhile, referring to the existing literature on the driving factors of corporate financialization (Song and Lu, 2015; Xie *et al.*, 2014; Demir, 2009), this paper includes the relevant corporate characteristics variables into the control variables, such as enterprise size, asset-liability ratio, net cash flow of business activities, growth rate of business income. The specific names and definitions of all variables in the model are shown in Table 1. *FIRM* represents the firm's individual fixing effect, *YEAR* represents the time fixing effect, and ε_{it} represents the interference item.

Table 1. Name and Definition of Variables

Signs	Name of variables	Definition of variables
FinAsst	financial assets	transactional financial assets + derivative financial assets + net sellable financial assets + net holding to maturity investment + net long-term creditor's rights investment + trust loans + financial products + trust product investment balance + investment real estate + equity holding of financial institutions
FinAsstRt	proportion of financial assets held	total financial assets/total assets
FinInc	financial return	interest income + investment return from holding various types of financial assets + long-term equity investment return from financial institutions + fair value change return from transactional financial assets and transactional financial liabilities as well as investment real estate
FinIncRt	proportion of financial return	total financial return/total operating profit
IO	institutional investor ownership ratio	institutional investor stock holdings/total outgoing stocks of listed companies
LIO	long-term institutional investor ownership ratio	long-term institutional investor stock holdings/total outgoing stocks of listed companies
SIO	short-term institutional investor ownership ratio	short-term institutional investor stock holdings/total outgoing stocks of listed companies

Signs	Name of variables	Definition of variables
OprtAsstRn	return on operating assets	(operating profit-financial return)/(total assets-financial assets)
$OprtAsstRn^2$	square term of return on operating assets	return on operating assets×return on operating assets
ROE_Diff	difference of profit rate in industry annually	average return on net assets in finance and real estate-average return on net assets in manufacturing industry
Size	natural logarithm of total assets	ln(total assets)
Lev	asset-liability ratio	total liability/total assets
Growth	growth rate of business income	(current operating income-last operating income)/last operating income
CFO	net cash flow ratio of operating activities	net cash flow of operational activities /total assets
SOE	nature of property right	SOE, *SOE*=1; Non-SOE, *SOE*=0
EPS	earnings per share	current net profit attributable to common shareholders / weighted average of common shares issued out
M2Grwth	M2 growth rate	current M2/last M2

In the model of formula (1), if the coefficient β of IO_{it} is significantly positive, institutional investor ownership drives corporate financialization. Furthermore, in view of the heterogeneity of institutional investors, this paper divides institutional investors into long-term and short-term institutional investors, and then makes regression analysis of the above model.

3.3. Definition and Calculation of Key Variables

3.3.1. Definition of the Proportion of Financial Assets Holding and the Proportion of Financial Return

Referring to the methods of Song and Lu (2015), this paper strips financial assets from assets and financial return from returns. The proportion of financial assets to total assets is used to indicate the degree of financialization of the company. Let the proportion of financial assets held in company i in year t be $FinAsstRT_{it}$, which is equal to the total financial assets $FinAsst_{it}$ divided by total assets $TtLAsst_{it}$ in year t of company i. Among them, total financial assets $FinAsst_{it}$ includes the following parts:

$$FinAsst_{it} = FinTrd_{it} + FinRcnt_{it} + FinRl_{it} + FinEty_{it} \quad (2)$$

Among them, $FinTrd_{it}$ represents transactional financial assets, including subjects such as transactional financial assets, derivative financial assets, net financial

assets available for sale, net investment held to maturity, net investment in long-term creditor's rights. $FinRcnt_{it}$ represents a relatively large number of new types of financial assets in recent years, including entrusted loans, financial products, investment balance of trust products, $FinRl_{it}$ represents investment real estate, $FinEty_{it}$ represents ownership of financial institutions' stock right.

In addition, this paper uses $FinIncRt_{it}$ to express the proportion of financial return to total operating profit. Financial return $FinInc_{it}$ is defined as follows:

$$FinInc_{it} = Interest_{it} + Invest_{it} + FairVl_{it} \tag{3}$$

Among them, $Interest_{it}$ represents interest income, $Invest_{it}$ represents the financial-related part of investment return, specifically including investment return obtained by holding various types of financial assets, long-term equity investment return obtained by holding financial institutions, $FairVl_{it}$ represents fair value change return, including fair value change returns of transactional financial assets, transactional financial liabilities and investment real estate.

3.3.2. The Division of Long-Term and Short-Term Institutional Investors

Referring to the existing methods (Yan and Zhang, 2009; Liu and Xu, 2012; Li and Lu, 2015), this paper divides institutional investors into long-term institutional investors and short-term institutional investors. The calculation steps are as follows:

Firstly, calculate the total purchase or sale of institution k:

$$CR\_buy_{k,t} = \sum_{\substack{i=1 \\ S_{k,i,t} > S_{k,i,t-1}}}^{N_k} \left| S_{k,i,t}P_{i,t} - S_{k,i,t-1}P_{i,t-1} - S_{k,i,t-1}\Delta P_{i,t} \right| \tag{4}$$

$$CR\_sell_{k,t} = \sum_{\substack{i=1 \\ S_{k,i,t} \le S_{k,i,t-1}}}^{N_k} \left| S_{k,i,t}P_{i,t} - S_{k,i,t-1}P_{i,t-1} - S_{k,i,t-1}\Delta P_{i,t} \right| \tag{5}$$

Among them, $CR\_buy_{k,t}$ and $CR\_sell_{k,t}$ respectively represent the total purchase and total sale of institution k in the t period, $P_{i,t}$ and $\Delta P_{i,t}$ respectively represent the difference between the price of institution k holding stock i in the t period and the price in the previous period. When $S_{k,i,t} > S_{k,i,t-1}$, it represents institution k buying stock in in the t period, and when $S_{k,i,t} \le S_{k,i,t-1}$, it represents that institution k sold stock i in the t period.

Secondly, the transaction flow rate (CR, Churn Rate) of each institution k can be calculated:

$$CR_{k,t} = \frac{\min\left(CR\_buy_{k,t}, CR\_sell_{k,t}\right)}{\sum_{i=1}^{N_k} \frac{S_{k,i,t}P_{i,t} + S_{k,i,t-1}P_{i,t-1}}{2}} t \tag{6}$$

Thirdly, average flow rate of institution k in the past year can be calculated:

$$AVG\_CR_{k,t} = \frac{1}{2}\left(CR_{k,t} + CR_{k,t-1}\right) \tag{7}$$

Institutional investors are divided into three groups according to the size of $AVG\_GR_{k,t}$, the lowest group is long-term institutional investors, and the highest group is short-term institutional investors.

Fourthly, for the company i in the sample, the proportion of all long-term institutional investors is added up and expressed by LIO_{it}. Similarly, the proportion of short-term institutional investors in company i can be obtained and expressed by SIO_{it}.

4. Empirical Results and Analysis

4.1. Descriptive Statistics

Table 2 shows descriptive statistics of major variables. As can be seen from Table 2, the average holding ratio of financial assets is 2.6%, and the maximum value is as high as 35.3%. The average share-holding ratio of institutional investors is 6.1% and the maximum is 53%. This shows that the average share-holding ratio of institutional investors in China has reached the level of influencing the company. Further, the average share-holding ratio of long-term institutional investors and short-term institutional investors is 1.3% and 2.5% respectively, and the maximum is 25.6% and 27.9% respectively. Therefore, on average, short-term institutional investors hold a larger proportion of shares in China's institutional investors. The average return on net assets of financial industry and real estate industry is 5.6 percentage points higher than that of manufacturing industry (*ROE_Diff*), which indicates that the return on net assets of real sector industry is also far from that of finance and real estate industry.

Table 2. Descriptive Statistics of Variables

Variables	Sample	Mean	SD	Min.	Median	Max.
FinAsstRt	6770	0.026	0.057	0.000	0.004	0.353
IO	6770	0.061	0.076	0.000	0.031	0.530

Variables	Sample	Mean	SD	Min.	Median	Max.
LIO	6770	0.013	0.022	0.000	0.005	0.256
SIO	6770	0.025	0.036	0.000	0.010	0.279
OprtAsstRn	6770	0.047	0.064	−0.210	0.041	0.236
ROE_Diff	6770	0.056	0.012	0.044	0.051	0.082
Size	6770	22.040	1.117	19.980	21.880	25.320
Lev	6770	0.422	0.195	0.044	0.424	0.826
Growth	6770	0.179	0.340	−0.414	0.128	2.009
CFO	6770	0.051	0.069	−0.141	0.047	0.251
SOE	6770	0.431	0.495	0.000	0.000	1.000
EPS	6770	0.407	0.483	−0.850	0.313	2.460
M2Grwth	6770	15.658	3.894	12.309	14.689	26.500

4.2. The Impact of Institutional Investor Ownership on Corporate Financialization

In order to investigate the impact of institutional investor ownership on corporate financialization, this paper makes regression analysis according to the benchmark model in formula (1). The estimated results are shown in column (1)~(4) of Table 3.[1]The results of column (1) show that the regression coefficient of total institutional investor ownership (*IO*) is significantly positive at the level of 5%, which shows that institutional investor ownership drives company financialization, therefore, H1 has been verified. The results of column (2) show that the regression coefficient of *LIO* is not significant which shows that there is no significant correlation between long-term institutional investor ownership ratio and corporate financialization, and H2a has been verified. The results of column (3) show that the regression coefficient of short-term institutional investor ownership ratio (*SIO*)

[1] In view of the rationality of model selection, this paper makes a series of statistical tests. Firstly, we test whether there is individual fixation effect. Through *F*-test, the *p* values of column (1)~(4) in Table 3 are all 0.00, therefore, we can reject the original assumption that there is no individual fixed effect, that is, the individual fixed effect model should be adopted instead of the mixed OLS regression model. Secondly, the time-fixed effect is tested. Through *F*-test, the *p* values of column (1)~(4) in Table 3 are all 0.00, so the original hypothesis without time fixed effect can be rejected. Thirdly, using the fixed effect model, the values of *p* obtained in column (1)~(4) of Table 3 are all 0.65, which shows that the variance of disturbance items mainly comes from the variation of individual effects, which further illustrates the rationality of choosing the fixed effect model in this paper. Fourthly, if the individual effects are not correlated with the disturbance terms, the random effects model will be more efficient than the fixed effects model. Therefore, this paper conducts Hausman test to decide to use the fixed effects model or the random effects model. The Hansman test of column (1)~(4) in Table 3 has the *p* value of 0.00, so the original hypothesis that individual effects are not related to disturbance terms is rejected, that is, the fixed effect model should be used instead of the random effect model.

is significantly positive at the level of 5%, which shows that short-term institutional investor ownership drives the company's financialization, and H2b has been verified. In addition, the results of column (4) show that the regression coefficient of short-term institutional investor ownership is still significantly positive at the level of 10% under the control of long-term institutional investor ownership ratio, which further verifies H2a and H2b. [1]In addition, the regression results of column (1)~(4) in Table 3 also show that the regression coefficients of $OprtAsstRtrn^2$ (the square term of return on operating assets) are significantly positive at the level of 1%, which shows that there is a U-shaped relationship between the proportion of financial assets held by the company and the operating rate of return, which verifies the research conclusions of Song and Lu (2015).

However, institutional investor ownership may be an endogenous variable. There may be a reverse causal relationship between the behavior of institutional investors holding stocks of listed companies and the return of financial assets. Institutional investors will analyze financial situation of listed companies when making stock investment choices. Long-term institutional investors may be more inclined to invest in companies with low degree of financialization, while short-term institutional investors may be more inclined to invest in companies with high degree of financialization. Therefore, this paper uses panel instrumental variable method to alleviate endogenous problem. Referring to the existing research (Song *et al.*, 2012; Cai and Rao, 2015), this paper uses the geographical distance between the office address of institutional investors and the office address of corporate headquarters as instrumental variable of institutional investor ownership. The specific method is to find the longitude and latitude of the office address of each company and institutional investors who hold the company's shares through Baidu Map, and then to calculate the geographical distance between company i and institutional investor j by using the following formula:

$$Distance = \frac{2\pi r}{360}\arccos\left\{\begin{array}{l}\cos(lat_i)\cos(lon_i)\cos(lat_j)\cos(lon_j) \\ +\cos(lat_i)\sin(lon_i)\cos(lat_j)\sin(+\sin(lat_i)\sin(lat_j)\end{array}\right\} \quad (8)$$

Among them, r is the equatorial radius with a value of 6378 km; lat_i and lon_i

[1] There is probably an economic link between the investment behavior of long-term institutional investors and short-term institutional investors. The investment behavior of long-term and short-term institutional investors may be affected by each other, which may lead to the collinearity between *LIO* and *SIO*. This paper examines the variance expansion factors of *LIO* and *SIO* in column (4) of Table 3, and finds that the variance expansion factors (*VIF*) of long-term institutional investors'shareholding ratio (*LIO*) and short-term institutional investors' shareholding ratio (*SIO*) are 1.67 and 1.36, respectively. In addition, the maximum *VIF* of all explanatory variables is 9.28, and the average value is 2.84. Therefore, the multi-collinearity problem has little influence on the hypothesis inference in this paper.

represent the latitude and longitude of the company's office address respectively; lat_j and lon_j represent the latitude and longitude of the institutional investors' office address respectively. Because the company may be held by many institutional investors, this paper uses weighted average distance weighted by the proportion of institutional investors as instrumental variable of institutional investor ownership. Then the regression analysis is carried out according to the model in formula (1). Firstly, the first stage regression is carried out with the proportion of institutional investors as explained variable, the geographical distance *Dist_w(DistLIO_w* and *DistSIO_w)* [1]as explanatory variable, and the exogenous variables in the second stage are controlled; then the second stage regression is carried out. The regression results are shown in column (5)~(8) of Table 3. The results of column (5)~(7) show that the regression coefficients of institutional investor ownership ratio and short-term institutional investor ownership ratio are significantly positive at the level of 10%, while the regression coefficients of long-term institutional investor ownership ratio are not significant. This shows that short-term institutional investors focusing on short-term interests drive the financialization of companies, which is consistent with the previous analysis. The results of column (8) show that the regression coefficients of short-term institutional investors are still significantly positive at the level of 5% under the condition of controlling the proportion of long-term institutional investors, which further verifies H2a and H2b. Therefore, after considering the problem of endogeneity the conclusion of this paper is still robust.

Table 3. The Impact of Institutional Investment Ownership on Corporate Financialization

Variables	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE-IV	(6) FE-IV	(7) FE-IV	(8) FE-IV
IO	0.022**				0.190*			
	(2.25)				(1.93)			
LIO		0.047		0.035		0.111		0.322
		(1.12)		(0.83)		(0.52)		(0.37)
SIO			0.033**	0.029*			1.920*	2.30**
			(2.07)	(1.77)			(1.95)	(2.20)
OprtAsstRn[2]	0.374***	0.384***	0.379***	0.376***	0.567***	0.586***	0.476***	0.470***
	(3.51)	(3.57)	(3.56)	(3.52)	(2.87)	(3.93)	(4.55)	(4.10)

[1] *Dist_w* is the weighted average distance between all institutional investors and listed companies, *DistLIO_w* is the weighted average distance between long-term institutional investors and listed companies, and *DistSIO_w* is the weighted average distance between short-term institutional investors and listed companies.

Variables	(1) FE	(2) FE	(3) FE	(4) FE	(5) FE-IV	(6) FE-IV	(7) FE-IV	(8) FE-IV
OprtAsstRn	−0.015	−0.012	−0.013	−0.014	−0.017	−0.071	0.006	−0.153
	(−0.86)	(−0.67)	(−0.75)	(−0.82)	(−0.27)	(−1.51)	(0.19)	(−0.01)
ROE_Diff	0.289***	0.272**	0.303***	0.285***	0.153	2.143*	0.312	0.104
	(2.64)	(2.47)	(2.77)	(2.58)	(0.43)	(1.70)	(1.63)	(−0.01)
Size	0.003	0.003	0.003	0.003	−0.001	−0.002	−0.002	−0.007
	(1.08)	(0.99)	(1.05)	(1.05)	(−0.17)	(−0.86)	(−0.85)	(−0.71)
Lev	−0.022***	−0.021***	−0.022***	−0.022***	0.018	0.009	0.016	0.423
	(−3.33)	(−3.20)	(−3.25)	(−3.31)	(1.01)	(0.65)	(1.31)	(0.51)
Growth	−0.003*	−0.003*	−0.003*	−0.003*	0.000	0.001	0.000	0.200
	(−1.80)	(−1.72)	(−1.81)	(−1.77)	(1.12)	(1.50)	(1.24)	1.01)
CFO	0.003	0.004	0.003	0.003	−0.000	0.000	0.000	0.002
	(0.43)	(0.48)	(0.43)	(0.43)	(−0.32)	(1.14)	(0.20)	(0.84)
M2Grwth	−0.002***	−0.002***	−0.002**	−0.002***	−0.003	−0.002	0.004	−0.005
	(−2.59)	(−2.62)	(−2.47)	(−2.59)	(−1.14)	(−1.17)	(1.25)	(−1.25)
_cons	−0.004	0.002	−0.005	−0.003	−0.055*	0.096**	−0.015**	−0.101*
	(−0.07)	(0.03)	(−0.07)	(−0.04)	(1.93)	(2.24)	(2.24)	(1.90)
YEAR/ FIRM	YES	YES	YES	YES	YES	YES	YES	YES
N	6770	6770	6770	6770	6770	6770	6770	6770
adj. R^2	0.047	0.046	0.046	0.046	0.051	0.042	0.066	0.068

Notes: The *t* value in brackets is the standard error of clustering robustness at the company level. * means $p < 0.1$, ** means $p < 0.05$, and *** means $p < 0.01$. Similarly hereinafter.

4.3. The Regulating Effect of Property Right Nature

In order to test H3, this paper groups the models in formula (1) according to the nature of property rights and conduct regression again. The estimated results are shown in panel A of Table 4. The results of panel A in columns (2) and (6) show that the regression coefficients of total institutional investor ownership (*IO*) and short-term institutional investor ownership (*SIO*) are significantly positive at the level of 10% in the private enterprise group. However, the results of panel A in columns (1) and (5) show that in state-owned enterprises, the regression coefficients of total institutional investor ownership (*IO*) and short-term institutional investor ownership *(SIO)* are not significant.

This shows that in private enterprises, institutional investor ownership significantly drives the financialization of companies, while the driving role is not significant in state-owned enterprises. Therefore, H3 has been verified. Moreover, the results of panel A's columns (7) and (8) show that after controlling the long-term institutional investor ownership ratio *(LIO)*, the regression coefficient of the short-term institutional investor ownership ratio *(SIO)* is still significant only in the private enterprise group, which further verifies H3. In order to test the robustness of the results in panel A, this paper also makes regression of panel instrumental variables with different samples. The results are shown in panel B of Table 4. The results in panel B are similar to those in panel A, so we will not repeat them.

Table 4. The Regulating Effect of Property Right Nature

Panel A Regression results of fixed effect model								
Variables	(1) SOE	(2) PE	(3) SOE	(4) PE	(5) SOE	(6) PE	(7) SOE	(8) PE
IO	0.013	0.024*						
	(1.07)	(1.85)						
LIO			−0.002	0.097			−0.012	0.090
			(−0.04)	(1.25)			(−0.28)	(1.15)
SIO					0.028	0.025*	0.030	0.013*
					(1.22)	(1.87)	(1.30)	(1.69)
	(−3.70)	(−1.39)	(−3.63)	(−1.33)	(−3.73)	(−1.29)	(−3.70)	(−1.37)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
YEAR/ FIRM	YES	YES	YES	YES	YES	YES	YES	YES
N	2921	3849	2921	3849	2921	3849	2921	3849
R^2_adj.	0.035	0.047	0.035	0.061	0.035	0.060	0.035	0.061
Panel B Regression results of panel instrumental variables								
Variables	(1) SOE	(2) PE	(3) SOE	(4) PE	(5) SOE	(6) PE	(7) SOE	(8) PE
IO	−0.441	0.404*						
	(−0.10)	(1.83)						
LIO			0.278	3.081			0.934	1.663
			(0.22)	(0.33)			(0.40)	(0.06)

Panel B Regression results of panel instrumental variables								
Variables	(1) SOE	(2) PE	(3) SOE	(4) PE	(5) SOE	(6) PE	(7) SOE	(8) PE
SIO					−0.322	1.480**	0.194	1.460*
					(−0.26)	(2.10)	(0.18)	(1.71)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
YEAR/ FIRM	YES	YES	YES	YES	YES	YES	YES	YES
N	2921	3849	2921	3849	2921	3849	2921	3849
R^2_adj.	0.211	0.127	0.317	0.264	0.169	0.122	0.362	0.308

Notes: Due to space limitation, this table only reports the results of the core explanatory variables, while the panel tool variable method in Panel B only reports the estimation results of the second stage. Details are available.

4.4. Substitution Effect of Corporate Financialization

Song and Lu (2015) found that owing to the poor performance of the company, the return of financial assets is more attractive than that of operating assets, so holding more financial assets has a "substitution effect". If corporate financialization does produce this substitution effect, then corporate financialization will be conducive to restraining the decline of short-term performance of the company, and then restraining the stock price decline caused by the shareholding reduction of institutional investors. In order to identify this impact mechanism, this paper uses counter-factual framework identification strategy (Rubin, 1974), and uses bias correction matching estimators (Abadie *et al.*, 2004; Abadie and Imbens, 2011) to estimate the processing effect of corporate financialization.

This paper sets whether a company is financialized as a processing variable which is expressed in *D*. When the company holds financial assets in that year, the value of *D* is 1, or is 0. *EPSdecr* is a virtual variable, when the company's earnings per share declines from the previous period, the value is 1, or is 0; *EPSr* is a continuous variable, indicating that in the current sub-sample of earnings per share declining from the previous period, the company's earnings per share declines from the previous period (absolute value). This paper compares whether there are significant differences between financialized and non-financialized companies in *EPSdecr* and *EPSr*. If there are expected differences, it can be concluded that the differences originate from corporate financialization. In this paper, PATE is used to represent overall average processing effect; PATT is used to represent average processing effect of financial companies in general; SATE is used to represent average processing effect of samples;

SATT is used to represent average processing effect of financial companies in samples. At present, there is no uniform standard for the selection of sample matching quantity. In this paper, different matching methods are used. [1]Because SATT and PATT are relatively more important (Abadie *et al.*, 2004), this paper focuses on SATT and PATT.

Table 5 reports the results of matching estimation. The number of sample matches does not affect the estimation results. The estimated results of SATT and PATT in Table 5 show that compared with the companies without financialization, the probability of the current performance decline of the financialized companies is significantly lower, and the proportion of the decline of the financializing companies is also significantly lower in the subsamples where the performance decline has occurred. This shows that under the pressure of institutional investor ownership interest concerns, the company's holding of financial assets has indeed improved short-term performance.

Table 5. Average Processing Effect of Corporate Financialization: Counterfactual Framework

Variables	M=3				M=6			
	SATT	PATT	SATE	PATE	SATT	PATT	SATE	PATE
EPSdecr	−0.036*	−0.036*	−0.040**	−0.040**	−0.038*	−0.038*	−0.040**	−0.040**
	(−1.81)	(−1.82)	(−2.19)	(−2.21)	(−1.97)	(−1.98)	(−2.27)	(−2.29)
EPSr	−1.166***	−1.166***	−0.930***	−0.930***	−1.105***	−1.105***	−0.857***	−0.857***
	(−4.24)	(−4.24)	(−3.87)	(−3.82)	(−4.31)	(−4.18)	(−3.81)	(−3.65)
Matching	*Size Lev ROE Growth CFO Age Dual MgHldShr DrcSize SOE year*							

5. Robustness Test

In order to examine the robustness of empirical results above, this paper makes the following four robustness tests.[2]

Firstly, the model in formula (1) is re-estimated by using the lag period of explanatory variables, and the results are consistent with the previous ones.

Secondly, long-term and short-term institutional investors are reclassified according to the median of the average transaction flow rate (*CR*, Churn Rate) of institutional investors in the past year. The group less than the median of the average transaction

[1] The matching variables used in this paper are company financial characteristics variables (scale, asset-liability ratio, ROE, growth, net operating cash flow), company age, corporate governance variables (integration of two positions, management shareholding, board size), property rights nature and year. Moreover, the matching methods of 1 to 1, 1 to 2, 1 to 3, 1 to 4, 1 to 5 and 1 to 6 are used in this paper, and the results are consistent. In order to save space, only 1 to 3, 1 to 6 are reported.

[2] Due to space constraints, this paper does not report the results of robustness test in the text. Details are available.

flow rate is long-term institutional investors, and the group larger than the median of the average transaction flow rate is short-term institutional investors. Then the regression analysis of the model in formula (1) is conducted again, and the results are consistent with the previous ones.

Thirdly, the samples are grouped according to whether there is a decline in performance, and then the model in formula (1) is subdivided into sub-sample regression analysis. A dummy variable *SD* (Small Decrease) is introduced here, when the company's operating profit declines from the previous period, but the decline can be compensated by financial investment return, *SD* is 1; otherwise, *SD* is 0. If the short-term interest concerns of institutional investors do drive the financialization of companies, and the motivation of holding financial assets is to avoid the decline of short-term performance, the positive correlation between institutional investor ownership and the proportion of financial assets held by companies should be more significant in the *SD*=1 sample. The regression results confirm this theoretical expectation.

Fourthly, grouping regression analysis is carried out according to the proportion of institutional investor ownership. If the short-term interest concerns of institutional investors affect the investment decisions of corporate management, the proportion of institutional investors should reach an influential level. For the total proportion of institutional investors, referring to Bushee (1998), this paper chooses 5% as the critical value of influential shareholding level; for the long-term and short-term proportion of institutional investors, this paper chooses 3% as the critical value. If the short-term interest-focused behavior of institutional investors does drive the financialization of companies, then the driving role should be more significant in the samples whose shareholding level is higher than the critical value. The regression results confirm this theoretical expectation.

6. Conclusion and Implication

Under the background of the increasing financialization of real companies, this paper studies the driving factors of the financialization of real companies from the perspective of institutional investors' short-sightedness, and uses the sample data of A-share manufacturing companies from 2007 to 2015 to study the relationship between institutional investor ownership and the financialization of real companies. The results show that institutional investor ownership drives the financialization of real companies, but the driving force mainly comes from short-term institutional investors. Further research finds that institutional investor ownership plays a more significant role in driving corporate financialization in private enterprises. The empirical results of this paper show that when institutional investors only focus on short-term performance, it will put pressure of falling stock prices on the company's management. In order

to maintain short-term performance, the management will allocate more capital to financial assets with shorter period to achieve returns. Based on the above conclusions, the following policy implications are obtained.

Firstly, we should adhere to the principle of "combining virtual with real" and enhance the vitality of economy. In order to fundamentally reverse the phenomenon of "off the real to the virtual", we must accelerate the transformation and upgrading of the real economy and actively promote the strategy of innovation and development. In addition, we should guide the rational development of virtual economy. The development of virtual economy is a double-edged sword. The existence and development of virtual economy has a significant pulling effect on the development of real economy, but as a speculative economy, excessive development will lead to macro risks such as bubble economy.

Secondly, we should restrain institutional speculation and encourage long-term value investment. Therefore, regulators should actively guide institutional investors to make long-term value investments. In order to avoid excessive speculation by institutional investors, regulators need to improve the market system and create an overall market environment in which value investment does not suffer losses. Specific measures include: to urge listed companies to increase the proportion of dividends, to give long-term shareholding of institutional investors trading stamp tax concessions, and to levy high transaction tax on short-term speculative institutional investors.

References

Abadie, A., & Imbens, G. W. (2011). Bias-Corrected Matching Estimators for Average Treatment Effects. *Journal of Business & Economic Statistics*, 29 (1), 1-11.

Abadie, A., Drukker, D., Herr, J. L., & Imbens, G. W. (2004). Implementing Matching Estimators for Average Treatment Effects in Stata. *Stata Journal*, 4, 290-311.

Badrinath, S. G., Gay, G. D., & Kale, J. R. (1989). Patterns of Institutional Investment, Prudence, and the Managerial "Safety-Net" Hypothesis. *Journal of Risk and Insurance*, 56 (4), 605-629.

Bushee, B. J. (1998). The Influence of Institutional Investors on Myopic R&D Investment Behavior. *Accounting Review*, 73 (3), 305-333.

Cai, H. B., & Rao, P. G. (2015). Institutional Investors, Tax Collection and Management and Tax Avoidance of Enterprises. *Accounting Research (Kuaiji Yanjiu)*, 10, 59-65.

Cai, Q. F., & Song, Y. Y. (2010). Can Institutional Investors with Supernormal Development Stabilize the Market?—Reflections on the Leapfrog Development of

China's Fund Industry. *Economic Research Journal (Jingji Yanjiu)*, 1, 90-101.

Chen, X., Harford, J., & Li, K. (2007). Monitoring: Which Institutions Matter? *Journal of Financial Economics*, 86 (2), 279-305.

Davis, L. E. (2013). Financialization and the Non-Financial Corporation: An Investigation of Firm-Level Investment Behavior in the United States. *Metroeconomica*, 86 (273), 178-184.

Demir, F. (2009). Financial Liberalization, Private Investment and Portfolio Choice: Financialization of Real Sectors in Emerging Markets. *Journal of Development Economics,* 88 (2), 314-324.

Epstein, G. A., & Jayadev, A. (2005). The Rise of Rentier Incomes in OECD Countries: Financialization, Central Bank Policy and Labor Solidarity. *Financialization and the World Economy*, 46-74.

Froot, K. A., Perold, A. F., & Stein, J. C. (1992). Shareholder Trading Practices and Corporate Investment Horizons. *Journal of Applied Corporate Finance*, 5 (2), 42-58.

Huang, Q. H. (2017). On the Development of Chin's Real Economy in the New Period. *China Industrial Economics (Zhongguo Gongye Jingji)*, 9, 7-26.

Krippner, G. R. (2005). The Financialization of the American Economy. *Socio-Economic Review*, 3 (2), 173-208.

Li, W. J., & Lu, X. Y. (2015). Do Institutional Investors Pay Attention to Environmental Performance of Enterprises?—Empirical Evidence from Listed Companies in Heavily Polluted Industries in China. *Journal of Financial Research (Jinrong Yanjiu)*, 12, 97-112.

Liu, J. J., & Xu, H. P. (2012). Institutional Investors: Long-term Investors or Short-Term Opportunists? *Journal of Financial Research (Jinrong Yanjiu)*, 9, 141-154.

Song, J., & Lu, Y. (2015). U-Shaped Relation between Non-Monetary Financial Assets and Operational Return Rate: Evidence from Financialization of Listed Non-Financial Companies in China. *Journal of Financial Research (Jinrong Yanjiu)*, 6, 111-127.

Song, Y., Shen, J., & Fan, M. H. (2012). Does the Geographical Characteristics of Listed Companies Affect the Stock Ownership Decision of Institutional Investors?—Empirical Evidence from China's Stock Market. *Accounting Research (Kuaiji Yanjiu)*, 7, 72-79.

Stein, J. C. (1988). Takeover Threats and Managerial Myopia. *Journal of Political Economy*, 96(1), 61-80.

Stein, J. C. (1989). Efficient Capital Markets, Inefficient Firms: A Model of Myopic Corporate Behavior. *The Quarterly Journal of Economics*, 104 (4), 655-669.

Sun, S. P., Zhao, X., & Li, S. N. (2013). Equity Control, Debt Capacity and Payment Method: Evidence from M & A of Chinese Enterprises. *Accounting Research (Kuaiji Yanjiu)*, 4, 52-57.

Tan, R. Y. (1999). An Empirical Study on the Relationship between Financial Development and Economic Growth in China. *Economic Research Journal (Jingji Yanjiu)*, 10, 53-61.

Xie, J. Z., Wang, W. T., & Jiang, Y. (2014). Financialization of Manufacturing Industry, Government Control and Technological Innovation. *Economic Perspectives (Jingjixue Dongtai)*, 11, 78-88.

Yan, X., & Zhang, Z. (2009). Institutional Investors and Equity Returns: Are Short-Term Institutions Better Informed? *The Review of Financial Studies*, 22 (2), 893-924.

Yao, Y., & Liu, Z. Y. (2008). Shock Market, Institutional Investors and Market Stability. *Management World (Guanli Shijie)*, 8, 22-32.

Yi, G., & Song, W. (2008). Evolution of China's Financial Assets Structure: 1991-2007. *Economic Research Journal (Jingji Yanjiu)*, 8, 4-15.

Zhang, C. S., & Zhang, B. T. (2015). Re-Discussion on Finance and Real Economy: From the Perspective of Economic Financialization. *Economic Perspectives (Jingjixue Dongtai)*, 6, 56-66.

Zhang, C. S., & Zhang, B. T. (2016). The Mystery of the Decline of China's Industrial Investment Rate: From the Perspective of Economic Financialization. *Economic Research Journal (Jingji Yanjiu)l*, 12, 32-46.

Zhang, M. B., & Sun, Y. Q. (2014). The Efficiency of Financial Resources Allocation and the Causes of Economic Financialization: An Empirical Analysis Based on Listed Companies in China. *Economist (Jingjixue Jia)*, 4, 81-90.

On the Effectiveness and Externalities of the Home Purchase Restriction Policy in China

Kairong Zhu, Pei Li, Zhenfa Xie*

In order to curb the soaring house prices, the Chinese government has been focusing on macro-control of real estate on the demand side. Among them, the Home Purchase Restriction (HPR) is one of the most commonly used policy tools, and its influence has attracted the attention from both the public and the academia. Although many scholars have studied the effectiveness of the home purchase restriction policy, there is no universal conclusion and the empirical research on the externalities of this policy is scarce. Based on the daily transaction micro-data of the real estate sales market, the rental market and the land market, this paper uses the difference-in-difference model to evaluate the effectiveness of the HPR more accurately, further integrates the relevance of each market into the analytical framework and explores the externalities of the HPR on the real estate rental market and the land market. The empirical results show that the HPR lowers the house price by 10.12%, which is higher than the estimation results of previous studies; and increases the rent by 25.09%, while decreases the residential land price by 9.08%, with no significant impact on industrial and commercial land prices. A series of robustness tests and counterfactual analysis, such as PSM-DID, all support the reliability of the empirical results. The externalities of the HPR indicates that the policy is not conducive to improving the welfare of people with the rigid housing demand, and may trigger the "soft resistance" of the local government. Therefore, the government should focus on how to promote the supply-side structural reform on the land market and real estate market on the basis of strengthening the local tax system.

Keywords: home purchase restriction, policy effectiveness, policy externalities, difference-in-difference model

1. Introduction

"Everyone has a home to live in" is the inevitable requirement of building the moderately prosperous society in an all-round way in China, and it is also a reflection

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that China is now overcoming the unbalanced and insufficient development so as to ensure all people can enjoy the shared prosperity and acquire more sense of gain during the joint development. The concept of "home is used for residence rather than speculation, rent and buying are of parallel importance" was officially proposed in the reports of the 19th National Congress of the Communist Party of China and became a long-term arrangement of housing system. The earlier regulation policies are implemented from the perspective of supply side, which includes adjusting the housing structure by enlarging the development of affordable housing. However, such policies are not that efficient. Under this background, China begins to turn to demand side management (Fan, 2016). On January 10th, 2010, the central government issued "11 national policies" to elevate the ratio of down payment by housing loan from 30% to 40% in the hope that the house price could be declined by means of restriction on housing loan. But it failed to curb the house price either.[1] As such, the central government introduced the toughest "new 11 national policies" in history on April 17th, 2010, requiring that "the local people's governments may adopt temporary measures to limit the number of house-purchase within a certain period of time".[2] As of 2014, a total of 46 large and middle cities had implemented the home purchase restriction policies, which covered nearly all economic central cities nationwide and in different regions. It not only exerted the policy effect in the real estate market, but also expanded the extensive boundary of its policy influence to other key market areas in close relation with the real estate sales market.

On the one hand, as one of the key policies regarding the macro-control of real estate market at present and in the near future, how about the effect on curbing house prices delivered by homepurchase restriction policies? Although some empirical studies have discussed the question, no consistent conclusions are reached. In terms of the data hierarchy of the regression samples and the definition of core explanatory variables, the model setting in the traditional research fails to match the actual situation of the implementation of the home purchase restriction policy, and the accuracy is obviously insufficient, thus interfering with the evaluation results of the policy. On the other hand, what is ignored but of important research value is that, will home purchase restriction policy exert externalities on other key market areas apart from real estate sales market, such as the real estate rental market and land market in direct connection with sales market in particular? Although existing literature has discussed the effect of the purchase restriction policy on house price, the externalities of the purchase restriction policy has been less concerned by scholars, and the real estate sales market and other related market fields have not been incorporated in the analysis framework. Several studies even fail to provide sufficient micro empirical evidence. The possible

[1] *Notice on Promoting the Stable and Healthy Development of the Real Estate Market by the General Office of the State Council.*

[2] *Notice on Curbing the Rapid Rise of House Price in Some Cities Resolutely.*

mechanisms of externalities lie in the following aspects. (1) In real estate rental market, in order to seek temporary solution to housing, a large number of people who are in actual demand of a house but are unqualified to purchase house turn to rent house for residence in a short term (Zhu and Yan, 2013). (2) In land market, house restriction policy obviously inhibits the demand in real estate sales market and at the same time, the supply side of housing market will be affected as well, as evidenced by the obvious weakened willingness of developers to buy land and build houses. It will further lead to the adjustment of supply demand relationship in land market and the significant decrease of the land price (unit price). Considering the relevance to local governments' land financial revenue (Tao, 2009; Yang *et al.*, 2014), it may trigger local governments' "soft resistance" against the restriction policy.

The contributions of this paper include three aspects. (1) This paper provides more accurate micro empirical evidence for the effectiveness of the purchase restriction policy. Based on the micro-data of daily transactions in three types of markets, this paper constructs a difference-in-difference model refined to districts, counties and daily transactions, which is matched with the actual situation of purchase restriction policy, so as to evaluate its policy effect in an accurate and scientific approach. The results show that the purchase restriction policy would obviously inhibit the house price, and the influence on house prices is bigger than the estimated results in the past empirical papers. Therefore, as the most essential policy tool for macro-control of real estate at the current stage, the effectiveness of purchase restriction policy has been significantly underestimated for a long time. (2) This paper innovatively extends to other market areas besides the real estate sales market, namely, the two most directly related to the real estate sales market—the real estate rental market and the land market, and analyzes the externality effect of the purchase restriction policy. As shown in the results, purchase restriction policy would cause significant rise of rent and obvious decline of the land price. (3) This paper also pays attention to the heterogeneity effect of three regions and two dimensions of land transfer model. The results indicate that the effectiveness and externalities happen in eastern China more often in comparision with central and western China; and the restriction policy's externalities are further reflected in the marketized land transfer ways as "bidding, auction and listing" in land market.

The following structures are: the second section is the literature review and research hypothesis; the third section is the empirical strategy and data specification; the fourth section shows the empirical results; the fifth and sixth section introduces the robustness tests and heterogeneity test respectively; and the last section is the conclusion and policy implication.

2. Literature Review and Research Hypotheses

The existing literature on the purchase restriction policy has two obvious

deficiencies in the aspects of policy effectiveness and policy externalities, which affects the accuracy and depth of analysis and evaluation.

2.1. Policy Effectiveness

A core dispute is that whether purchase restriction policy could effectively curb the house price. Some scholars hold that the restriction policy can hardly to do so (Qiao, 2012; Wang and Huang, 2013; Han *et al.*, 2014; Tang and Liang, 2016). Tang and Liang further point out that the effectiveness may be offset by the policy escape of "fake divorce". Others regard that whether the purchase restriction policy can curb the house price depends on certain preconditions like the reduction of consumer demand caused by the purchase restriction policy, the cost and expectation of developers' inter-temporal adjustment of supply (Liu *et al.*, 2012), policy enforcement (Zhang and Zheng, 2013) as well as the period of policy taking effect (Deng *et al.*, 2014).

The common characteristic of the above empirical researches is that the regression test is done on the basis of the monthly house price index (hereinafter referred to as "house price index") in 70 mid-and-large cities or the mean value of urban house prices per year. Conversely, this paper refers to the daily transaction data in real estate sales market to construct the difference-in-difference model refined to district, county and daily transaction, so as to estimate the restriction policy's effect on curbing house prices. To be specific: (1) This paper achieves accurate match with the implemented scope of purchase restriction policy. The most majority of cities adopting purchase restriction only choose part of districts and counties under their jurisdiction as the implementation targets. But when the house price data at the city level are adopted to conduct the regression test, the non-restriction districts and counties are actually included into the policy implementation, thus producing the error in estimating the effect of purchase restriction. (2) This paper refrains from bringing about the possible error of indirect measurement data. Two kinds of house price data and their measurement approaches have certain defects in the current application, which results in measurement inaccuracy of both of them and even the serious deviation from the actual house price (Wu *et al.*, 2014). (3) This paper uses daily high-frequency data which could better reflect the immediate effect of the purchase restriction policy. Owing to the numerous real estate transactions are made on a daily basis, in comparison with the monthly or annual average value, the frequent daily transaction data on real estate sales is more in line with the actual real estate transaction frequency. Thus, the immediate policy effect of adopting home purchase restriction policy on house prices can be accurately reflected.

This paper holds that the purchase restriction policy would curb the demand in real estate sales market, which moves down the short-term demand curve while brings no change to short term supply curve. Therefore, the short-term equilibrium price of the

real estate sales market would drop.

In summary, we put forward the first hypothesis to be tested.

Hypothesis 1: As for the real estate market, the purchase restriction policy has the effectiveness of curbing the house price.

2.2. Policy Externalities

Apart from the real estate sales market, purchase restriction policy will exert significant externality impact on other market areas. For example, it is conducive to easing the side effect on technological innovation due to the rise of house prices (Yu and Zhang, 2017), and will bring about the phenomenon known as "divorce for house purchase" (Fan, 2016; Tang and Liang, 2016).

This paper first focuses on the externalities of purchase restriction policy on the real estate rental market. In terms of the 46 cities adopting purchase restriction policy, the vast majority of them emphasize the restrictive house purchase conditions regarding the households without local registrations. So, both local households who have owned one or more sets of houses and the non-local registration households are unqualified to buy house.[1] The latter, however, are not allowed to purchase any house even though they have no real estate in the city. As is often the case, such "non-house owners" belong to the kind in actual rigid demand for housing. Also, cities with purchase restriction policy include the first and second-tier, large-and-medium-sized cities with a large number of migrant population, and their rigid real housing demand is more robust. Hence, due to the purchase restriction policy, the speculative demands of real estate investment will be curbed, and quite a few households will turn to rental market to seek temporary solutions to housing. Once the supply demand relation changes in the real estate rental market, namely the demand rises and the short-term supply remains unchanged, the equilibrium price of the rental market in the short term will be increased significantly.

In summary, we put forward the second hypothesis to be tested.

Hypothesis 2: For real estate rental market, the purchase restriction policy has the externalities which will significantly drive up rent.

The third hypothesis is about the purchase restriction's externalities on land market. The supplier of real estate (that is, developer enterprises) would adjust their supply behaviors at each stage according to the present and future demand in the real estate sales market (Wang and Huang, 2013). Therefore, from the views of market supply and demand, purchase restriction policy would significantly curb the demand in real estate sales market, at the same time, developers as the supply side will react to the policy. When real estate development enterprises observe the obvious drop in the demand

[1] According to papers on purchase restriction policies, the house purchase conditions of non-local registered households are often linked with the local tax payment and social security payment. If no certificate of the above two payments are provided, they are not allowed to purchase house in that city.

of real estate sales market, they will make rational behavioral decisions to reduce the development and supply of real estate so as to avoid possible "oversupply". As residential land is the basic factor input for the "production" of real estate development enterprises, it will further lead to the decline in the demand for residential land market. Under the condition that the supply of residential land market stay unchanged in the short term, the short-term equilibrium price of residential land market will significantly decline. However, as the purchase restriction policy does not have a significant impact on the supply-demand relationship between the industrial land market and the commercial land market, the short-term equilibrium price of the industrial land market and the commercial land market will not change significantly.

In summary, we put forward the third hypothesis to be tested.

Hypothesis 3: For land market, the purchase restriction policy has the externalities on the significant decrease of real estate land price while it has no significant impact on commercial land price and industrial land price.

3. Empirical Strategy and Data Description

3.1. Empirical Strategy

This paper adopts the difference-in-difference model to analyze the changes of house prices, rents and land prices in cities with purchase restriction policies before and after the implementation of such policies in comparison with cities without purchase restriction, as is shown in formula (1).

$$Y_{ijt} = \alpha x_{ijt} + \beta Policy_{jt} + \mu_j + \lambda_t + \varepsilon_{ijt} \tag{1}$$

Among them, the subscript j stands for the district or county where the i transaction information lies in. The subscript t stands for the transaction date (year, month, day); Y_{ijt} is the explanatory variable which stands for the unit price of real estate sales, real estate unit rent and the unit land price of various types of utilization (residential land, industrial land and commercial land) upon transaction; $Policy_{jt}$ is the core explanatory variable. When district or county j implements the purchase restriction policy on the date of t, $Policy_{jt}$ is 1, otherwise is 0. The estimation coefficient β reflects the purchase restriction policy's impact on house price, rent and land price. In addition, other control variables as X_{ijt} is included in this paper with an aim to control other factors' influence on house price. In the meantime, fixed effect μ_j and daily fixed effect λ_t are controlled to capture the heterogenous factors and the common factors that are unable to be observed. And ε_{it} stands for error term. It can be seen that the model is extended to the level of districts, county and daily condition.

Because the house prices, rents and land prices in cities are not only subject to

purchase restriction policies, but also dependent on the socio-economic development condition there, it is necessary to introduce some key control variables to the above empirical models as follows. (1) Other control variables at the city level including per capita GDP, total population, average expenditure, and administration coverage, which are used to depict the economic development, total amount of population, residents' consumption level and the housing supply respectively. (2) Other control variables at the residential level include greening rate and floor area ratio, which are used to control other factors influencing the real estate sales price and rent. (3) Other control variables including land source, way of supply, land scale and the convenience degree of nearby areas, which are used to control other factors influencing the land transfer prices.[1]

3.2. Variable and Data Description

House price and rent data. Housing sales transaction unit price and rental transaction unit price are directly derived from the daily transaction micro-data in the real estate sales and real estate rental market (2005—2013),[2] recorded in the "sofang. com". Similar to real estate sales transaction data, real estate rental transaction data also has four advantages applicable to the analysis of the effect of purchase restriction policies.[3]

Land price data. Residential land transaction unit price, industrial land transaction unit price and commercial land transaction unit price are directly coming from the daily transaction micro-data in the land market (2007—2013). Such data are from the "landchina.com".[4]

Other control variables. The data of control variables at city level are derived from

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[1] Land sources include existing construction land and new construction land; land supply modes involve allocation agreement, bidding, auction and listing and other modes; land grade is from 1-18 level; the convenience of nearby areas are measured by the minimum distance between plot and KFC or Macdonald's. The closer the distance is, the more convenience it is.

[2] The transaction price, residence coverage, community name, transaction date, greening ratio in a community and floor area ratio are recorded in the daily micro transaction data in real estate sales and rental market. Also, the selection of the sampling date is due to that some restricted cities began to ease or cancel the purchase restriction policy since 2014. Therefore, in order to avoid the underestimation of the impact brought by purchase restriction policy, data in 2014 or the upcoming years will not be adopted.

[3] Both real estate sales transaction data and the real estate rental transaction data are from "soufang. com". The transaction information of such two types of data are basically the same, so the advantage of them are similar.

[4] China's land website: http://www.landchina.com/. The public land transaction data are from the *Regulations on the Transfer of State-Owned Land Use Right through Bidding, Auction and Listing (Trial)* implemented since the date of August 1th, 2006. It specifies that the authoritative department at the municipality and county government must publish any land using right transfer plan earlier and make the result of land transfer public. Therefore, we have opportunities to get access to the details of each land transfer result, including the details of district and county government, plot, coverage, land usage, land grade, transfer mode and land transaction price.

the *China Statistical Yearbook for Regional Economy*, *China City Statistical Yearbook* and CEIC database; control variables at the residence level are directly from the real estate sales and rental transaction data at the "soufang.com", which include greening ratio and floor area ratio.

Table 1. Descriptive Statistics

Variable name	Unit	Sample size	Mean value	Standard deviation	Minimum	Maximum
City level data						
House price logarithm	yuan/m^2	2600	7.9674	0.5609	6.5709	10.6961
House price increase	%	2600	11.3898	13.5760	-225.3201	94.3221
Logarithm of GDP per capita	10 thousand yuan	2608	10.0411	0.7268	7.7807	12.1896
Logarithm of expenditure per capita	10 thousand yuan	2563	9.2683	0.3641	8.2399	10.4118
Logarithm of total population	10 thousand people	2611	5.8311	0.7115	2.7973	8.1107
Logarithm of administrative area	km^2	2609	9.1710	0.9798	3.9103	10.2866
Ratio of the secondary industry	%	2608	53.2134	11.8972	8.0696	90.2328
Ratio of the tertiary industry	%	2608	43.5912	10.6753	6.0961	87.0302
Latitude (1999)	—	2611	32.9001	6.6102	18.2501	50.2513
Longitude (1999)	—	2611	114.7602	6.8110	84.8902	131.1614
Average altitude (1999)	m	2611	439.8231	528.0902	1.3020	3120.5115
Average slope (1999)	%	2611	0.7014	0.6721	0.0099	5.0789
Micro-transaction data						
Logarithm of residential sales transaction unit price	yuan/ m^2	907997	9.8830	0.7541	1.9459	20.4666
Logarithm of residential transaction unit rent	yuan/m^2	85947	8.0600	0.5041	7.0901	9.1378
Logarithm of residential use transaction unit price	10 thousand yuan/ hm^2	369669	5.9632	1.2178	3.8067	9.1676
Logarithm of industrial land transaction unit price	10 thousand yuan / hm^2	220917	5.1992	0.6195	3.8067	9.1547
Logarithm of commercial land transaction unit price	10 thousand yuan/hm^2	191819	6.0654	1.1930	3.8067	9.1674
Floor area ratio	—	778745	2.3975	1.2146	0.4000	8.3700
Greening ratio	%	797420	37.45	0.0979	0.1000	70.0000
Convenience degree of nearby areas	km	782405	2.3470	1.4122	0.0031	6.9248

4. Empirical Result

4.1. Effectiveness Analysis of Purchase Restriction Policy

We first evaluated the inhibitory effect of purchase restriction policy on house price based on formula (1). And column (1) and column (2) in Table 2 are the estimated results without and with other control variables. It is can be seen that when other control variables are added in column (2), the house price in areas with purchase restriction is significantly down by 10.12% in comparision with that in non-restricted areas, and the absolute value and significance level of the estimated coefficient are elevated to some degree relative to the results in column (1). So, the purchase restriction policy has the effect of significantly curbing the house price.

Table 2. Purchase Restriction Policy's Impact on Transaction House Prices and Rents

	(1)	(2)	(3)	(4)
	Transaction unit price of residential house sales		Residential transaction unit rent	
Daily purchase restriction in district and county	-0.0919**	-0.1012***	0.2517***	0.2509***
	(0.0462)	(0.0273)	(0.0651)	(0.0752)
County and district fixed effect	yes	yes	yes	yes
Daily fixed effect	yes	yes	yes	yes
Other control variables	no	yes	no	yes
Adjustment of R^2	0.6038	0.6219	0.3317	0.3714
Sample size	907747	719120	106932	73324

Notes: ***, ** and * respectively stand for 1%, 5% and 10% in terms of the significance level. No other control variables are added in column (1) and column (3); in column (2) and (4), other control variables come from city and residence level; in parenthesis are the clustering robust standard errors of districts and counties; the district and county fixed effect and daily fixed effect are controlled.

4.2. Externalities Analysis of Purchase Restriction Policy

Real estate rental market. First, this paper examines the externality effect of the purchase restriction policy on the real estate leasing market. The column (3) and (4) in Table 2 respectively lists the regression results without and with other control variables. On the basis of adding other control variables in column (4), the influence coefficient of the purchase restriction policy remains positive, and the absolute value of the influence coefficient increases to a certain extent. Viewed from the impact degree, the rent in purchase-restricted areas rises significantly by 25.09% in comparision with non-purchase-restricted areas. This can be explained that many people will "seek to rent instead of purchase" to satisfy their housing demands, which will increase the rental demands in real estate rental market. And given that the rental supply remains

stable, the supply-demand relation will change in rental market and drive up the rent. Therefore, the purchase restriction policy exerts side effect on the actual rigid demand for housing besides curbing the speculative demand for real estate investment.

Land market. Next is the externalities of purchase restriction policy on the land market. According to the empirical results shown in Table 3, the odd column is the regression results without other control variables included in the regression, and the even column is the regression results with adding other control variables included in the regression. The regression result in column (2) indicates that the purchase restriction policy gives rise to the significant decline of the transaction price of residential land. And in the view of impact degree, the residential land price in purchase-restricted areas is significantly down by 9.08% in comparison with those areas without purchase restriction. However, the regression results in column (4) and (6) show that the purchase restriction policy has no significant impact on the price of industrial and commercial land. Based on the above analysis, the reason may be that the policy effect of purchase restriction is transmitted from the real estate sales market to the residential land market. The low house price makes the real estate developers' demand for residential land drops, which results in the decline of residential land price when the supply of urban residential land is relatively stable.

Table 3. Purchase Restriction Policy's Impact on Land Price

	(1)	(2)	(3)	(4)	(5)	(6)
	Residential land transaction unit price		Industrial land transaction unit price		Commercial land transaction unit price	
Daily purchase restriction in district or county	-0.0820***	-0.0908***	-0.0072*	-0.0058	-0.0448	0.0000
	(0.0335)	(0.0300)	(0.0041)	(0.0179)	(0.0385)	(0.0361)
County or district fixed effect	yes	yes	yes	yes	yes	yes
Daily fixed effect	yes	yes	yes	yes	yes	yes
Other control variables	no	yes	no	yes	no	yes
Adjustment of R^2	0.4959	0.6326	0.4501	0.6396	0.3197	0.4902
Sample size	369658	369658	220888	220888	191796	191796

Notes: ***, ** and * stand for the significance level as 1%, 5% and 10% respectively. No other control variables are added in column (1), (3) and (5); in column (2), (4) and (6), other control variables come from city and plot level; in parenthesis are clustering robust standard errors of districts and counties; the district and county fixed effect and daily fixed effect are controlled.

5. Robustness Test

5.1. Parallel Trend Hypothesis Test and Dynamic Time Trend

Based on the difference-in-difference model test above, the purchase restriction

policy could significantly pull down the house price and exert a series of externalities, which causes the rent in real estate rental market to rise significantly and the real estate land price in land market to drop significantly. One of the key conditions to support the difference-in-difference model is the hypothesis of "parallel trend" (Besley and Case, 2000). In order to study this question, this paper adds some dummy variables before and after the implementation of purchase restriction. To be specific, we take one month as a unit and add some new dummies including the third month before the implementation of purchase restriction as *pre 3*, the second month before the policy implementation as *pre 2* and also *pre 1*; the current month of the implementation of purchase restriction as *post 0*, the first month following the implementation as *post 1*, along with *post 2* and *post 3* and other dummy variables. All of these are added into the regression equation. The period before-acts as the benchmark group.

Table 4 illustrates the results of regression. The column (1)~(3) show the regression result concerning house price, rent and residence land price. It is obvious that prior to the implementation of purchase restriction policy, the house price, rent and the residence land price don't drop significantly in comparision with that of control group, which is in line with the hypothesis of "parallel trend" in the difference-in-difference model. Besides, following the implementation of the purchase restriction policy, the change of the two groups of samples began to show significant differences. The house price and residence land price in the treatment group drops significantly relative to that in the control group, and the rent in the treatment group rises significantly in comparision with that in the control group. Such trend is continuous to some extent. In column (4)~(5), based on the regression result of industrial land price and commercial land price, no significant differences occur before and after the implementation of the purchase restriction policy by both control and treatment group, indicating that such policy brings no significant external influence on industrial land price and commercial land price. The above empirical results verify the robustness of the major conclusions in this paper.

Table 4. Parallel Trend Hypothesis Test and Dynamic Time Trend

	(1)	(2)	(3)	(4)	(5)
	Residence sale transaction unit price	Residence transaction unit rent	Residence land transaction unit price	Industrial land transaction unit price	Commercial land transaction unit price
pre3	0.0257•	-0.0929	-0.0714	0.0013	0.0024
	(0.0139)	(0.0572)	(0.0229)	(0.0169)	(0.0311)
pre2	0.0254•	0.0813	-0.0709	-0.0020	0.0019
	(0.0153)	(0.0599)	(0.0395)	(0.0184)	(0.0334)
pre1	0.0232	0.1017	-0.0624	-0.0017	0.0018
	(0.0220)	(0.0632)	(0.0431)	(0.0176)	(0.0392)

	(1) Residence sale transaction unit price	(2) Residence transaction unit rent	(3) Residence land transaction unit price	(4) Industrial land transaction unit price	(5) Commercial land transaction unit price
post0	-0.0901** (0.0355)	0.2014** (0.0790)	-0.0882*** (0.0200)	-0.0078 (0.0186)	0.0011 (0.0378)
post1	-0.1024*** (0.0288)	0.2327*** (0.0725)	-0.0808*** (0.0234)	-0.0091 (0.0175)	0.0022 (0.0404)
post2	-0.1013*** (0.0296)	0.2520*** (0.0708)	-0.0775*** (0.0278)	-0.0077 (0.0184)	0.0017 (0.0332)
post3	-0.0930** (0.0381)	0.1905** (0.0783)	-0.0896*** (0.0344)	-0.0083 (0.0189)	0.0026 (0.0384)
Fixed effect in district and county	yes	yes	yes	yes	yes
Monthly fixed effect	yes	yes	yes	yes	yes
Other control variables	yes	yes	yes	yes	yes
Adjustment of R^2	0.6220	0.3719	0.6331	0.6427	0.4964
Sample size	719120	73324	369658	220888	191796

Notes: ***, ** and * stand for the significance level as 1%, 5% and 10% respectively. In column (1) and (2), other control variables are at city and residence level; in column (3)~(5), other control variables are at city and plot level. In column (1)~(5), values in parenthesis are clustering robust standard errors of districts and counties; the district and county fixed effect and daily fixed effect are controlled.

5.2. PSM-DID Method

In order to further guarantee the reliability of core conclusions, Propensity Score Matching (PSM) is used to select a suitable control group for treatment groups.[1] It is pivotal to select appropriate pre-treatment variables for match analysis. There are three types of match variables herein. Firstly, main factors which will influence the implementation of purchase restriction policy, namely house price and its growth.[2] Secondly, other factors which may simultaneously affect the demand for house purchase and house price, rent and land price and other explained variables such as per capita GDP, industrial structure, population size, per capita income level and administrative area. Thirdly, geographical factors are used for controlling the climate

[1] Due to the shortage of match variables at the district and county level, we chose to do PSM at the city level.

[2] According to the *Notice on the General Office of the State Council on further Improving the Regulation and Control of the Real Estate Market*, "All provincial capitals in municipalities directly under the central government and cities with excessively high or excessively rapid house prices shall, within a certain period of time, strictly formulate and implement measures to restrict the purchase of housing". Therefore, The residence price, growth of house price and the administrative level of municipalities directly under the central government, are the three most important foundations for the implementation of the purchase restriction, but the purchase restriction list has basically included all cities listed separately under the central government and provincial capitals.

condition and livability degree of cities and factors as city construction land plan involving geographical location and landform.[1] The parallel conditional hypothesis test results of matched samples reflect that the parallel conditional hypothesis of PSM is basically satisfied.[2] Upon completion of the above match, the original 46 treatment group cities are reserved and a total of 159 control group cities are selected to match with them.

Table 5 shows the empirical result of the effect of purchase restriction policy estimated by PSM method. According to the result by difference-in-difference estimation after PSM match. (1) The house prices in purchase-restricted cities are significantly down by 11.29% in comparision with non-purchase-restricted cities. Comparied with the estimation coefficient as 10.12% without PSM match during benchmark regression, the estimation coefficient is increased to some extent. Therefore, the self-selection issue fails to affect the benchmark regression result in terms of the purchase restriction effectiveness, instead, it intensifies the effectiveness; (2) The rents and residence land prices in purchased restricted cities are significantly increased by 23.07% and decreased by 8.70% in comparision with the non-purchase restricted cities. However, the industrial and commercial land prices will not have significant changes, which is basically consistent with the estimation coefficient in the benchmark regression result. As the above mentioned, PSM-DID result shows that the conclusion in this paper is robust enough.

Table 5. PSM-DID Regression Result

	(1)	(2)	(3)	(4)	(5)
	Residence sales transaction unit price	Residence transaction unit rental fee	Residence land transaction unit price	Industrial land transaction unit price	Commercial land transaction unit price
City daily purchase restriction	-0.1129***	0.2307***	-0.0870***	-0.0035	0.0023
	(0.0250)	(0.0652)	(0.0431)	(0.0162)	(0.0669)
City fixed effect	yes	yes	yes	yes	yes
Daily fixed effect	yes	yes	yes	yes	yes
Other control variables	yes	yes	yes	yes	yes

[1] Among them, the geographical location is measured by the latitude and longitude of the control city's geographical center of mass, and the terrain is measured by the average altitude and slope of the city. Of the above match variables, the economic variables at the city level are derived from the *China City Statistical Yearbook*. The data of urban longitude, latitude, elevation and slope variables in the geographic information variable are based on the Chinese Digital Elevation Model (DEM) offered by Google Earth and extracted by Arcgis software.

[2] Due to the space limitation, parallel condition hypothesis test result of match variables are not include in the main text, but are retained on request.

	(1) Residence sales transaction unit price	(2) Residence transaction unit rental fee	(3) Residence land transaction unit price	(4) Industrial land transaction unit price	(5) Commercial land transaction unit price
Adjustment of R^2	0.7195	0.4016	0.7023	0.7810	0.5402
Sample size	590177	47624	240569	143782	122785

Notes: ***, ** and * stand for the significance level as 1%, 5% and 10% respectively. In column (1) and (2), other control variables come from city and residence level; in column (3)~(5), other control variables come from city and plot level. In column (1)~(5), in parenthesis are clustering robust standard errors of districts and counties; the district and county fixed effect and daily fixed effect are controlled.

5.3. Policy Spill-over Effect Test

When the policy intervention has an impact on the treatment group, it may also produce spill-over effect on individuals from the control group. Then, estimation bias may be caused with the trend of the control group as the basis of the counterfactual trend of the treatment group. In this paper, implementing the purchase restriction policy in a city will affect the real estate market in the neighbor cities: it is possible that the purchase restriction policy will produce the transfer of market demand between regions, resulting in the rise of house prices in non-purchase restricted cities, thus underestimating the effect of the purchase restriction on house prices. This cannot influence the major conclusions in this paper, but makes the conlusions further consolidated; it is also possible that affected by the purchase restriction policies in nearby cities, house buyers in non-purchase restricted areas expect the decline of house price, which will lead to the reduction of the demand in real estate market along with the house price decrease. Hence, it may overestimate the effectiveness of the policy in curbing house prices and thus seriously threaten the major conclusions of this paper.

To this end, we identify the non-purchase restricted cities geographically next to (sharing the common boundary) the 46 purchase-restricted cities by using the software of Arcgis. They are excluded from the regression samples and tests are repeated. Results show that, the curbing effect of the purchase restriction policy on the house price is not disturbed by the spillover effect of the policy, and the benchmark regression result remains robust. As a matter of fact, according to the study by Zhang *et al.* (2018), the purchase restriction policy causes the trans-regional transfer of the real estate market demand and drive up the house price in the non-purchase restriction cities, which supports the major conclusions of this paper.

5.4. Implementation Status of the Humanely and Randomly Generated Purchase Restriction Policy

For purpose of examining the extent to which the omitted variables in the benchmark regression affected the regression results, this paper randomly assignes the implementation status of the purchase restriction policies in each district and county (Chetty *et al.*, 2009; Ferrara *et al.*, 2012; Li *et al.*, 2016). Given the process of generating the above random data, the artificially constructed dummy variables of the purchase restriction policy should not yield estimates significantly different from zero. The result shows that in the regression of house price, rent and land price for commercial and residential use, the influence coefficients obtained from randomly designated purchase restricted areas and counties are concentrated around zero, which further verifies the reliability of the main conclusions of this paper.[1]

6. Heterogeneity Test

6.1. Three Regions

In order to study the purchase restriction policy's impact differences in various regions, we divide the samples into east region, central region and west region. Table 6 lists the regression result by regions. According to the regression result in column (1), in real estate sales market, the purchase restriction policy has significant inhibitory effect on house price in eastern region. Based on the regression result in column (2)~(3), purchase restriction policy exerts more significant externalities on rent and residence land price in eastern region, extending to real estate rental market and land market. The regression results in column (4)~(5) match with the benchmark regression result in this paper, an indication that the purchase restriction policy doesn't have significant impact on industrial land price and commercial land price and no obvious regional differences exist. The above heterogeneity analysis results are reflected in both significance level and absolute value of the influence coefficient.

The are two possible reasons. (1) Obvious regional differences exist in terms of the implementation extent of policy. Although the purchase restriction policy is implemented in all places, the policy is more strictly enforced in eastern region than the central and western region, so the purchase restriction policy will have a more obvious impact on the relevant market areas in eastern region. (2) The degree of marketization has obvious trans-regional differences. The degree of marketization in the eastern region is much higher than that in central and western regions and the mechanism that market relation determines price is complete (Wang *et al.*, 2017),

[1] Picture of three placebo tests are retained on request.

involving the three types of markets underscored in this paper. Therefore, although the purchase restriction policy has an impact on the market supply and demand in central, eastern and western region, compared with the central and western region, the house price, rent and residential land price in east region have more obvious changes due to the externalities of the purchase restriction policy.

Table 6. Regression Result of Three Regions

	(1) residence sales transaction unit price	(2) residence rental transaction unit price	(3) residence land transaction unit price	(4) industrial land transaction unit price	(5) commercial land transaction unit price
Eastern region	-0.1041***	0.2529***	-0.0913**	-0.0044	0.0039
	(0.0365)	(0.0904)	(0.0527)	(0.0360)	(0.0581)
Central region	-0.0902**	0.1917***	-0.0610**	-0.0030	0.0024
	(0.0523)	(0.0709)	(0.0307)	(0.0960)	(0.0690)
Western region	-0.0880**	0.1729*	-0.0609*	0.0049	0.0113
	(0.0441)	(0.0920)	(0.0367)	(0.0563)	(0.0799)

Notes: ***, ** and * stand for the significance level as 1%, 5% and 10% respectively. In column (1) and (2), other control variables come from city and residence level; in column (3)~(5), other control variables are at city and plot level. In column (1)~(5), values in parenthesis are clustering robust standard errors of districts and counties; the district and county fixed effect and daily fixed effect are controlled.

6.2. Land Transfer Method

At present, there are many land transfer methods such as agreement, bidding, listing and auction in the land transaction market. Different land transfer methods varied a lot in terms of the marketization degree (Tao *et al.*, 2009; Yang *et al.*, 2014).[1] Therefore, it is necessary to categorize them into multiple sub-samples and test the externalities on residence land price exerted by purchase restriction policy. Table 7 offers the regression results accordingly. It is clear from the column (1) that excluding the very few samples of non-market transfers through appropriation and lease, the estimation result is basically in line with the benchmark regression result in this paper. Namely, the purchase restriction policy has a significantly negative effect on the residence land price. We further divide the samples into agreement transfer and transfer by "bidding, auction and listing" for regression. It is noticeable from the results in column (2) and (3) that from the view of significance level or coefficient absolute value, the purchase

[1] In order to improve and standardize the land transfer system, the State Council specified that the land transfer may adopt agreement, bidding and auction as the land transfer methods and specified the procedures accordingly in the *Interim Regulations on the Grant and Transfer of State-Owned Land Use Rights in Cities and Towns* in 1990. In May 2002, the listing method was incorporated into the public land transfer in the *Provisions on the Grant of State-Owned Land Use Right through Bidding, Auction and Listing*.

restriction policy has more significant impact on resident land transfer price by "bidding, auction and listing" than that by agreed residence land transfer price. In addition, according to column (4)~(6), in spite of the significant decline in the land transfer price "bidding, auction and listing" to some degree, from the view of estimation coefficient's significance and the absolute value, the purchase restriction policy has a significant effect on the bidding and auction of the residence transfer price, yet a limited impact on the listed residence land price.[1]

Table 7. Land Price Regression Result based on Different Land Transfer Methods

	(1)	(2)	(3)	(4)	(5)	(6)
	residence land transaction unit price					
	Excluding transfer by appropriation and rental	Agreement transfer	Transfer via bidding, auction and listing	Bidding transfer	Auction transfer	Listing transfer
district and county Purchase restriction	-0.0912*** (0.0291)	-0.0744* (0.0327)	-0.0917*** (0.0320)	-0.0935** (0.0292)	-0.0928*** (0.0321)	-0.0668* (0.0372)
District and county fixed effect	yes	yes	yes	yes	yes	yes
Daily fixed effect	yes	yes	yes	yes	yes	yes
Other control variables	yes	yes	yes	yes	yes	yes
Adjustment of R^2	0.6430	0.5335	0.5186	0.7798	0.5223	0.5261
Sample size	362633	194458	167915	3662	41062	123191

Notes: ***, ** and * stand for the significance level as 1%, 5% and 10% respectively. In column (1)~(6), other control variables are at the city and plot level. Values in parenthesis are clustering robust standard errors of districts and counties; the district and county fixed effect and daily fixed effect are controlled.

An important explanation is that, in the process of agreement transfer, the local government and specific land using party negotiate with each other and jointly set the land transaction price together with other conditions. Local government enjoys absolute right of controlling the land users and land price, making it difficult to reflect the supply-demand relation in the land market by agreed land transfer price. As the relatively complete and marketized transfer method, the price of land transfer by "bidding, auction and listing" is mainly determined by the market (Zhao and Yang, 2015). When purchase restriction policy brings about the externalities on and leads to the drop in demand in the residence land market in comparision with the supply, the transfer price of residence land via "bidding, auction and listing" may go down significantly. But even if we use such method, the transfer price by listing may be

[1] Based on the benchmark regression result, the home purchase restriction policy only has significant influence on residence land price but no significant influence on industrial land price and commercial land price.

subject more to the government administrative interference in comparison with bidding and auction, and may be more difficult to be adjusted according to the supply-demand changes in land market. Therefore, purchase restriction policy only exerts limited externalities on the transfer price by listing. As some studies indicate, listing transfer in disguised form has acted as a tool for local governments to select land-use objects for targeted land transfer. (Cai *et al.*, 2013; Wang and Yang, 2016).

7. Conclusion and Policy Implication

How to curb the continuous and rapid rise of real estate prices by way of macro-control policies is an important issue which urgently needs to be discussed and solved in China. As one of the most important real estate regulation methods in the recent period and at the current stage, can purchase restriction policies significantly curb the rising house price? Besides, does purchase restriction policy exert externalities on other key markets and fields—real estate rental market and land market? A comprehensive assessment of the effectiveness and externalities of the purchase restriction policy is instrumental in optimizing policy measures to further stabilize the real estate market.

First, we need to look at the policy effectiveness of the purchase restriction policy. As the result indicates, the purchase restriction policy significantly curbs the house price. And the influence on house price is bigger than the estimated result from previous studies, meaning that the effectiveness of the purchase restriction policy is significantly underestimated. Second, we should notice the externalities of the purchase restriction policy. This paper uses two kinds of micro-transaction data on real estate rental and land to incorporate the connection between real estate sales and real estate rental, land market into the empirical analysis framework, which compensates for the shortage of the existing studies. According to the results, the purchase restriction policy has important externalities on other markets and fields apart from the real estate sales market. Firstly, for the real estate rental market, purchase restriction policy has driven up the rental fees significantly. Secondly, purchase restriction policy has led to the decrease of residence land price, yet exert no significant influence on industrial land and commercial land. In addition, this paper conducts heterogeneous analysis from two dimensions. Firstly, as for three major aspects including house price, rent and residence land price, the purchase restriction policy has higher effects on eastern region instead of the central and western region. Secondly, in terms of the land transfer method, purchase restriction policy has more influence on the transfer price of residence by "bidding, auction and listing", especially that of the residence land by bidding and auction.

The following implications are concluded based on the facts and the empirical analysis result herein. First, the control and regulation effect of the purchase restriction policy on house price is not clear in the mid-and-long term. When the policy influence

is extended to land market, the land market demand with the real estate developers as the subject will be significantly decreased, thus bringing negative impact on land financial revenue of different cities. Despite that the central government has issued a series of macro-control measures of real estate market involving the purchase restriction policy, in order to avoid the huge financial burden arising from it, the local government may adopt ways such as negative response or "soft resistance". In reality, it is a more likely to ease or unlock the house purchase restriction the land finance in cities which rely more on land finance. So, strengthening the development of local taxation system and creating new financial sources for local governments is the key to solving this problem. Second, the most fundamental is to adhere to the land supply side reform. As an essential measure to curb the excessively rapid rise of house price from the demand side, the purchase restriction policy has certain positive significance in the short term by restraining the speculative demand of real estate investment. But if we only conduct reform from the demand side and not try to find the rooted cause from supply side, it is easy to get trapped in the circulation of "price rise-purchase restriction-restriction release-rebound", and also difficult to achieve the control and regulation positioning of restricting the house purchase speculative demand. Therefore, while performing purchase restriction from the perspective of demand, it is necessary to deepen the reform of land and real estate from supply side, and find solutions to the difficulty of control and regulation of the real estate market in the mid-and long-term.

References

Besley, T., & Case, A. (2000). Unnatural Experiments? Estimating the Incidence of Endogenous Policies. *Economic Journal*, 110 (467), 672-694.

Cai, H., Henderson, J. V., & Zhang, Q. (2013). China's Land Market Auctions: Evidence of Corruption? *Rand Journal of Economics*, 44 (3), 488-521.

Chetty, R., Looney, A., & Kroft, K. (2009). Salience and Taxation: Theory and Evidence. *American Economic Review*, 99(4), 1145-1177.

Deng, B., Li, Z., & Zhang, H. (2014). Is Home Purchase Restriction Policy Effective for House Price Control. *Statistical Research (Tongji Yanjiu)*, 11, 50-57.

Du, X., Huang, Z., & Wu, C. (2009). Study on the Relation between Real Estate Price, Local Public Expenditure and Real Estate Taxation—Theoretical Analysis and the Empirical Test Based on China's Data. *The Journal of Quantitative & Technical Economics (Shuliang Jingji Yu Jishu Jingji Yanjiu)*, 1, 109-118.

Fan, Z. (2016). Divorce for Sake of Home Purchase—Study Based on Home Purchase Restriction Policy. *World Economic Papers (Shijie Jingji Wenhui)*, 4, 1-17.

Ferrara, E. L., Chong, A., & Duryea, S. (2012). Soap Operas and Fertility: Evidence from Brazil. *American Economic Journal Applied Economics*, 4(4), 1-31.

Han, Y., Huang, L., & Zou, J. (2014). Research on the Effect of Real Estate's "Home Purchase Restriction Policy". *Economic Management Journal*, 4, 160-170.

Li, P., Lu, Y., & Wang, J. (2016). Does flattening Government Improve Economic Performance? Evidence from China. *Journal of Development Economics*, 123, 18-37.

Liu, J., Zhang, B., & Huang, Z. (2012). Home Purchase Restriction Policy and the Dynamic Change of Home Price. *Economic Perspectives (Jingjixue Dongtai)*, 3, 47-54.

Liu, J., & Fan, Z. (2013). Effect Evaluation on China's Property Tax Trials: Research Based on Synthetic Control Method. *The Journal of World Economy (Shijie Jingji)*, 11, 117-135.

Qiao, K. (2012). Is Home Purchase Restriction Working? — Evidence from Seventy Large and Medium-Sized Cities in China. *Research on Economics and Management (Jingji Yu Guanli Yanjiu)*, 12, 25-34.

Tang, Y., & Liang, R. (2016). Home Purchase Restriction Cannot Control Home Price—Explanation from the Marriage Market. *Economic Perspectives (Jingjixue Dongtai)*, 11, 47-58.

Tao, R., Lu, X., Su, F., & W, H. (2019). China's Shift under the Changes of Regional Competition Landscape: Financial Incentives and Development Mode Reflection. *Economic Research Journal (Jingji Yanjiu)*, 7, 21-33.

Wang, M., & Huang, Y. (2013). Home Purchase Restriction and Property Tax's Impact on Home Price: Analysis Based on Long-Term Dynamic Equilibrium. *The Journal of World Economy (Shijie Jingji)*, 1, 141-159.

Wang, X. (2017). Report on China's Market Index by Province, Social Sciences Academic Press, China.

Wang, Y., & Yang, G. (2016). Interference for Economic Growth: Analysis on Local Governments' Land Transfer Strategy. *Management World (Guanli Shijie)*, 5, 18-31.

Wu, J., Deng, Y., & Liu, H. (2014). House Price Index Construction in the Nascent Housing Market: The Case of China. *Journal of Real Estate Finance & Economics*, 48 (3), 522-545.

Yang, Q., Zhang, P., & Yang, J. (2014). Industrial Land Transfer and Investment Quality Bottomline Competition—Empirical Study Based on China's Prefecture-Level Cities between 2007 and 2011. *Management World (Guanli Shijie)*, 11, 24-34.

Yu, Y., & Zhang, Sh. (2017). Urban Home Price, Home Restriction and Technological Innovation. *China Industrial Economics (Zhongguo Gongye Jingji)*, 6, 100-118.

Zhang, D., & Zheng, X. (2013). Is the "Home Purchase Restriction Policy" the Effective Policy Tool for Curbing the Rise of Home Price? —Empirical Study

Based on Seventy Large and Medium-Sized Cities. *The Journal of Quantitative & Technical Economics (Shuliang Jingji Yu Jishu Jingji Yanjiu)*, 11, 56-72.

Zhang, Q., Su, G., & Liang, R. (2018). Is it Effective to Curb the Rise of Home Price by Increasing Land Supply—Quasi-Experiment Research by Way of "Revoking Counties and Setting Up Districts". *Finance & Trade Economics (Caimao Jingji)*, 4, 22-36.

Zhao, W., & Yang, J. (2015). Financial Gap and Land Transfer Method in Local Governments—Explanation Based on the Behaviors of Mutual Benefit between Local Governments and State-Owned Enterprises. *Management World (Guanli Shijie)*, 4, 11-24.

Zheng, S., Han, G., & Shi, G. (2016). Home Purchase Restriction's Impact on Corporate Default Risk. *The Journal of World Economy (Shijie Jingji)*, 10, 150-173.

Zhu, G., & Yan, S (2013). Is It Possible for "Residents Owning their Houses" via New Control and Regulation Measures in Real Estate Market? —Empirical Analysis on Dynamic General Equilibrium. *China Economic Quarterly (Jingjixue Jikan)*, 4, 103-126.

Land Finance, Corporate Leverage and Debt Risk

Bin Zhou, Cai Zhou*

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.

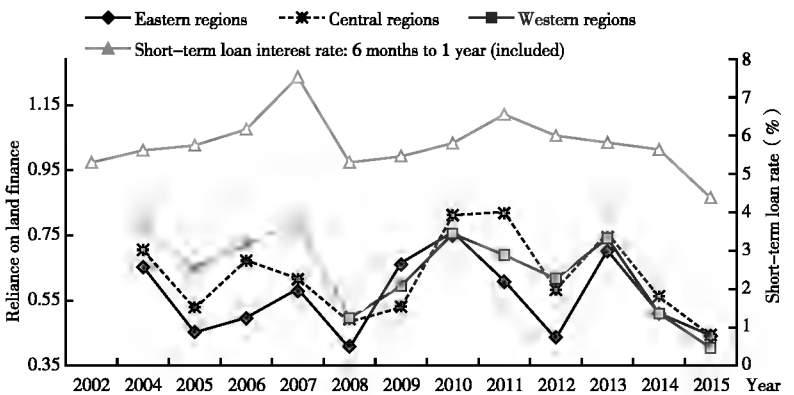

Figure 1. Urban Reliance on Land Finance and Short-Term Loan Rate

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.

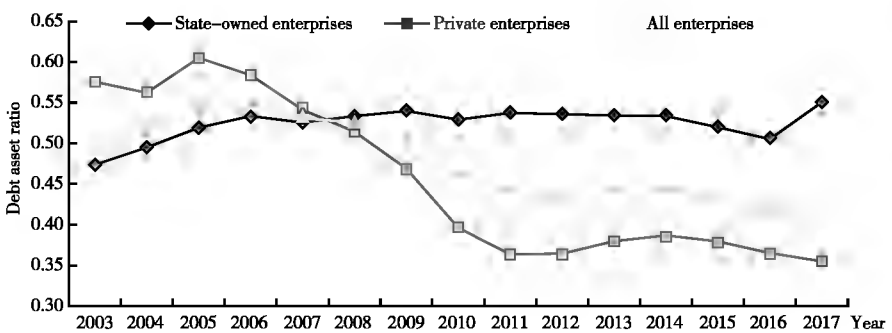

Figure 2. Debt Asset Ratio of Non-Financial Listed Companies

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.

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

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) *disdebt*	(6)
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.

References

Baron, R. M., & Kenny, D. A. (1986). The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic and Statistical Considerations. *Journal of Personality and Social Psychology,* 51 (6), 1173-1182.

Campello, M. (2006). Debt Financing: Does It Boost or Hurt Firm Performance in Product Markets? *Journal of Financial Economics*, 82 (1), 135-172.

Caskey, J., Hughes, J., & Liu, J. (2012). Leverage, Excess Leverage, and Future Returns. *Review of Accounting Studies,*17 (2), 443-471.

Chang, C., Chen, X., & Liao, G. (2014). What Are the Reliably Important Determinants of Capital Structure in China? *Pacific-Basin Finance Journal*, 30, 87-113.

Demirci, I., Huang, J., & Sialm, C. (2017). Government Debt and Corporate Leverage: International Evidence. National Bureau of Economic Research Working Paper.

Fan, Z. Y. (2015). The Root of Land Finance: Financial Pressure or Investment Impulse. *China's Industrial Economics (Zhongguo Gongye Jingji)*, 6, 18-31.

Farhi, E., & Tirole, J. (2011). Bubbly Liquidity. *The Review of Economic Studies,* 79 (2), 678-706.

Gou, Q., Huang, Y. P., & Liu, X. G. (2014). Is There Really Ownership Discrimination in Bank Credit Allocation? *Management World (Guanli Shijie)*, 1, 16-26.

He, Y., & Man, Y. Y. (2012). Risk Control of Local Government Debt Financing. *Finance & Trade Economics (Caimao Jingji)*, 5, 45-50.

Jiang, F. X., & Huang, J. C. (2011). Manager Incentive, Debt and Enterprise Value. *Economic Research Journal (Jingji Yanjiu)*, 5, 46-60.

Lu, H. Y., Yuan, G. P., Chen, S. L., & Lu, S. F. (2011). The Source of Land Finance: Competitive Impulse or Desperate Try? *Comparative Economic & Social Systems*

(Jingji Shehui Tizhi Bijiao), 1, 88-98.

Lu, Z. F., He, J., & Dou, H. (2015). Which Are More Over-Indebted: State-Owned or Non-State-Owned Enterprises? *Economic Research Journal (Jingji Yanjiu)*, 12, 54-67.

Mei, D. Z., Cui, X.Y., & Wu, Y. (2018). House Price Change, Land Finance and China's Economic Fluctuation. *Economic Research Journal (Jingji Yanjiu)*, 1, 35-49.

Ru, H. (2018). Government Credit, a Double-Edged Sword: Evidence from the China Development Bank. *The Journal of Finance*, 73 (1), 275-316.

Shao, C. D., Su, D. N., & Deng, H. T. (2016). House Price, Land Finance and Urban Agglomeration Characteristics: The Path of Chinese Urban Development. *Management World (Guanli Shijie)*, 2, 19-31.

Sheng, D., & Wang, Y. J. (2013). Industrial Agglomeration, Efficiency of Credit Resource Allocation and Financing Cost of Enterprises. *Management World (Guanli Shijie)*, 6, 85-98.

Sun, X. L., & Zhou, F. Z. (2013). Land Finance and Tax Sharing: An Empirical Explanation. *Social Sciences in China (Zhongguo Shehui Kexue)*, 4, 40-59.

Uysal, V. B. (2011). Deviation from the Target Capital Structure and Acquisition Choices. *Journal of Financial Economics,* 102(3), 602-620.

Wang, H. J., Yang, Z., Ruan, G. M., & Cao, Y. Q. (2018). Relaxation of Interest Rate Control, Excessive Indebtedness and Debt Maturity Structure. *Journal of Financial Research (Jinrong Yanjiu)*, 2, 100-117.

Wang, Y. Q., Gao, X., Yuan, Z. G., & Du, J. L. (2016). Financial Development, Asset Bubbles and the Real Economy: A Literature Review. *Journal of Financial Research (Jinrong Yanjiu)*, 5, 191-206.

Yang, J. D., Yang, Q. J., & Liu, K. (2018). Land Finance and Debt Growth: An Empirical Study Based on Prefecture-Level City Panel Data. *Finance & Trade Economics (Caimao Jingji)*, 2, 52-62.

Yang, J. D., Zhao, W. Z., & Liu, K. (2016). Stimulus Plan, State-Owned Enterprise Channels and Land Transfer.*China EconomicQuarterly (Jingjixue Jikan)*, 3, 1225-1252.

Zhang, L., Gao, Y. H., & Xu, X. X. (2013). Land Transfer under the Collusion of the Enterprises. *Management World (Guanli Shijie)*, 12, 43-51.

Zhang, P., & Liu, X. H. (2011). Urbanization, Fiscal Expansion and Economic Growth. *Economic Research Journal (Jingji Yanjiu)*, 11, 4-20.

Zhao, Y. J. (2014). Land Finance: History, Logic and Choice. *Urban Development Studies (Chengshi Fazhan Yanjiu)*, 1, 1-13.

Zhong, N. H., Liu, Z. K., He, J. X., & Su, C. L. (2016). Structural Problems of Corporate Debt in China. *Economic Research Journal (Jingji Yanjiu)*, 7, 102-117.

Zhou, Q., Tan, K. J. K., & Faff, R. (2016). Deviation from Target Capital Structure, Cost of Equity and Speed of Adjustment. *Journal of Corporate Finance*, 39, 99-120.

Is the Influence of Chinese Local Government Act on Tourism Efficiency Positive?

Panpan Sun*

In China, local governments play a very important role in the development of the tourism industry. Local governments appear to have a positive effect on the development of tourism because of the fact that the tourism industry output has improved for more than a decade. Many researchers have studied the relationship between government and tourism development. However, the existing studies were limited to qualitative discussion and there is still no relatively scientific quantitative analysis which can prove whether the impact is positive or not. Therefore, the purpose of this paper is to verify whether the impacts of Chinese local government act on the tourism industry are positive or negative from the perspective of efficiency. To achieve this aim, this paper binned a quantitative model of local government act, data envelopment analysis and spatial statistics together in a creative way, measured tourism industry efficiency with and without the influence of local government act and compared the changes in results and their spatial patterns and spatial interactions. On the basis of these analyses, the author found that positive impacts as a result of the local government act on efficiency in the tourism industry do exist.

Keywords: tourism efficiency, local government act, impacts, China

1. Introduction and Literature Review

Government is one of the most important stakeholders with a major role in tourism development (Bachmann, 1988). The tourism industry involves many sectors and stakeholders, and governments must take responsibility for building the social policies and legal systems needed to support tourism (Jenkins and Henry, 1982; Gunn, 1988; Hughes, 1994; Akama, 2002). In addition, tourism market mechanisms possess features that can be dealt with by governments, such as public goods, external effect, information asymmetry and monopolistic competition (Wang, 2005; Wei and Zhu, 2005). In developing countries, these factors as well as the low regional economic development and economic effects of the tourism industry (Balaguer and Cantavella-Jordá, 2002) are common reasons for governments to act within the tourism industry.

In China, the government is closely related to tourism industry development because

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of the country's unique national conditions. During the mid-1990s, a strategy mode called government-led tourism development was established in China. Government intervention in development of the tourism industry became explicit and rational, and the government's fields of participation have continuously expanded. The methods of government intervention have continued to diversify and the level of intervention has gradually increased. Government activities have permeated the tourism industry and have had a natural and inevitable influence on the scale and quality of tourism industry development in China.

Nowdays, tourism is a strategic industry and will develop into a strategic pillar industry of the national economy and a modern service industry that the people are more statisfied with. Tourism has become a powerful industry that is leading development of the national economy, with the increasingly important and positive roles of maintaining growth, expanding domestic demand, adjusting industrial structure and promoting employment. However, there is a common reality that cannot be ignored; the tourism industry in China is large but not strong. In other words, Chinese tourism possesses quantity on a large scale but lacks quality and efficiency. The tourism industry urgently needs transformation and upgrading, as well as improvement of its quality and efficiency. Much remains to be achieved before China can reach its goal to be a nation with a robust tourism industry. Hence, the question arises of what exactly is the effect of the Chinese government act on tourism industry development and is it positive or negative.

All existing studies agree that the government's act has a dual effect on development of the tourism industry. On one hand, the fact that the acts of government described above have positive impacts on the tourism industry is beyond doubt. For example, the government can coordinate different interest groups and tourism resources (Chien and Law, 2003; Henderson, 2003); establish an operating environment that is conducive to the tourism industry (Akama, 2002); and guarantee that sustainable measures be applied by tourism operators, with the environment, social costs and benefits in mind (Hunter and Green, 1995; Bramwell and Alletorp, 2001; Oracion, 2007). The government can also promote the capacity to supply tourism and the overall national tourism image (Hao, 2001); solve problems of externalities, information asymmetry and public goods in the tourism industry and ensure social fairness and stability in the referent fields (Wang, 2005); and speed up the accumulation of tourism human capital (Miu and Wang, 2002; Liu *et al.*, 2009). On the other hand, most scholars believe that the limitations of governments and some improper acts have had negative effects on the development of tourism (Burns, 1999). In China, these negative effects have mainly been expressed as unclear property rights, unfair competition, imbalance of tourism supply and demand, resource waste and environmental destruction, poor management of tourism enterprises and low economic benefits, among others. (Zhang, 2002). Some causes of these negative effects include the government's pursuit of

maximum economic benefit; preoccupation with too many things within the tourism industry; and its short-term leadership, administrative procedures and decentralized organization (Guo, 2006). Other causes are governments' functional absence and dislocation (Cao, 2006) as well as excessive competition between local governments (Li and Yang, 2012).

Hence, does the government in China have a positive effect on the tourism efficiency or not? Those studies cited above were limited to qualitative discussion and failed to uncover the relationship between governmental actions and tourism development by quantitative analysis. Further, there has been no quantitative research studying the overall impacts of Chinese local government act (LGA) on tourism efficiency in China, the question to which this work is dedicated. Thereforth, finding the answer to this question is the research goal of this paper. To realize this aim, this paper focuses on the following aspects. First, the author defined two important variables, Chinese local government act (LGA) and tourism efficiency. Second, a quantitative model of LGA proposed by Sun and Xia (2017) and data envelopment analysis (DEA) were used to detect the changes in tourism efficiency owing to LGA. Specifically, the quantified LGA was taken as one input factor, and the results of tourism industry efficiency with and without LGA were compared. To further clarify the real impacts of LGA on tourism industry efficiency, further comparative analysis was made of spatial patterns and spatial interactions of the efficiency results under the two conditions, using spatial statics.

This paper attempts to clarify the influence of government act on tourism and further develop quantitative research on the activities of governments in this regard, which will help guide the study of government act in the academic field of tourism, to convert quantitative analysis from qualitative analysis. These findings will provide a basis for local governments to control the strength of their influence so as to improve tourism industry efficiency in China.

2. Methods

2.1. Quantification of Governmental Act

The acts of local governments (LGA) in the tourism industry are diverse and complex. In 1974, Eden investigated governmental act in the tourism industry. Since then, several reference studies have emerged, and the consensus is that government interventions in the tourism industry are diverse, complex, and interact with each other. The influence of the government is different in different countries. Hughes (1984) pointed out that supportive act of the British government for the tourism industry included cash subsidies, tax breaks, restriction of imports and export promotion. In Thailand, Elliott (1987) found that government action focused on reducing taxes

for hotel rooms, increasing charter flight service, simplifying tourism procedures, controlling tourism functions and the status of Bangkok International Airport, and endowing the national economic and social development committee with new functions to coordinate and monitor tourism development, among others. Akama (2002) summed up the acts of the Kenyan government into three aspects: being solely responsible for operation and management of the tourism industry, establishing a Kenya tourism development group to promote the government's direct investment in and management of tourism industry development, and setting up a socioeconomic environment to attract social capital and foreign capital for tourism through tax incentives, financing and others. Other activities such as promoting human resources, online marketing and investment in tourism have been reported by Baum (2007), Horng and Tsai (2010), and Chavan and Bhola (2013), respectively. In China, most studies agree that governmental act in tourism is embodied by establishing laws, regulations and policies; planning; financing; and marketing, among others. Deng (2005) and Meng (2009) condensed the influence of the Chinese government into the following acts: creating favorable conditions for tourism development; establishing tourism laws, regulations and industry policies, and tourism development planning; engaging in destination marketing; raising funds to improve tourism infrastructure and guiding their investment. In addition, Ge (2003) considered government actions such as protecting tourism resources, and the collection and publication of tourism market information. Sun and Xia (2017) distinguished eight main acts of local governments with respect to tourism that are based on some basic principles, and established an index system for quantification (Table 1). The method followed in that study was applied in this work.

According to Sun and Xia (2017), the principles of an index system should include four aspects. First, the index system must be comprehensive and scientifically treat the macro-and micro-level activities of local governments. Second, each index selected should be related to development of the tourism industry and should be consistent with the mechanisms of governmental act on tourism industry efficiency. Third, the data of each index should be accurate, reliable, complete, and continuous and should reflect any change, so as to be able to draw clear and factual conclusions. Following these principles and basing this work on national and international data as well as the opinions of several relevant experts in the tourism industry, the author established an index system for quantization of macro-and micro-level LGA. Macro-level LGA refers to macro-environment development acts, including political, economic and cultural as well as those related to industry, ecology and facilities. Micro-level LGA includes tourism policies, regulations, standards, planning, marketing, cooperation, image, industry, management, education and training by local governments. Fourth, the index system comprises 8 aspect indexes, 24 primary indexes, 13 sub-indexes and

6 basic indexes. Details about the specific meaning and nature[1]of each index and its relationship with LGA and the quantization method have been described by Sun and Xia (2017). For brevity, these details have been omitted from this paper.

Table 1. Index System of Local Government Acts in the Tourism Industry

Index name	Index category
1 Macro environment construction	Major index
1a political environment	primary index
1a1: regional corruption control	sub-index
1a2: regional social security control	sub-index
1b economic environment	primary index
1b1: regional economic development	sub-index
1b2: degree of regional marketization	sub-index
1c industry environment	primary index
1c1: third industry development level	sub-index
1c2: third industry investment level	sub-index
1d ecological environment	primary index
1d1: forest cover rate	sub-index
1d2: coverage rate of Nature Reserves	sub-index
1d3: control efforts of environmental pollution	sub-index
1e infrastructure environment	primary index
1e1: transportation infrastructure	sub-index
road construction	basic index
railway construction	basic index
1e2: the level of city facilities	sub-index
the construction of public toilet	basic index
the construction of public transportation	basic index
the construction of city road	basic index
the green construction of city park	basic index
1f social and cultural environment	primary index
1f1: expenses on cultural undertakings	sub-index

[1] The nature of an index is positive, i.e., the higher the index value, the stronger the effect of the corresponding action of local government, and vice versa. Among the indexes, regional corruption control is taken as a neutral index and regional social security control as a negative index; the rest are considered positive indicators.

Index name	Index category
1f2: financial support for cultural undertakings	sub-index
2 Construction of the policies, regulations and standards	Aspect index
2a the construction of regional tourism policy	primary index
2b the construction of regional tourism regulations	primary index
2c the construction of regional standards	primary index
3 Tourism planning and construction	Aspect index
3a attainment rate of tourism income	primary index
3b attainment rate of the number of tourists	primary index
4 The evaluation and construction of tourism image	Aspect index
4a the creation of national excellent tourism city	primary index
4b the creation of national scenic area	primary index
5 Tourism marketing	Aspect index
5a tourism promotion	primary index
5b festival marketing	primary index
6 Regional tourism cooperation	Aspect index
6a international cooperation	primary index
6b cooperation between the central and local	primary index
6c inter provincial cooperation	primary index
7 The management of the tourism industry	Aspect index
7a the travel agency management	primary index
7b the star hotel management	primary index
7c the tour guide management	primary index
8 Tourism education and training	Aspect index
8a the construction of tourism colleges	primary index
8b cultivation of students majoring in Tourism	primary index
8c tourism industry training	primary index

2.2. Calculation of Tourism Industry Efficiency

Based on a comprehensive comparison of the existing research literature, this paper followed Sun and Xia (2014; 2016) and used fixed capital of the tourism industry; number of employees in tourism; travel agencies and top-rated hotels; and the number of 4A and 5A scenic tourist attractions as input indicators. Total tourism revenue, total number of tourists and inbound tourists, and tourist complaints were used as output indicators.

To establish a clear link between the findings of this study and those of existing research so as to make comparisons, the static efficiency of China's provincial tourism industry in the years 2000, 2006 and 2012 was measured using a DEA-BCC (Banker, Charnes and Cooper) model. This is a basic DEA model that has been applied to many studies on tourism efficiency. The premise of the model is that the returns to scale vary; it is therefore known as a variable returns to scale (VRS) model. Results obtained using the BCC model include overall efficiency (OE), pure technical efficiency (PTE) and scale efficiency (SE). OE is the product of PTE and SE and can be used to evaluate the resource allocation capacity and resource use efficiency. PTE is related to the influence of technical factors and SE to that of industry scale. When OE is equal to 1, the input and output of the provincial unit are effective, that is, both the PTE and SE are effective. The closer the values of PTE and SE are to 1, the more effective their efficiency. When both values are equal to 1, maximum efficiency is achieved.

The dynamic efficiency—that is, the change of TFP (total factor productivity) of the tourism industry—was measured from 2000 to 2012 using the DEA-MI (Malmquist productivity index). The value of the MI reflects the growth in TFP from period t to t+1. When the value of MI is greater than 1, the TFP is increasing. The MI can be further decomposed into technical efficiency change (TEC) and technical progress (TP) indexes. The TEC measures variation of the boundary distance from period t to t+1 of a provincial unit. A value of TEC greater than 1 indicates that the relative efficiency of the provincial unit is high. The TEC can be further divided into pure technical efficiency and scale efficiency; the meaning of these is the same as above. TP measures the degree of technological progress during the period t to t+1 of every provincial unit.

Table 2. Classification and Description of the Measurement Indexes, without LGA

Index	Name	Unit	Representations
Input	Fixed capital of tourism industry	Million	The scale of capital investment in tourism industry
	Number of tourism employees	Person	Number of labor force in tourism industry
	Travel agency conditions	Score	Tourism reception conditions
	Stars Hotel conditions	Score	Tourism reception conditions
	4A and 5A scenic spot conditions	Number	Tourism resource endowment
Output	Total tourism income	Billion	Economic output of tourism
	Number of tourists	Billion person time	Scale output of tourism
	Evaluation of inbound tourists	Score	Service quality output of tourism
	Tourist complaints	Score	Service quality output of tourism

2.3. Analysis of the Spatial Pattern and Interaction of Tourism Efficiency

The influence of LGA on tourist industry efficiency cannot be determined if only considering impacts of LGA on the measurement results of tourist industry efficiency. Because industry efficiency data possess geographic attributes, they can also present spatial patterns and have spatial autocorrelation, that is, there is interaction between neighboring provinces. The existence and types of influence from LGA on the spatial interaction patterns of tourism industry efficiency are therefore worth further exploration, to clearly understand the impacts on tourism efficiency by LGA.

To achieve this purpose, the author selected an appropriate level of the OE and MI values to present the spatial patterns and used a Moran scatter plot of spatial statistics to compare the change in spatial interaction of tourism industry efficiency, with and without LGA included in the measurement. The Moran scatter plot is divided into four quadrants. The first quadrant represents the spatial relationship between regions with high observed values and surrounding regions with high observations, namely HH (High-High). The second quadrant represents the spatial relationship between regions with low observed values and surrounding regions with high observations, or LH (Low-High). The third quadrant represents the spatial relationship between regions with low observed values and surrounding regions with low observations, or LL (Low-Low). Finally, the fourth quadrant represents the relationship between regions with high observed values and the surrounding regions with low observations, namely HL (High-Low). A significance level map can be obtained by combining a Moran scatter plot with the significance level of the Moran's I index of local autocorrelation. In practical analysis, because the function is the same and the present form is more vivid, the clustering chart commonly replaces the significance level chart (Sun and Dai, 2014). Therefore, a clustering chart was chosen in the following analysis to reflect the change in tourism industry efficiency.

3. Results

3.1. Measured Results of Static Efficiency

LGA was taken as an input indicator of tourism industry efficiency. The measurement results of 31 provinces throughout China in the years 2001, 2006 and 2012 are listed in Table 3, without and with the inclusion of LGA. The result of the former is OE (overall efficiency), and that of the latter is AOE (overall efficiency with governments' act).

The data in Table 3 show that with LGA, the average tourism industry efficiency increased (0.095, 0.121 and 0.12 in 2001, 2006 and 2012, respectively) compared with the results without LGA. Refined to the provincial level, tourism industry efficiency

improved in 17, 21 and 21 provinces in these 3 respective years, when taking LGA into account in measurement. The provinces with significantly improved tourism efficiency in 2001 are Jiangsu (0.383), Anhui (0.294), Zhejiang (0.261), Shandong (0.250), Shaanxi (0.233) and Sichuan (0.215). In 2006, these were Gansu (0.484), Jilin (0.273), Xinjiang (0.271), Liaoning (0.269), Shandong (0.252), Hebei (0.243), Zhejiang (0.235), Jiangsu (0.225), Heilongjiang (0.221), Hubei (0.205) and Yunnan (0.201) and in 2012, Xinjiang (0.409), Jiangsu (0.338), Shandong (0.321), Beijing (0.294), Zhejiang (0.263), Shanxi (0.250), Guangxi (0.248), Gansu (0.242) and Jilin (0.223). Therefore, it can be seen that the act of local governments has a significant positive impact on efficiency in the tourism industry. However, the strength of this impact remains to be expounded. The number of provinces whose tourism industry efficiency changed from ineffective status to effective was only 7, 6 and 5 in 2001, 2006 and 2012, respectively.

Table 3. Static Efficiency of the Tourism Industry, without LGA and with LGA, in 31 Provinces of China: 2001, 2006, and 2012

	2001		2006		2012	
	OE	AOE	OE	AOE	OE	AOE
Mean	0.844	0.939	0.808	0.929	0.780	0.900
Beijing	1.000	1.000	1.000	1.000	0.493	0.787
Tianjin	1.000	1.000	1.000	1.000	1.000	1.000
Hebei	0.785	0.958	0.626	0.869	0.494	0.619
Shaanxi	1.000	1.000	0.980	1.000	0.681	0.931
Inner Mongolia	0.962	1.000	1.000	1.000	0.736	0.833
Liaoning	0.542	0.639	0.587	0.856	0.933	1.000
Jilin	0.844	1.000	0.727	1.000	0.777	1.000
Heilongjiang	1.000	1.000	0.779	1.000	1.000	1.000
Shanghai	1.000	1.000	1.000	1.000	0.877	1.000
Jiangsu	0.617	1.000	0.775	1.000	0.662	1.000
Zhejiang	0.636	0.897	0.583	0.818	0.516	0.779
Anhui	0.625	0.919	0.651	0.784	1.000	1.000
Fujian	0.627	0.788	0.779	0.837	0.528	0.693
Jiangxi	1.000	1.000	0.783	0.790	0.704	0.754
Shandong	0.750	1.000	0.748	1.000	0.662	0.983
Henan	1.000	1.000	1.000	1.000	1.000	1.000
Hubei	1.000	1.000	0.602	0.807	0.874	0.898
Hunan	0.914	1.000	0.657	0.799	0.734	0.797
Guangdong	1.000	1.000	0.866	0.997	0.814	1.000

	2001		2006		2012	
	OE	AOE	OE	AOE	OE	AOE
Guangxi	0.795	0.887	0.736	0.875	0.709	0.957
Hainan	0.536	0.688	0.609	0.683	0.714	0.714
Chongqing	1.000	1.000	1.000	1.000	1.000	1.000
Sichuan	0.785	1.000	1.000	1.000	1.000	1.000
Guizhou	1.000	1.000	1.000	1.000	1.000	1.000
Yunnan	0.654	0.707	0.624	0.825	0.605	0.775
Tibet	1.000	1.000	1.000	1.000	1.000	1.000
Shaanxi	0.767	1.000	0.835	1.000	0.842	0.913
Gansu	0.633	0.808	0.422	0.906	0.535	0.777
Qinghai	1.000	1.000	1.000	1.000	1.000	1.000
Ningxia	1.000	1.000	1.000	1.000	1.000	1.000
Xinjiang	0.681	0.831	0.672	0.943	0.289	0.698

3.2. Measured Results of Dynamic Efficiency

The data in Table 4 show that LGA also has a significant positive impact on dynamic efficiency in the tourism industry. From the perspective of mean, the average annual growth rate of dynamic efficiency in the tourism industry increased from –1% to 2% after the inclusion of LGA. At the same time, the annual growth rates of technical efficiency and technical progress in the tourism industry also increased, from 0.3% and –0.1% to 2.5% and 2.0%, respectively. Clearly, LGA not only promotes technical efficiency but also the technological progress of tourism. In particular, the influence on the latter is more remarkable, further promoting dynamic efficiency within tourism.

According to the measurement results in different periods, the impact of LGA on dynamic efficiency of the tourism industry is basically positive because its annual growth rate improved after taking LGA into account. However, the influence of LGA from 2008 to 2011 decreased. As is well known, a global financial crisis broke out in 2008. The Chinese tourism industry faced an adjustment before a gradual recovery took place. The reason may lie in the lack of experience of local governments to revitalize the tourism industry when faced with the economic crisis. To further examine the changes in technical efficiency and technical progress before and after the addition of LGA, it can be seen that the influence of LGA on technical efficiency reflects a mix of positive and negative effects; however, the effects are nearly all positive with respect to technical progress. This verifies the conclusion above that LGA promotes

the dynamic efficiency of the tourism industry mainly through improving the status of technological progress.

Table 4. Dynamic Efficiency of the Tourism Industry from 2001 to 2012, without and with LGA

Year	without LGA			with LGA		
	Technical efficiency change	Technical progress change	TFP Change	Technical efficiency change	Technical progress change	TFP change
2001-2002	0.998	0.895	0.893	0.985	0.946	0.931
2002-2003	0.927	0.909	0.843	0.976	0.909	0.887
2003-2004	1.075	0.946	1.017	1.028	1.023	1.052
2004-2005	0.977	0.988	0.965	1.011	0.996	1.006
2005-2006	0.982	1.005	0.987	0.992	1.030	1.022
2006-2007	0.982	0.982	0.965	1.014	0.984	0.998
2007-2008	0.944	1.102	1.040	0.948	1.104	1.047
2008-2009	1.025	1.044	1.070	1.013	1.055	1.069
2009-2010	1.050	1.059	1.112	1.028	1.051	1.081
2010-2011	0.972	1.040	1.010	0.965	1.089	1.052
2011-2012	0.982	1.104	1.084	0.999	1.104	1.102
Mean	0.987	1.003	0.990	0.996	1.025	1.020

To further analyze the impacts of LGA on dynamic efficiency in the tourism industry, the author adopted a provincial perspective. The data in Table 5 show that the number of provinces with an average annual growth rate that improved, remained constant, or decreased was 26, 1 (Sichuan) and 4 (Guangxi, Anhui, Hainan and Yunnan), respectively. It can be seen that the overall impact of LGA on the dynamic efficiency of tourism is positive. Among those provinces with improved annual growth rates in dynamic efficiency, Xinjiang, Shandong, Shanxi, Hebei, Guangdong and Henan showed superior performance. By comparing the change in the average annual growth rates of technical efficiency and technical progress, it can be seen that the average annual growth rate of technical efficiency declined in only six provinces (Liaoning, Jiangsu, Anhui, Hainan, Sichuan and Shaanxi); however, this rate for technical progress increased in these six provinces. Only Beijing, Guangxi and Yunnan had a decline in the average annual growth rate of technical progress and an increase in that of technical efficiency.

Therefore, these provincial data provide further evidence of the previous conclusion that there is a positive effect owing to LGA on both technical efficiency and technical progress in the tourism industry via the promotion of dynamic efficiency by LGA, which is especially true for technical progress.

Table 5. Dynamic Efficiency of the Tourism Industry, with and without LGA, in 31 Provinces of China from 2001 to 2012

Province	without LGA			with LGA		
	Technical efficiency change	Technical progress change	TFP change	Technical efficiency change	Technical progress change	TFP change
Beijing	0.938	1.093	1.025	0.978	1.086	1.063
Tianjin	1.000	1.010	1.010	1.000	1.016	1.016
Hebei	0.959	1.023	0.981	0.961	1.070	1.029
Shanxi	0.966	0.966	0.933	0.993	0.994	0.987
Inner Mongolia	0.976	0.962	0.939	0.984	0.969	0.953
Liaoning	1.051	1.070	1.125	1.041	1.099	1.144
Jilin	0.993	0.977	0.970	1.000	1.002	1.002
Heilongjiang	1.000	1.034	1.034	1.000	1.056	1.056
Shanghai	0.988	1.037	1.025	1.000	1.039	1.039
Jiangsu	1.006	1.092	1.099	1.000	1.130	1.130
Zhejiang	0.981	1.087	1.066	0.987	1.098	1.084
Anhui	1.044	0.998	1.041	1.008	1.019	1.027
Fujian	0.985	1.040	1.024	0.988	1.070	1.058
Jiangxi	0.969	0.971	0.940	0.975	0.971	0.946
Shandong	0.989	1.001	0.989	0.998	1.076	1.074
Henan	1.000	1.023	1.023	1.000	1.063	1.063
Hubei	0.988	1.050	1.037	0.990	1.076	1.066
Hunan	0.980	1.001	0.981	0.980	1.039	1.018
Guangdong	0.981	1.050	1.031	1.000	1.079	1.079
Guangxi	0.990	1.098	1.086	1.007	1.064	1.071
Hainan	1.026	0.937	0.962	1.003	0.952	0.955
Chongqing	1.000	1.039	1.039	1.000	1.041	1.041
Sichuan	1.022	1.091	1.115	1.000	1.115	1.115
Guizhou	1.000	0.996	0.996	1.000	1.006	1.006
Yunnan	0.993	1.071	1.064	1.008	1.052	1.061
Tibet	1.000	0.931	0.931	1.000	0.933	0.933
Shaanxi	1.009	0.987	0.996	0.992	1.035	1.026
Gansu	0.985	0.940	0.926	0.997	0.957	0.953
Qinghai	1.000	0.875	0.875	1.000	0.890	0.890
Ningxia	1.000	0.862	0.862	1.000	0.868	0.868
Xinjiang	0.925	0.890	0.823	0.984	0.962	0.946

3.3. Results of Spatial Patterns of Static Efficiency

By observing the range of the measurement results, it can be seen that 0.7 is an appropriate value with which to divide static efficiency into three levels, that is OE=1, $0.7 \leqslant OE < 1$ and $OE < 0.7$. In the light of this division, the spatial pattern of tourism static efficiency changed obviously after the addition of LGA. Specifically, the number of provinces with tourism industry static efficiency equal to 1 increased, those with tourism industry static efficiency less than 0.7 declined, and those with tourism industry static efficiency between 0.7 and 1 remained stable. In other words, efficiency of the tourism industry presented a spatial pattern that was predominantly upper-and mid-level OE values, after including LGA in the measurement.

By performing an in-depth analysis of change in the provinces during different periods, it can be seen that the number of provinces with OE values at the three levels above, listed in descending order, changed from 14, 8, and 9 to 21, 8, and 2 in 2001; the spatial pattern showed predominantly upper-level OE values and became more significant. In 2006, this change was from 14, 8, and 9 to 17, 13, and 1. The spatial pattern was still predominantly OE values at the upper level, but the mid-level values began to show an increasing trend. In 2012, the change was from 10, 11, and 10 to 15, 13, and 3, and the spatial pattern changed from uniform distribution of the three levels to predominantly upper-and mid-level values. Therefore, LGA consistently influenced the change in static efficiency of China's tourism industry such that the spatial pattern gradually became predominantly static efficiency with OE values greater than 0.7; most provinces demonstrated effective efficiency.

3.4. Results of Spatial Patterns of Dynamic Efficiency

The value of dynamic efficiency from 2001 to 2012 was measured by the MI divided into three levels: $MI > 1$, $0.9 < MI \leqslant 1$ and $0.8 < MI \leqslant 0.9$. The results show that the spatial patterns of tourism industry dynamic efficiency underwent considerable changes after including LGA in the measurement. The number of provinces with MI values greater than 1 increased; MI values decreased in the remaining provinces.

To more clearly depict changes in the spatial patterns of tourism industry dynamic efficiency over the 12 years, the study period was divided into two stages, with 2006 as the midpoint. MI values were divided into three levels following the principle above, and a pattern of spatial distribution emerged.

When LGA was included for 2001—2006, the number of provinces with dynamic efficiency at the upper, mid and lower MI levels changed from 9, 13, and 9 to 12, 15, and 4. Consequently, although the pattern of spatial distribution changed overall, mid-level values were always predominant. From 2006 to 2012, with LGA included in measurement, the number of provinces with dynamic efficiency at these three levels

changed from 24, 5, and 2 to 24, 6, and 1. Changes in the pattern of spatial distribution were small, and upper-level MI values always predominated.

It can therefore be concluded that the spatial pattern of dynamic efficiency in China's tourism industry was influenced by both changes in the tourism industry efficiency itself and the effect of LGA during 2001—2012.

3.5. Results of Spatial Interaction of Static Efficiency

It can be seen that after LGA is included in measurement, the spatial interaction pattern of static efficiency in the tourism industry for 2001, 2006 and 2012 changed considerably. The basic pattern of change is that the number of provinces in the HH quadrant increased, those in the LH and LL quadrants decreased, and the number in the HL quadrant remained relatively stable. Specific changes are as follows.

Firstly, after inclusion of LGA in 2001, the number of provinces in the HH, LH, HL and LL quadrants changed from 7, 10, 4, and 10 to 13, 7, 2, and 9, respectively. In other words, the number of provinces in the HH and LL quadrants increased whereas those in HL and LH decreased. There were 20 provinces with no change from the original quadrant: Beijing, Tianjin, Heilongjiang, Shanxi, Hubei, Chongqing and Hunan in the HH quadrant; Liaoning, Gansu, Yunnan, Fujian and Hainan in the LH quadrant; and Guangdong, Tibet, Qinghai, Guizhou, Ningxia, Jiangxi, Jilin and Inner Mongolia in the HL quadrant. In the remaining 11 provinces, Hebei and Shaanxi changed from the original LH quadrant to the HH quadrant; Jiangsu and Shandong moved from the LL to the HH quadrant; Shanghai and Henan went from HL to HH; Xinjiang and Guangxi moved from LH to LL; Anhui and Zhejiang changed from LL to LH; and Sichuan moved from the LH quadrant to the HL quadrant. In 2001, LGA had an overall influence on the spatial interaction of static efficiency in the tourism industry; however, the interaction pattern remained predominantly in the HL and LH quadrants.

Secondly, with inclusion of LGA in 2006, the number of provinces in the HH, LH, HL and LL quadrants changed respectively from 7, 7, 10, and 7 to 12, 5, 7, and 7; that is, interaction patterns in the HH quadrant increased whereas those in LH and LL decreased and those in HL remained the same. There were 19 provinces with no change from the original quadrant: Beijing, Tianjin, Shaanxi, Shanxi, Tibet and Sichuan in the HH quadrant; Gansu, Hebei, Yunnan, and Hainan in the LH quadrant; Anhui and Jiangxi, Zhejiang, Fujian and Guangxi in the LL quadrant; and Shanghai, Guangdong, Guizhou and Henan in the HL quadrant. Among the remaining 12 provinces, Chongqing moved from the HH quadrant to HL; Heilongjiang from LH to HH; Inner Mongolia, Ningxia and Qinghai changed from HL to HH; Xinjiang and Jilin from LL to HH; Hubei and Hunan went from HL to LL; Liaoning from LL to HL; and Jiangsu and Shandong moved from the LL quadrant to the HL quadrant. Compared with 2001, LGA had a large influence overall on the spatial interaction of static efficiency of tourism in

2006. The interactive correlation patterns were strongly dominated by the HH and LL quadrants, and performance was more notable after taking LGA into account.

Thirdly, with inclusion of LGA in the measurement in 2012, the number of provinces in the HH, LH, HL and LL quadrants changed respectively from 5, 10, 6, and 10 to 9, 8, 4, and 10. Interaction patterns in the HH quadrant increased whereas those in LH and LL decreased and those in HL remained the same. A total of 23 provinces showed no changes in quadrant: Shaanxi, Sichuan, Chongqing and Guizhou in the HH quadrant; Inner Mongolia, Xinjiang, Hunan, Yunnan, Hainan, Gansu and Hebei in LH; Zhejiang, Jiangxi, Fujian and Beijing in LL; and Ningxia, Liaoning, Tianjin, Shanghai, Guangdong, Henan, Qinghai and Tibet in the HL quadrant. In the remaining eight provinces (or city), Hubei moved from the HH quadrant to the LH quadrant; Shandong and Jilin from the LH to the HH quadrant; Guangxi from LH to HL; Jiangsu from LL to the HH quadrant; Shanxi from LL to HL; and Heilongjiang and Anhui from the HL to the HH quadrant. In 2012, LGA had an overall influence on the spatial interaction of tourism static efficiency; however, the interaction pattern remained predominantly reflected by the HL and LH quadrants.

3.6. Results of Spatial Interaction of Static Efficiency

In accordance with the results, with LGA, the number of provinces in the HH, LH, LL and HL quadrants changed respectively from 13, 7, 8, and 3 to 10, 5, 8, and 6. A total of 25 provinces remained unchanged from the original quadrant: Beijing, Henan, Jiangsu, Anhui, Chongqing, Shanghai, Zhejiang, Yunnan, Fujian and Guangxi in the HH quadrant; Jilin, Jiangxi, Guizhou and Hainan in LH; Inner Mongolia, Xinjiang, Gansu, Shanxi, Shaanxi, Ningxia, Qinghai and Tibet in LL; and Sichuan, Liaoning and Heilongjiang in the HL quadrant. In these provinces, the influence of LGA on spatial interaction patterns of the dynamic efficiency of tourism was small. In the remaining six provinces, Tianjin moved from the HH quadrant to both the LH and HL quadrants; Guangdong and Hubei moved from the HH quadrant into the HL quadrant; Hebei and Shandong changed from LH to HH; and Hunan from LH to the HL quadrant. LGA in these provinces had a large influence on the spatial interaction patterns of tourism dynamic efficiency. Therefore, during 2001—2012, LGA had a small overall influence on the spatial interaction patterns of tourism industry dynamic efficiency, with interaction patterns predominantly in the HH and LL quadrants.

To further clarify the influence on spatial interaction patterns of tourism industry dynamic efficiency by LGA during 2001–2006 and 2006–2012, the spatial interaction patterns of tourism dynamic efficiency, with and without LGA included in measurement.

According to the data, from 2001 to 2006 and with inclusion of LGA, the number of provinces in the HH, LH, HL and LL quadrants changed respectively from 11, 6,

11, and 3 to 6, 9, 8, and 8. In total, 18 provinces remained unchanged from the original quadrant: Shandong, Jiangsu, Shanghai, Zhejiang and Yunnan in the HH quadrant; Jilin, Anhui, Jiangxi and Hainan in LH; Xinjiang, Gansu, Shanxi, Hubei, Ningxia, Qinghai and Tibet in LL; and Sichuan and Liaoning in the HL quadrant. The remaining 13 provinces showed varying distributions.

With LGA from 2006 to 2012, the number of provinces in the HH, LH, HL and LL quadrants changed respectively from 9, 11, 7, and 4 to 13, 6, 8, and 4. A total 26 provinces remained unchanged from the original quadrant: Tianjin, Henan, Jiangsu, Anhui, Hubei, Chongqing, Zhejiang, Hunan, Yunnan and Guangxi in the HH quadrant; Jilin, Jiangxi, Guizhou, Fujian and Hainan in LH; Inner Mongolia, Xinjiang, Gansu, Shaanxi, Ningxia, Qinghai and Tibet in LL; and Sichuan, Guangdong, Liaoning and Heilongjiang in the HL quadrant.

It can be seen that LGA had a large influence on the spatial interaction patterns of tourism industry efficiency from 2001 to 2006, but a comparatively small influence from 2006 to 2012. In the first period, the predominance of the HH and LL quadrants declined, and that of HL and LH increased; this was completely reversed in the second period.

4. Conclusion

By analysis and comparison of the spatial patterns and spatial interactions of tourism efficiency, the conclusion can be reached that LGA indeed exerts an influence on the efficiency in the tourism industry. Judging from these results, LGA has a positive correlation with tourism efficiency via promotion of technological efficiency and technological advancement. In terms of spatial pattern variation, LGA has led to a tremendous increase in the number of provinces with static efficiency above 0.7, depicted as a predominant spatial pattern in these provinces. Moreover, LGA also improves the dynamic efficiency of tourism; thus, the number of provinces with positive annual average growth has increased substantially. Spatial patterns vary remarkably, with central and eastern regions of China enjoying positive annual average growth whereas western areas experience negative annual average growth. From variation in the general static and dynamic efficiency of tourism, it can be concluded that LGA also affects the spatial interaction patterns of tourism efficiency, but the influence is not profound.

The above analysis has served to clarify the general correlation between LGA and efficiency in the tourism industry and thereby verify the rationality of this research. In addition, the quantification of government acts and the method used to determine the impacts of LGA on the tourism industry have provided a solid basis for quantitative study in this field. In other words, the intensity index of LGA is a useful tool for such thorough investigation; temporal and spatial variations alone can be tracked and analyzed, and the economic impact of LGA on the tourism industry can be assessed.

The findings of this paper are factual and can serve as a reference for local

governments and tourism development. However, this study was unable to determine which activities of local governments have a larger influence on tourism efficiency and which acts have little or no impact. Further study and follow-up analysis are required.

References

Akama, J. S. (2002). The Role of Government in the Development of Tourism in Kenya. *International Journal of Tourism Research*, 4 (1), 1-14.

Bachmann, P. (1998). *Tourism in Kenya: A Basic Need for Whom?* Switzerland Peter Lang AG.

Balaguer, J., & Cantavella-Jordá, M. (2002). Tourism as a Long-Run Economic Growth Factor: The Spanish Case. *Applied Economics*, 34 (7), 877-884.

Baum, T. (2007). Human Resources in Tourism: Still Waiting for Change. *Tourism Management*, 28 (6), 1383-1399.

Bramwell, B., & Alletorp, L. (2001). Attitudes in the Danish Tourism Industry to the Roles of Business and Government in Sustainable Tourism. *International Journal of Tourism Research*, 3 (2), 91-103.

Burns, P. (1999). Paradoxes in Planning Tourism Elitism or Brutalism? *Annals of Tourism Research*, 26 (2), 329-348.

Cao, G. X. (2006). An Analysis on the Malfunction of Government Guide of the China's Tourism Products. *Tourism Science (Lvyou Kexue)*, 20 (2), 6-9.

Chavan, R. R., & Bhola, S. S. (2013). Government Tourism Efforts and Reflections of Tourism in the Satara District. *International Journal of Technology Marketing*, 3 (9), 143-159.

Chien, G. C. L., & Law, R. (2003). The Impact of the Severe Acute Respiratory Syndrome on Hotels: A Case Study of Hong Kong. *International Journal of Hospitality Management*, 22(3), 327-332.

Dong, X. J. (2009). An Empirical Analysis on the Technical Efficiency of Tourism Enterprises in China's Coastal Areas. Master Thesis of Ocean University of China.

Eden, J. (1974). *Tourism and Government*. Management of Tourism, Heinemann Educational Books, London, 177-181.

Elliott, J. (1987). Government Management of Tourism—A Thai Case Study. *Tourism Management*, 8(3), 223-232.

Ge, L. F. (2003). The Functions of Government in the Development of Tourism. *Macroeconomic Management (Hongguan Jingji Guanli)*, 12 (48), 112.

Gunn, C. A. (1988). *Tourism planning*. Taylor & Francis.

Guo, X. (2006). The Analysis on Government's Monitoring to Tourist Economy. *Around Southeast Asia (Dongnanya Zongheng)*, 10, 73-77.

Hao, S. (2001). On the Market Proceeding Development of China's Tourism Industry and Governmental Conduct. *Tourism Tribune (Lvyou Xuekan)*, 2, 19-22.

Henderson, J. C. (2003). Communicating in a Crisis: Flight SQ 006. *Tourism Management*, 24 (3), 279-287.

Horng, J. S., & Tsai, C. T. (2010). Government Websites for Promoting East Asian Culinary Tourism: A Cross-National Analysis. *Tourism Management*, 31(1): 74-85.

Hughes, H. L. (1984). Government Support for Tourism in the UK: A Different Perspective. *Tourism Management*, 5 (1), 13-19.

Hughes, H. L. (1994). Tourism and Government: A Subset of Leisure Policy? *Tourism-The State of the Art*, 472-480.

Jenkins, C. L., & Henry, B. M. (1982). Government Involvement in Tourism in Developing Countries. *Annals of Tourism Research*, 9 (4), 499-521.

Meng, F. T. (2009). Study of the Functions of Local Government in the Development of Tourism Industry. *Theoretic Observation (Lilun Guancha)*, 5, 72-73.

Miu, J. J., & Wang, J. S. (2002). Market Failure, Government Intervention and International Competitiveness of Tourism Industry. *Social Scientist (ShehuiXue Jia)*, 3, 30-35.

Oracion, E. G. (2007). Dive Tourism, Coastal Resource Management, and Local Government in Dauin. *Philippine Quarterly of Culture & Society*, 35 (3), 149-178.

Sun, P. P., & Dai, X. F. (2014). An Analysis on the Spatial Data of China's Regional Tourism Economic Disparity. *Tourism Science (Lvyou Kexue)*, 28(2), 35-48.

Sun, P. P., & Xia, J. C. (2014). Chinese Provincial Tourism Industry Efficiency: Indices Construction and Empirical Analysis. *Research on Economics and Management (Jingji Yu Guanli Yanjiu)*, 12, 70-79.

Sun, P. P., & Xia, J. C. (2016). Government's Environment-Construction Act and Tourism Potential Growth—Empirical Evidence from Chinese Provincial Data. *Finance & Trade Economics (Caimao Jingji)*, 37 (3), 148-160.

Sun, P. P., & Xia, J. C. (2017). A Research on the Quantitation and Spatial Effects of Local Governments' Behaviors in Tourism Industry: Based on Provincial Panel Data from 2000 to 2012. *Economic Management Journal (Jingji Guanli)*, 39(6), 148-161.

Wang, Q. J. (2005). Market Function, Government Act and the Development of China's Tourism Industry. *Journal Beijing International Studies University (Beijing Dier Waiguoyu Xueyuan Xuebao)*, 1, 20-25.

Wei, X., & Zhu, D. L. (2005). Research on the Government Regulation of Tourism Economy Based on Public Economics. *Inquiry into Economic Issues (Jingji Wenti Tansuo)*, 12, 109-111.

Zhang, S. Z. (2002). Analysis of Government Led Tourism Development Strategy. *Journal of Anhui University (Philosophy and Social Sciences) (Anhui daxue Xuebao, Zhexue Shehui Kexueban)*, 26(1), 118-121.

Resolving the Pension Payment Crisis: Effect of the Central Adjustment System

Chenxi Shi, Yi Zeng*

The central adjustment system is the first step of the national coordination of basic pension, which can alleviate the pension payment crisis in some provinces. This paper establishes an actuarial model, measures the financial status of the central adjustment fund, and simulates the impact of the central adjustment system on the sustainability and subsidies of the basic pension funds in each province (municipality). The results show that: (1) Before the central adjustment fund system, the first accumulated deficit of basic pension occured earier in central region than that in eastern and western region. (2) After the implementation of the central adjustment system, the basic pension funds in 19 provinces (municipalities) experienced a decline in the scale of the first accumulated deficit, and the time of the first accumulated deficit in Sichuan and Liaoning was postponed. (3) Increasing the handover ratio of the central adjustment system will enhance the adjustment effect. (4) The adjustment effect of the central adjustment system is positively affected by the effect of the delayed retirement policy. (5) Under the current handover and appropriation method of central adjustment system, a higher contribution rate means more fund revenue for areas with a higher proportion of retirees. The central adjustment system is conducive to the sustainability of the pension fund in West China and other areas with underdeveloped market economy, but the actual effect depends on the retirement age, the subscription rate, the wage level and so on. When strengthening pension fund adjustment, the government should take into account the current operation status of pension funds to ensure both fairness and efficiency.
Keywords: pension, central adjustment system, fiscal burden, sustainability

1. Introduction

The report of the 19th National Congress of the Communist Party of China clearly put forward that the national coordination of pension funds should be realized as soon as possible. Because of the unbalanced development of pension funds in various regions of China, the gap is large, the pension information system is not perfect, and national coordination cannot be realized in one step but in "multiple

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steady steps".[1] On June 13, 2018 *Notice of the State Council on the Establishment of a Central Adjustment System for the Basic Pension Funds for Enterprise Employees* (hereinafter referred to as No.18 [2018] document of the State Council) proposed the establishment of the central adjustment system as the first step to achieve national coordination of pension funds. The adjustment of the pensions funds among provinces will balance the burden of the funds between regions to achieve the sustainable development of the pension system. Therefore, can the central adjustment system improve the sustainability of pension funds in various provinces? What is the financial status of the central adjustment fund? What is the impact on the deficit and financial subsidies of the provincial pension funds? Will the implementation of delayed retirement policy and the *State and Local Tax Collection and Administration System Reform Program* affect the effect of the central adjustment system? The actuarial analysis and scenario analysis of the operation of pension funds and the scale of financial subsidy under the central adjustment system from a long-term perspective are not only beneficial to the quantitative analysis of the impact of the current system, but also provide data support for the further development of scheme with stronger adjustment.

Scholars at home and abroad have proved that the aging of the population and the risk of longevity will increase the expenditure of pension funds, thus reducing the sustainability of the pension funds (Wang, 2002; Engelen, 2003; Machnes, 2003; Banks and Blundell, 2005; Liu, 2014). Due to the different measurement objectives and methods, there are differences in the final measurement results of scholars. For example, the results of Ai *et al.* (2012) show that the current deficit of basic pension funds for urban employees appears between 2018 and 2036. Zeng *et al.* (2016) argue that under the"one-child" policy, the basic pension funds will experience a current deficit in 2023, while the accumulated deficit will appear in 2076, and that the implementation of the "two-child" policy would delay the time point of the deficit occurs. However, it needs to be acknowledged that the situation of pension fund revenue and expenditure in China is not optimistic, and in recent decades there will be a serious payment gap, resulting in a huge fiscal burden (Yu and Zhong, 2009; Wang, 2012). Therefore, the reform of the current pension system is an inevitable choice to improve the sustainability of pension funds.

The reform measures proposed by scholars to improve the sustainability of pension funds can be summed up into three categories: the reform of institutional parameters, the institutional reform of the departments involved in the system, and the addition of

[1] By the end of 2016, the current revenue of the pension funds in 7 provinces in China was lower than the expenditure. The development gap of the funds is not only reflected in the imbalance of fund revenue and expenditure among eastern, central and western region, but also within each region. For example, expenditure in the eastern region in 2016 was 1.6363 trillion yuan, representing 51.38% of the total expenditure of the basic pension funds for the year, among which the pension funds expenditure of Shanghai is 3.68 times and 12.14 times of that in Fujian and Hainan respectively.

new institutional provisions. Many scholars have studied how to reform the parameters of retirement age, contribution rate and substitution rate in the system to improve the sustainability of pension funds. In the context of population ageing, most scholars (Bovenberg, 2003; Cremer and Pestieau, 2003; Rao, *et al.*, 2005; Breyer and Hupfeld, 2010; Gong and Yu, 2015) believe that the delayed retirement can ease the pressure on pension payments; there are also academics (Weller, 2002; Zhang, 2011; Yu, 2012; Cipriani and Pascucci, 2018) who believe that delayed retirement may increase the revenue and expenditure of the funds at the same time, or have a negative impact on fertility, exacerbating population ageing, so that there is uncertainty about its ultimate effect. The adjustment of contribution rate and substitution rate have a reversely affected by the sustainability of the funds and the effect of organization and individual rights and interests. For example, reducing pension substitution rate can reduce pension fund expenditure, but it "undermines" the rights and interests of insured persons (Samuelson,1969; Yang, 2008; Kang, 2012). Therefore, due to the rigidity of welfare and other reasons, to increase the contribution rate or reduce the substitution rate is not favored by organizations, individuals and the government. Although the reform of the parameters in the system is controversial, it is unanimously recognized by scholars to improve the efficiency of system management and operation. That includes to reform the departments involved in the system, to ensure the implementation of the system, and to further improve the efficiency of the funds' operation by achieving the objectives of coverage, fund rate of return, collection rate, etc. (Holzmann and Stiglitz, 2001; Gui, 2015; Vogel *et al.*, 2017).

Based on actuarial principles, this paper calculates the operation of the pension funds and the scale of the financial subsidy required under the central adjustment system, and clarifies the impact of the central adjustment system on the time and scale of the accumulated deficit of the pension funds in each province. At the same time, considering the influence of delayed retirement policy, contribution rate and handover ratio, the effect of central adjustment system on the transfer of pension funds in different scenarios is simulated. The innovation of this paper is mainly embodied in the following. First, by taking into account the latest birth policy, this paper does not artificially set models, but sets models according to the latest survey on fertility intentions. Secondly, scenario simulation is of practical significance for the further development of the reform plan by simulating the impact of increasing the strength of the central adjustment system, of implementing the delayed retirement policy, and of reforming the departments involved in pension coutribution on adjustment effects.

2. Models and Methods

After the implementation of No.18 [2018] document of the State Council, the impact

of the external financial flows of the basic pension funds is not taken into account, and the revenue of the provincial funds includes the disbursement of the central adjustment fund, interest income, the payment of insured personnel and the payment of enterprises; the expenditure of provincial funds includes the amount handed over to the central adjustment fund and basic pension expenditure. Drawing on the ideas and methods of actuarial modeling in the study of Wang (2002), Yu and Hong (2009), and Zeng *et al.* (2016), this paper establishes an actuarial model based on the provisions about the calculation and payment of pensions in No.26 [1997] document and No.38 [2005] document of the State Council and the provisions about the management of the central adjustment fund in No.18 [2018] document of the State Council.

2.1. Pension Fund Expenditure

2.1.1. Central Adjustment Fund Drawing a Certain Portion from the Provincial Capital Pool

No.18 [2018] document of the State Council stipulates that the amount of handover funds from provinces (municipalities) is based on a certain proportion of the average wage of employees in the province (municipality) and the number of working employees contributing to pension. Let $CAFC_t^i$ indicate the amount turned over to the central adjustment fund by province i in the year of t, W_t^i indicate the average wage of the employees in province i in the year of t, α indicate the proportion of handover base in the average wage, β indicate the proportion of handover, $L_{x,t}^i$ indicate the number of insured workers in province i in the year of t, *and* i=1,2,……,31 respectively indicate Beijing, Tianjin ... Xinjiang.[1] Then,

$$CAFC_t^i = W_t^i \times \alpha \times \beta \times \sum_{x=e}^{r-1} L_{x,t}^i \tag{1}$$

2.1.2. Paying Basic Pensions

At present, there are differences in the calculating and paying of pensions in the basic pension system due to differences in the number of working years of insured personnel, and differences in contributing time. Accordingly, the basic pension can be divided into basic old-age benefit, transitional pensions, personal account pensions and personal account expenditure return, represented by $(AC)_{t,b}$, $(AC)_{t,g}$, $(AC)_{t,i}^1$, and $(AC)_{t,i}^2$, respectively.

Basic Old-Age Benefits. Insured persons will receive a basic old-age benefit upon retirement. The three main factors that determine the level of the basic old-age

[1] The provincial order is sorted by the first two digits of the identity card number.

benefits for retirees are the calculation base, the proportion of the calculation, and the growth coefficient. In order to improve the accuracy of measurement, the insured persons are divided into the elderly, the old, the new and the newcomers, expressed as i=1,2,3,4 respectively. Among them, the calculation base of basic old-age benefit of the elderly and the old is the average social wage in the year before retirement, and the basic old-age benefit of the new and the newcomer is the mean of the average annual social wage and the exponential average annual contribution wage in one year before retirement. The insured persons are divided into female workers, women cadres and men according to different job categories, expressed in j=1,2,3 respectively. $N_{t,x}^{i,j}$, $\bar{B}_{t,x}^{i,j}$, and $S_{t,x}^{i,j}$ represent number of insured workers in the categories of i and j in the year of t, the calculation base of basic old-age benefit, and the proportion of calculation respectively; $1+g_t$ indicates the growth coefficient of the annual basic old-age benefit; b_t^j and C_t^j represent the retirement age and the ultimate age of the insured j workers in the year of t respectively.

$$(AC)_{t,b} = \sum_{i=1}^{4}\sum_{j=1}^{3}\sum_{x=b_t^j}^{c_t^j}\left[N_{t,x}^{i,j} \times \bar{B}_{t,x}^{i,j} \times s_{t,x}^{i,j} \times \prod_{s=t-x+b_t^j}^{t}(1+g_s)\right] \tag{2}$$

Transitional Pensions. The old and the new will receive a transitional pension when they retire. The factors affecting the transitional pension level are the calculation base of transitional pension, the proportion of the calculation, the deemed payment years, and the growth coefficient. The calculation bases of transitional pensions of the old man and the new are the average social wage and the exponential average contribution wage in one year before retirement, respectively. $\bar{G}_{t,x}^{i,j}$ and $v_{t,x}^{i,j}$ represent the calculation base and proportion of the transitional pension of x-year-old insured workers in the categories of i and j in the year of t respectively. a_t^j indicates the entry age of category j of insured workers for the year of t, 1998-(t-x+a_t^j) is the deemed payment years.

$$(AC)_{t,g} = \sum_{i=2}^{3}\sum_{j=1}^{3}\sum_{x=b_t^j}^{c_t^j}\left\{N_{t,x}^{i,j} \times \bar{G}_{t,x}^{i,j} \times \left[1998-(t-x+a_t^j)\right] \times v_{t,x}^{i,j} \times \prod_{s=t-x+b_t^j}^{t}(1+g_s)\right\} \tag{3}$$

Personal Account Pension. The old, the new, and the newcomers will receive a personal account pension upon retirement. The level of personal account pension is determined by the amount of personal account balance and the number of calculation months as of the insured person's retirement. $m_t^{i,j}$ represents the number of calculation months of insured workers in category i and j; r represents the interest rate on bank deposits for one year; $\bar{w}_s$ and R_s^2 represent the contribution wages and contribution rates of the insured at the age of s, respectively.

$$(AC)_{t,i}^{1}=\sum_{i=2}^{4}\sum_{j=1}^{3}\sum_{x=b_t^j}^{c_t^j}\left\{\left\{N_{t,x}^{i,j}\times 12\times\left[\sum_{s=a_t^j}^{b_t^j-1}\overline{w}_s\times R_s^2\times(1+r)^{b_t^j-s-1}\right]\Big/m_t^{i,j}\right\}\times\prod_{s=t-x+b_t^j}^{t}(1+g_s)\right\} \tag{4}$$

Personal Account Expenditure Return. Personal account expenditure return means that if there is a balance in his or her personal account when the insured person dies, the balance will be returned to his/her heirs. If the insured person dies in the calculation months after retirement, the personal account expenditure returned to his heirs is shown in the first formula on the right of equation (5); If he/she dies before retirement, the personal account expenditure returned to his/her heirs is shown in the second formula on the right of equation (5). $D_{t,x}^{i,j}$ is used to represent of the number of deaths of insured workers in category i and j, and the return of personal account expenditure is expressed as:

$$\begin{aligned}(AC)_{t,i}^{2}=&\sum_{i=2}^{4}\sum_{j=1}^{3}\sum_{x=b_t^j}^{b_t^j+m_t^{i,j}/12}\left(D_{t,x}^{i,j}\times\left(b_t^j+\frac{m_t^{i,j}}{12}-x\right)\times\left(12\times\left(\sum_{s=a_t^j}^{b_t^j-1}\overline{w}_s\times R_s^2\times(1+r)^{b_t^j-s-1}\right)\Big/m_t^{i,j}\right)\right)\\&+\sum_{i=2}^{4}\sum_{j=1}^{3}\sum_{x=a_t^j}^{b_t^j-1}\left(D_{t,x}^{i,j}\times\left(\sum_{s=a_t^j}^{x}\overline{w}_s\times R_s^2\times(1+r)^{x-s}\right)\right)\end{aligned} \tag{5}$$

2.2. Pension Funds Revenue

2.2.1. Allocation of Central Adjustment Fund

The expenditure of central adjustment fund depends on its collection, all of which is disbursed to the provinces (municipalities). The central adjustment fund is allocated in accordance with the per capita quota and the amount of funds allocated is determined on the basis of the number of retirees in the provinces approved by the Ministry of Human Resources and the Ministry of Finance. The national allocation per capita = The central adjustment fund raised ÷ approved number of national retirees, of which, the allocation of a province's adjustment amount = The national allocation per capita × the number of the province's retirees. Let $CAFI_t^i$ represent the amount of the central adjustment fund received by province i in the year of t, then:

$$CAFI_t^i=\sum_{x=e}^{r-1}L_{x,t}^i\times CAFC_t\Big/\sum_{i=1}^{31}\sum_{x=e}^{r-1}L_{x,t}^i \tag{6}$$

where, $CAFC_t = \sum_{i=1}^{31} CAFC_t^i$.

2.2.2. Contribution Revenue

The contribution revenue of pension funds is divided into enterprise contribution and individual contribution according to the difference of payers. Enterprises and individuals pay the basic pensions in a certain proportion on the basis of contributory wages. Let $(Ai)_t$ represent the pension fund revenue in the year of t, let $\bar{w}_t$, k_t, and R_t respectively represent the contribution base of pension in the year of t, the contribution base growth rate and the contribution rate; let t_0 represent the starting year for the measurement period. Then

$$(AI)_t = \left(\sum_{i=1}^{4} \sum_{j=1}^{3} \sum_{x=a_t^j}^{b_t^j-1} N_{t,x}^{i,j} \right) \times \bar{w}_t \times R_t = \left(\sum_{i=1}^{4} \sum_{j=1}^{3} \sum_{x=a_t^j}^{b_t^j-1} N_{t,x}^{i,j} \right) \times \bar{w}_{t_0-1} \times \prod_{s=t_0}^{t} (1+k_s) \times R_t \qquad (7)$$

2.3. Accumulated Balance of Pension Funds

The current balance of a provincial pension fund = The amount of the provincial fund contribution revenue–the basic pension distributed + the central adjustment fund disbursement-handover to the central adjustment fund. The accumulated balance of a provincial pension fund is equal to the sum of the principal and interest of the accumulated balance of the previous year and the accumulated balance of the current period. When the current expenditure of the pension fund is greater than the revenue, there is a current fund deficit, and the provincial government needs to fulfill the guaranteeing responsibility to ensure the payment of pensions. F_t^i is used to represent the accumulated balance of the pension fund of province i in year t, then:

$$F_t^i = F_{t-1}^i \times (1+r) + \left[(AI)_{t-1}^i + CAFI_t^i - (AC)_{t-1}^i - CAFC_t^i \right] \times (1+r) \qquad (8)$$

3. Population Structure and Basic Parameter Hypotheses

3.1. Population Projections

3.1.1. Forecast of Urban Population Structure in Provinces

Based on the data of the sixth census, this paper uses the cohort-component method to predict the age and gender structure of population in 31 provinces (municipalities).

First, the number of newborns is obtained through the number of women of childbearing age and the corresponding fertility rate. $P_{t,x}^{f,j}$, $f_{t,x}^{j}$, $q_{x}^{f,j}$, and $l_{t,x}^{f,j}$ indicate the average female population of x years old, the corresponding fertility rate for women, mortality rate, and number of females. sr_t^j represents the proportion of male infants, j=1, 2 represents urban and rural areas, respectively; the number of newborns B_t^j can be expressed as: $B_t^j = \sum_{x=15}^{49} P_{t,x}^{f,j} \times f_{t,x}^{j} = \sum_{x=15}^{49} [l_{t,x}^{f,j} + l_{t,x-1}^{f,j} \times (1 - q_{x-1}^{f,j})] f_{t,x}^{j} / 2$. The age and gender structure of population for the following year is obtained on the basis of the previous year's population structure and mortality rate. Let $l_{t,x}^{m,j}$ and $q_{x}^{f,j}$ represent the number of males aged x and the corresponding mortality rate respectively, then $l_{t,x}^{m,j} = l_{t-1,x-1}^{m,j} \times (1 - q_{x-1}^{m,j})$, $l_{t,x}^{f,j} = l_{t-1,x-1}^{f,j} \times (1 - q_{x-1}^{f,j})$. Finally, the actual population structure of the provinces is obtained by taking into account the migration of rural population to towns in the province, the migration of the rural population of the province to the towns of other provinces, the migration of the rural population from other provinces to the towns of the province, and the migration of the urban population from other provinces to the province.

The sum of intra-and inter-provincial migrations is 0, with cross-border migration ruled out. The national urbanization rate is affected by the migration of rural population to towns and cities in the provinces, and the migration of rural population from other provinces to the cities and towns of the provinces, but not by the inter-provincial migration of the urban population to towns. According to international experience, the steady-state urbanization rate is 75%, and it is assumed that the average urbanization rate in China can reach this level in 2051. The province is a "net immigration" province of the rural population when the scale of rural population migrating to the province's towns is greater than that migrating to other provinces, while the province is a "net emigration" province of the rural population when the former scale is less than the latter. According to the sixth census on the scale of migration of provinces, Beijing, Tianjin, Inner Mongolia, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Guangdong, Hainan, Yunnan, Tibet, Qinghai, Ningxia, Xinjiang are the "net immigration" provinces, and the remaining 16 provinces are the "net emigration" provinces. Assume that the scale of intra-provincial migration of the rural population to the towns in "net immigration" provinces is twice the scale of migration to other provinces, then the future urbanization rate of cities such as Beijing, Tianjin and Shanghai is above average, between 90% and 100%. Future intra-and inter-provincial migrations are calculate based on the scale and proportion of migration in each province released by the sixth census. Assume that the migration structure remains unchanged in the future, population of 1 to 19 years of age, 20 to 49 years of age, and 50 to 89 years of age accounts for 19%, 19% and 62%, respectively, in the migrating population.[1] The

[1] According to 1992 statistics, the migrating population of 20 to 49 years of age as a proportion of the total migrating population is about 62.4%; the median age of the migrating population is 36.6 years old (Zhou, 2004), according to which the migrating population is appropriately revised in this paper.

age and gender structure of migrating population is the same as the corresponding age and gender structure of population. According to the relevant steps of the cohort-component method, the age and gender structure of population the provinces and towns can be calculated. According to the investigation report on the impact of the implementation of the universal two-child policy on family education, the sum of definite and indefinite intention to give birth to two children is 46.7%.[1] Number of qualified families under the "universal two-child" policy is simulated based on the "421" family microscopic simulation model.

3.1.2. F Forecast of the Population Structure of the Insured

Calculation Ideas. The numbers of employees and retirees covered by the basic pension of provinces (municipalities) in 2016 are obtained from *China Statistical Yearbook 2017*. For example, in 2016, the employees covered by the basic pension in Beijing were 12.712 million and the retired covered were 2.754 million. Assume that the population structures of employees and retirees covered by the basic pension in Beijing in 2016 are the same as that of the urban population in the corresponding age group in 2016 respectively, then the age and gender structure of the employees covered in Beijing in 2016 can be obtained. Based on the cohort component method, the age and gender structure of the employees covered in the next year can be obtained from the age and gender structure of insured employees and the mortality rate of each age in the previous year, of which the newly enrolled insured population is calculated from the provincial employed population and the coverage rate.

Urban Employed Population and Coverage Rate. The age of men and women in the employed population is mainly concentrated at 20~59 years and 20~54 years.[2] The proportion of the male and female employed population in the urban population of the provinces can be obtained from the sixth census, and assume that the proportion remains unchanged. Based on the structure of male population 20~59 years old and the structure of female population 20~54 years old, the age and gender structure of urban population employed can be obtained. The actual urban employed population is not fully involved in the pension insurance. According to sixth census, only the coverage rate of employees in Beijing and Shanghai is more than 90%, and assume that the provincial coverage rate gradually increases to 100%.[3] In the current context, our country will raise the retirement age. In view of the lack of specific implementation measures, this paper draws on the experience of international delayed retirement and divides the delayed retirement scheme into two categories, based on the distinction

[1] Details of the report: http://news.ifeng.com/a/20161224/50468025_0.shtml.

[2] According to the sixth census: the male employed population aged 20~59 accounted for 93.83% and the female employed population aged 20~54 years accounted for 90.9%.

[3] The coverage rate and growth rate of coverage in each province are detailed in Zeng (2017).

between gender differences: one is to increase the retirement age for women workers, cadres and men in turn at the pace of raising one year every two years with gender differences taken into account; the other is to increase the retirement age for both men and women at the same time. The increase in the retirement age will be introduced in 2022 until the retirement ages reaches 65.

3.2. Parameter Setting

3.2.1. Wage Growth Rate and Contribution Base

Based on data of the pension fund revenue, the number of people covered, and the average wage of employees in *China Statistical Yearbook* over the years, the average growth rate of contributory wages can be calculated. The average growth rate of contributory wages from 2000 to 2015 was about 11.66%, roughly the same as the growth rate of GDP per capita. Considering the downward trend in per capita GDP growth, and drawing on the calculations of economic growth under China's "new normal" by Yan and Liu (2015), it is assumed that the national average wage growth rate before 2020 is 7%, after 2020 it decreases by 0.5% every five years until 2066, when it falls to 2% and remains at that level. Based on the annual average national and provincial (municipal) social wage levels released in *China Statistical Yearbook* from 2006 to 2016, the proportion of the provincial annual social average wage in the national annual average social wage from 2006 to 2016 is calculated, and by assuming that the proportion remains unchanged, the average wage growth rate of the provinces (municipalities) is obtained.

Considering that the actual contribution base of pension funds is lower than the contribution base stipulated in the policy,[1] in order to better reflect the revenue of pension fund, this paper's calculation is based on the actual contribution base. Based on the annual revenue of pension insurance funds, the number of people covered by the pension fund, and the average wage of employees published in *China Statistical Yearbook*, it can be calculated that the actual contribution wages of pension insurance in the past 15 years account for about 80% of the real wages.[2] The General Office of the CPC Central Committee and the General Office of the State Council issued *The Reform Plan of Collection & Management of National Tax and Local Tax*, stipulating that the social insurance fees will be uniformly collected by the tax authorities since 2019. More efforts in the collection is conducive to raising the actual contribution

[1] The contribution base specified in the policy document is the average wage of employees on duty in the previous year.

[2] The actual contribution wage of pension insurance = The contribution revenue of pension funds÷the number of insured persons ÷ the contribution rate of pension insurance. The proportion of actual contributory wages for pension insurance in real wage from 2001 to 2016 is 87.8%, 93.6%, 90.8%, 88.4%, 86.5%, 86.8%, 87.7%, 84.1%, 79.1%, 75.5%, 75.3%, 73.2%, 70.4%, 67.6%, 69.7% and 71.1%, respectively.

base, so the paper will further simulate the effect of the central adjustment system as the contribution rate increases.

3.2.2. Contribution Rate, Proportion of Pension Payment and Number of Months Paid

The No.38 [2005] document of the State Council adjusted the contribution rates of insured workers and enterprises to 8% and 20%, respectively. The proportion of the basic old-age benefit paid for the elderly and the old is 70% and 20% respectively, and that for the new and the newcomer is 1% for each full year of the contributory period. The proportion of transitional pensions paid for the old and the new is 1.2%. Suppose this contribution rate remains the same in the future. According to the No.26 [1997] document and the No.38 [2005] document of the State Council, the number of months of personal account pensions paid to the old is 120. The number of months of personal account pensions paid to the new and the newcomer corresponds to the retirement age.

3.2.3. Per Capita Pension Growth Rate and Interest Rate

The average growth rate of per capita pensions accounted for 90% of the average annual growth rate of the contribution base from 2000 to 2017, and it is assumed that it remains unchanged in the future.[1] Considering that the current 1-year term deposit rate is between 1.5% and 3.5%, this paper takes an interest rate of 2.5%.

4. Simulation and Prediction

4.1. Scenario 1: The Operation of Provincial Funds without the Central Adjustment System

Based on equations (1)~(8) and parameter hypotheses, this paper first simulates the operation of the pension funds in the provinces (municipalities) from 2018 to 2098 if the adjustment system is not implemented, and years and the scale of the first accumulated deficit in the provincial pension funds are shown in Figure 1.[2] Prior to 2019, 14 provincial (municipal) basic pension funds were in deficit for the first time, and the time points of the first deficit in the provincial (municipal) basic pension funds after 2019 were relatively scattered. A deficit in the basic pension

[1] Based on the data published in *China Statistical Yearbook*, the average per capita pension growth rate and the contribution base grew by 12.88% and 11.6%, respectively, from 2000 to 2017.

[2] The starting time point of this paper is 2018. Taking into account that some provinces had seen more expenditure than revenue before 2018 years ago, the starting time point of figures in this paper is 2015 in order to fully show the situation when accumulated deficit of the basic pension funds appeared in the provinces for the first time.

fund first hit Heilongjiang in 2016, then Jilin and Liaoning in 2017. Qinghai, Sichuan, Chongqing, Guangxi, Hubei, Inner Mongolia and Tianjin experienced the deficit in the basic pension fund in 2018, and the scale of the deficit decreased in turn. In 2019, Gansu, Hainan, Hunan, and Jiangxi experienced the deficit of basic pension funds. A total of 26 provinces (municipalities) in the country experienced the accumulated deficit of pension funds in 2027 and before. Regionally, the basic pension funds in the central region has the first accumulated deficit earlier than in the eastern and western regions. In the eastern region, with the exception of Beijing and Guangdong, the remaining 9 provinces (municipalities) experience their accumulated deficit in the basic pension funds before 2026. The provinces (municipalities) in the central region experience their first accumulated deficit in the pension funds before 2027. The retirement ratio[1] of provinces (municipalities) with a later accumulated deficit of in the pension funds is significantly smaller than that of the provinces where the accumulated deficit occurs earlier. A lower retirement ratio is conducive to improving the sustainability of basic pension funds. For example, the retirement ratio of Yunnan in 2017 is 0.7902, and that of Tibet in 2077 is 0.7804, while that of Heilongjiang in 2018 had reached 0.7954. The first deficit will hit the pension fund of Tibet in 2092.

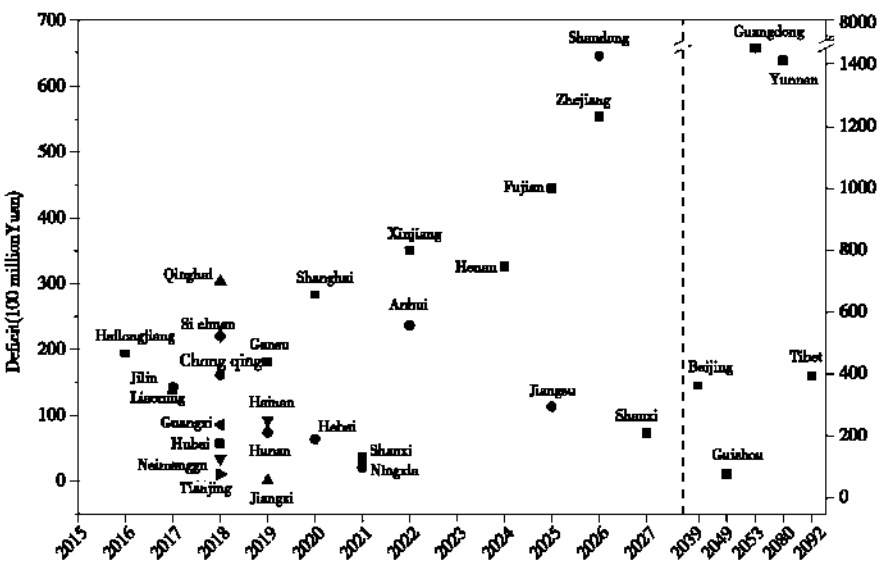

Figure 1. Time Points and Scale of First Accumulated Deficit in Pension Funds of the Provinces (Municipalities) under Scenario 1

[1] The retirement ratio is the number of retirees divided by the number of incumbents, which reflects the local demographic structure and the pressure on the current generation to raise retirees, and the decrease in the retirement ratio is conducive to the increase in the fund revenue and the reduction of expenditure, that is, to the sustainability of the fund.

Of all the provinces (municipalities), the accumulated deficit in the basic pension fund hits Tibet the latest, and the accumulated deficit in Tibet is the smallest, with a size of 454.2 billion yuan by 2098. The basic pension fund in Tibet remains strong and sustainable, on the one hand because of the high contribution rate in Tibet and, on the other hand, because of the absence of fertility restrictions in ethnic minorities and the high level of fertility in the Tibetan region. Although the level of economic development in Yunnan is not high, its basic pension fund has a cumulative deficit at a later point, and the deficit lasts for only 18 years. Although the accumulated deficit in the basic pension fund appears relatively late in Guangdong and Guizhou, the accumulated deficit is relatively large, which shows that there is no absolute positive relationship between the time point of occurrence and the scale of the accumulated deficit. The sustainable operation of Tibet's basic pension fund requires the shortest period of financial subsidy, followed by Yunnan and Guizhou. The number of years in need of financial subsidy for the operation of the basic pension fund in the western region is less than that in the central and eastern region. The accumulated deficit in the basic pension fund in the eastern, central, and western region is 1063 trillion yuan, 568 trillion yuan, and 414 trillion yuan respectively. It can be seen that although the accumulated balance of the basic pension fund in the eastern region is higher at this moment, when the deficit appears, the total size of the deficit is much higher than the size of the deficit in the central and western region. The accumulated deficits in the basic pension funds of Liaoning, Jiangsu, Zhejiang, Shandong and Guangdong in the eastern region exceeds the mean of the accumulated deficit of the eastern regional funds. The accumulated deficits in the basic pension funds of Guangxi, Chongqing and Sichuan in the western region exceeds the mean of the accumulated deficit of the western regional funds. The accumulated deficits in the basic pension funds of Heilongjiang, Henan, Hubei and Hunan in the central region exceeds the mean of the accumulated deficit of the central regional funds.

4.2. Scenario 2: Operation of Provincial Funds under the Central Adjustment System Alone

With the introduction of the central adjustment system, the first year of the deficit in the provincial (municipal) basic pension fund and the change in its scale are shown in Figure 2. The central adjustment system has less impact on the time point of the first accumulated deficit in the provinces (municipalities), and the impact on the scale of the deficit is relatively obvious. According to marketization rankings published by Wang *et al.* (2017), the top one was Shanghai, Zhejiang, Jiangsu,

Guangdong, Beijing, Fujian from 2008 to 2014[1]. Except Guangdong, under the central adjustment system, these high-marketization provinces (municipalities) see an increase in the scale of the first deficit in basic pension funds. This is due to a marked increase in the proportion of retired people in Guangdong province after 2043, with a positive net disbursement of central adjustment, which increases the revenue of the fund.[2] It can be seen that after the implementation of the central adjustment system, the financial sustainability of the basic pension fund in the western region and regions with a low degree of marketization is improved, while the financial sustainahility of the basic pension fund in the eastern and regions with the high degree of marketization is reduced. After the introduction of the adjustment system, the scale and changes of the accumulated deficit in the provincial (municipal) funds up to 2098 under different handover proportions are shown in Figure 3.

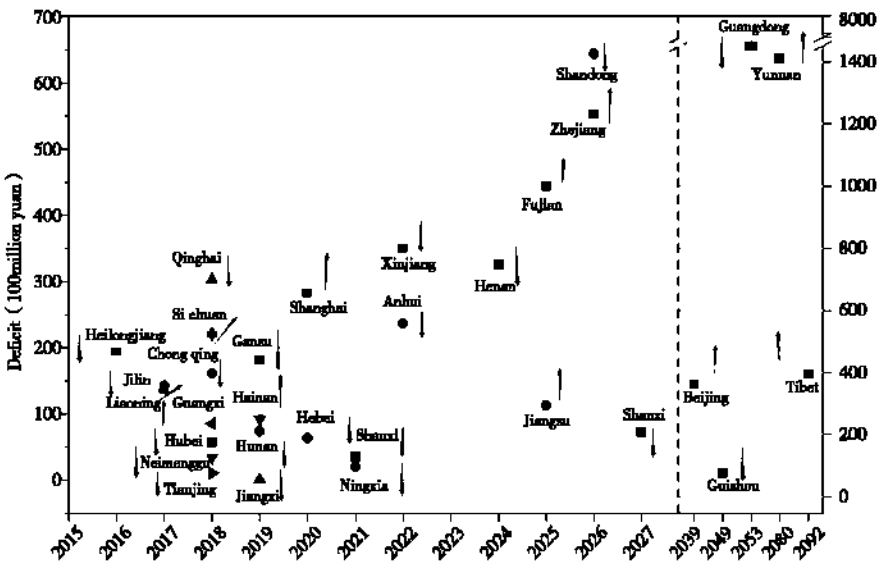

Figure 2. Changes in the Time Points and Scale of the Basic Pension Fund in Eastern Provinces (Municipalities) after the Introduction of the Central Adjustment System

Note: ↑ indicates that the scale of the first deficit in the basic pension fund has risen; ↓ indicates that the first deficit in the basic pension fund has declined; ↗ indicates that the first deficit in the basic pension fund has been delayed and the first deficit has risen.

[1] Wang *et al.* (2017) define the degree of marketization in the region by measuring the degree of change in economy, society, law, information and market, and the region with fast marketization process has relatively perfect mechanism and high level of economic development. http://www.sisixiang.com/data/99120.html.

[2] The positive net disbursement means that the province receives a higher disbursement of the central adjustment fund than the handover.

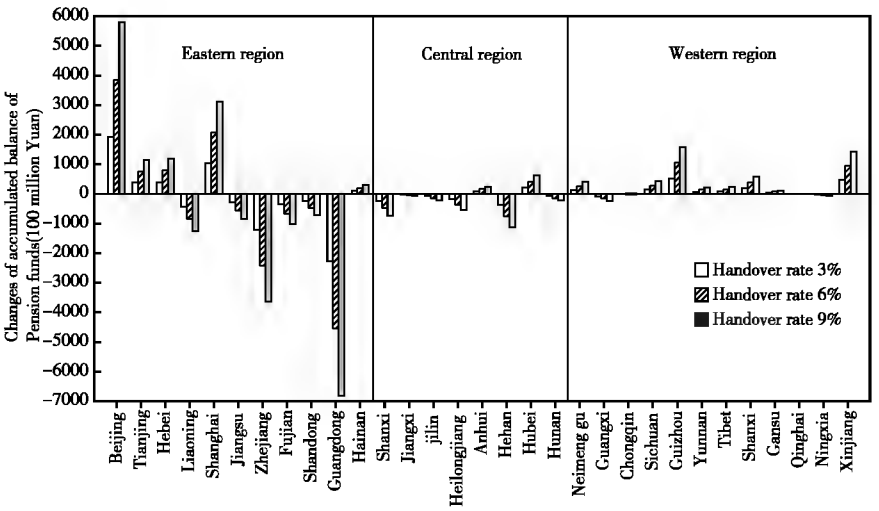

Figure 3. Changes in the Accumulated Deficit in the Basic Pension Funds of the Provinces (Municipalities) under Different Handover Proportions

According to the central adjustment system with the current handover proportion, provinces (municipalities) with accumulated deficit changes in the basic pension funds higher than 10 billion yuan include Beijing, Shanghai, Zhejiang, and Guangdong; provinces (municipalities) with accumulated deficit changes higher than 10 billion yuan but less than 20 billion yuan are Inner Mongolia, Heilongjiang, Hainan, Sichuan, and Shaanxi; provinces (municipalities) with accumulated deficit changes less than 10 billion yuan are Jilin, Anhui, Jiangxi, Hunan, Guangxi, Chongqing, Yunnan, Tibet, Gansu, Qinghai, and Ningxia; the remaining provincial (municipal) funds have an accumulated deficit change between 20 billion yuan and 50 billion yuan. Because of the different development status of the basic pension fund in each province (municipality), there is no one-way relationship between the relative level and the absolute level affected by the central adjustment system. The accumulated deficit of the fund of Tibet has increased by 8 billion yuan as a result of the central adjustment system, but the rate of change is 1.7642%, which is the largest relative change among regions. The impact on the accumulated deficits of Chongqing and Qinghai's funds is weaker, less than 0.001%. It is due to the relatively small population of Qinghai and the large number of ethnic minorities, due to the lack of fertility restrictions of ethnic minorities, and due to the high contribution rate that the net allocation is low. Chongqing is a city of net emigration, and its net emigration is higher than that of Guizhou and Yunnan. The actual contribution rate in the western region is higher than that in the central and eastern regions. When the handover proportion doubles, both the absolute level and relative level of the change

in the accumulated deficit of the basic pension fund in each province (municipality) increase. Increasing the handover proportion exacerbates the accumulated deficit of the basic pension funds in Beijing, Tianjin, Hebei, Inner Mongolia, Shanghai, Anhui, Hubei, Hainan, Chongqing, Sichuan, Yunnan, Guizhou, Tibet, Shaanxi, Gansu, Qinghai and Xinjiang, and reduces the accumulated deficit of the basic pension funds in 14 other provinces (municipalities).

4.3. Scenario 3: Operation of Provincial Funds under the Central Adjustment System Combined with Delayed Retirement

With the combination of the delayed retirement scheme and the central adjustment system, the scale and changes of the accumulated deficit of the basic pension funds in each province (municipality) are shown in Figure 4.

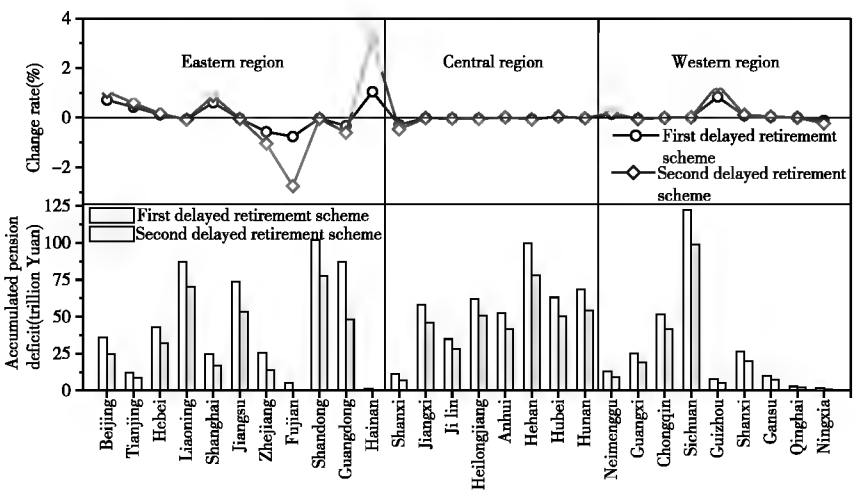

Figure 4. Scale and Changes of Accumulated Deficits of Basic Pension Funds in Provinces (Municipalities) under the Delayed Retirement Scheme

Under the first delayed retirement scheme, the accumulated deficit of the basic pension funds in the eastern, central and western regions decreases by 53.25%, 20.95% and 36.96% respectively compared with the accumulated balance under the non-delayed retirement. It can be seen that delayed retirement has the greatest reduction effect on the accumulated deficit of the basic pension fund in the eastern region, followed by central and western region. After the implementation of the delayed retirement policy, the gap between the accumulated deficit scale of the basic pension funds between the eastern and central regions has narrowed, but the accumulated deficit of the basic pension funds in the western region is still the lowest. Therefore, if the pilot of the delayed retirement scheme starts in the eastern region or the

implementation of the delayed retirement is strengthened in the eastern region, the effect of relieving the pressure on the basic pension funds is obvious.

Under the second delayed retirement scheme, the absolute level of the accumulated deficit changes in the basic pension funds of the provinces (municipalities) is lower than that under the first delayed retirement scheme, but higher than the absolute level of the accumulated deficit changes in the basic pension funds under the central adjustment system alone, and the gap between the eastern, central, and western regions has narrowed. For Yunnan and Tibet with a lower retirement, the basic pension funds in Yunnan and Tibet will no longer have the current deficit and the accumulated deficit after the increase of the retired age. The effect of delayed retirement scheme II is more pronounced if it is aimed only at alleviating the accumulated deficit of the national pension funds. Under delayed retirement scheme I, after the implementation of the central adjustment system, the average change rate of the accumulated deficit of the basic pension funds in the provinces (municipalities) is 0.2451%. Under the scheme two, the central adjustment system is implemented, and the average change rate of the accumulated deficit of the basic pension funds in provinces (municipalities) is −0.28552%, which shows that the implementation of the central adjustment system under scheme II enhances central adjustment and is conducive to reducing the accumulated deficit. It can be seen that the implementation of a central adjustment system in the context of delayed retirement could enhance the degree of adjustment of the central adjustment system.

4.4. Scenario 4: Operation of Provincial Funds under the Central Adjustment System Combined with the Reform of Institutions Involved in the System

After the social insurance fee is submitted to the tax department for uniform collection, the actual contribution rate of the future pension insurance will be improved. The impact of the central adjustment system on the pension insurance funds of the provinces (municipalities) when the subscription rate is 85% and 95% respectively is simulated, and the results are shown in Figure 5.

Under the two levels of contribution rate, the accumulated deficits of the provincial (municipal) pension funds change in the same direction. After increasing the contribution rate, the change rate of accumulated deficits of 16 provincial (municipal) pension funds in the country is positive, among which, there are 5 provinces (municipalities) in the central region and 9 provinces (municipalities) in the western region. When the contribution rate reaches 95%, the change rate of accumulated deficits in pension funds of Beijing and Guizhou is close to 0.04%, higher than that of other provinces and municipalities of the country, and the net handover amount is increased by 19.3 billion yuan and 5.3 billion yuan respectively. Increasing the contribution rate will increase the amount of handover to the central

adjustment fund as well as the contribution revenue of the pension funds, and for regions with lower retirement, the disbursement of the central adjustment will be relatively reduced. Therefore, although there is no doubt about the promotion effect of increasing the subscription rate on improving the overall sustainability of the national pension funds, the actual impact on the provincial pension funds under the central adjustment system is affected by multiple factors such as local retirement ratio and wage level.

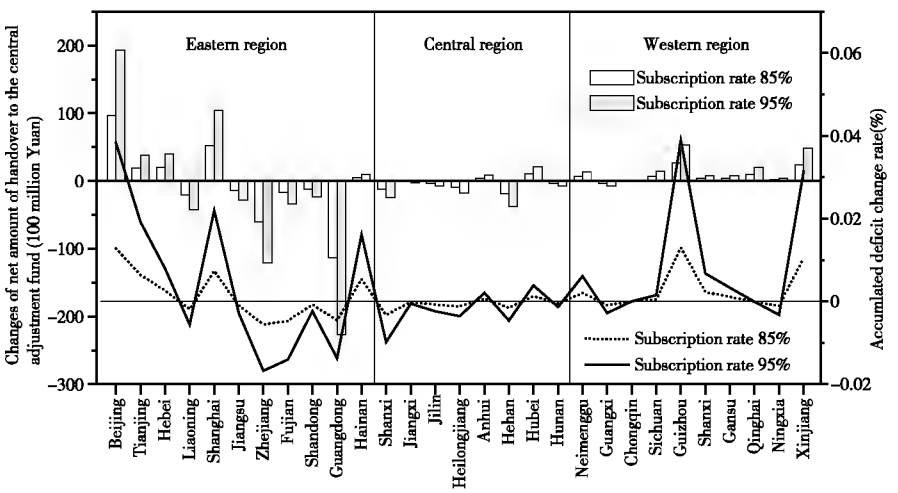

Figure 5. Changes in the Net Handover of Provincial (Municipal) Pension Funds and the Change Rate of Accumulated Deficits with the Contribution Rate at 85% and 95%, Respectively

5. Conclusions and Recommendations

A central adjustment system for basic pension funds of enterprise employees was officially established on July 1, 2018. This paper sets up an actuarial model to simulate the operation of provincial (municipal) basic pension funds under different handover proportion, delayed retirement policy and subscription rate, and obtains the following conclusions. (1) If the central adjustment system is not implemented, accumulated deficits of pension funds hit 26 provinces (municipalities) in the country in and before 2027. The time of first accumulated deficit occurs earlier in the central region than that in eastern and western regions. Compared with those in the central and eastern region, for fewer years provinces (municipalities) in the western region need financial subsidies for their basic pension funds. (2) After the implementation of the central adjustment system, 19 provinces (municipalities) can see a decline in the scale of first accumulated deficit of the basic pension funds. The financial sustainability of pension funds in the western and region with a low degree of marketization is improved, while that in the eastern and region with a high degree of marketization decreases.

(3) The increase in the handover proportion will enhance the adjustment effect of the central adjustment fund. (4) The adjustment effect of the central adjustment system is positively affected by the implementation of the delayed retirement policy. The implementation of the central adjustment system under the background of delayed retirement can enhance the effect of adjustment. (5) Under the current handover and disbursement of the central adjustment fund, the increase in the contribution rate will reduce the net handover to the central adjustment fund in the areas with a higher retirement ratio, thereby increasing the revenue of the fund in the region. It can be seen that the implementation of the central adjustment system is conducive to the circulation of pension funds among the provinces (municipalities), and to improve the sustainability of pension funds in the provinces where pension payments are currently in trouble. But the pool of funds from the central adjustment fund will flow out of certain provinces while flowing to certain provinces. Based on the above empirical analysis results, in order to ensure the implementation effect of the central adjustment system and the sustainability of the basic pension funds in each province (municipality), the following suggestions are put forward.

First, the central adjustment system should be implemented initially with a focus on ensuring the implementation of the system. The purpose of the central adjustment system is to strengthen the inter-provincial mutual assistance and achieve a more equitable and sustainable basic pension system. However, because the overall basic pension has not been fully implemented to the provincial co-ordination and the provincial centralized information system has not been fully established, the initial implementation of the central adjustment system should focus on ensuring that the provinces (municipalities) handover of capital to the central adjustment fund in time and in full. With the improvement of the management and informationization level of the basic pension funds in each province (municipality), the central adjustment system is further reformed and perfected. Only when it has a "steady start", can the follow-up be "steadily improved".

Second, the central adjustment system should take into account both fairness and efficiency. The central adjustment system can alleviate the problems of unfair and unbalanced development in various regions by adjusting the inter-provincial flow of funds, but there is no "guarantee" responsibility for inter-provincial finance, and inter-provincial mutual assistance is not equal to inter-provincial guarantee. Therefore, it cannot be expected that the gap will be bridged through a central adjustment fund.

Third, a dynamic adjustment mechanism including indicators such as the central adjustment system parameters, retirement age, and wage level should be established. The calculation results show that the way of delayed retirement affects the actual adjustment effect of the central adjustment system. At present, China's delayed retirement scheme has not been officially launched, therefore, the establishment of an adjustment mechanism with the delayed retirement scheme should be taken into

account to improve the central adjustment system. At the same time, the effect of the central adjustment system on the basic pension fund of each province (municipality) is affected by the actual local subscription rate and wage level.

References

Ai, H., Zhang, Y., Yang, C. Y., & Wu, Y. D. (2012). The Financial Sustainability of Coordination Account of China's Pension—Calculation Based on Open Systems. *Finance & Economics (Caijing Yanjiu)*, 2, 91-101.

Banks, J., & Blundell, R. (2005). Private Pension Arrangements and Retirement in Britain. *The Journal of Applied Public Economics*, 26 (1), 35-53.

Bovenberg, A. L. (2003). Financing Retirement in the European Union. *International Tax and Public Finance*, 10 (6), 713-734.

Breyer, F., & Hupfeld, S. (2010). On the Fairness of Early-Retirement Provisions. *German Economic Review*, 11 (1), 60-77.

Cipriani, G. P., & Pascucci, F. (2018). Pension Policies in a Model with Endogenous Fertility. IZA Working Paper, No.11511.

Cremer, H., & Pestieau, P. (2003). The Double Dividend of Postponing Retirement. *International Tax and Public Finance*, 10 (4), 419-434.

Engelen, E. (2003). The Logic of Funding European Pension Restructuring and the Dangers of Financialisation. *Environment and Planning A: Economy and Space*, 35 (8),1357-1372.

Gong, F., & Yu, J. L. (2015). Population Ageing, Tax Burden and Financial Sustainability. *Economic Research Journal (Jingji Yanjiu)*, 8, 16-30.

Gui, X. (2015). Problems and Suggestions in the Construction of China's Social Elderly Care System. *Economic Review (Jingji Zongheng)*, 6, 100-103.

Holzmann, R., & Stiglitz, J. E. (eds.). (2001). *New Ideas About Old Age Security: Toward Sustainable Pension Systems in the 21st Century*. Washington, DC: World Bank Press.

Kang, C. K. (2012). Increasing the Contribution Rate or Delaying Retirement?, *Statistical Research (Tongji Yanjiu)*, 12, 59-68.

Liu, X. L. (2014). The Gap and Sustainability of Pension Insurance in China. *China Industrial Economics (Zhongguo Gongye Jingji)*, 9, 25-37.

Machnes, Y. (2003). Stochastic Dominance of Pension Plans. *International Review of Economics*, 54(1), 49-59.

Rao, Q., Jiang, W. C., & Jiang, Y. (2005). On Increasing the Retirement Age of Pension in China—A Quantitative Analysis of the Impact of Contribution Rate under

Financial Balance. *Research on Financial and Economic Issues (Caijing Wenti Yanjiu)*, 1, 64-70.

Samuelson, P. A. (1969). Lifetime Portfolio Selection by Dynamic Stochastic Programming. *The Review of Economics and Statistics*, 51(3), 239-246.

Vogel, E., Ludwig. A., & Börsch-Supan, A. (2017). Aging and Pension Reform: Extending the Retirement Age and Human Capital Formation. *Journal of Pension Economics and Finance*. 6 (1), 81-107.

Wang, H. Q. (2012). Model Choice of Pension Insurance in China and Forecast of Fund Gap. *Statistics and Decision (Tongji Yujuece)*, 19, 154-157.

Wang, X. J. (2002). Analysis of the Financial Sustainability of China's Pension Insurance System. *Market and Population Analysis (Shichang Yu Renkoufenxi)*, 2, 26-29.

Wang, X. L., Fan, G., & Yu, J. W. (2017). *Report on Provincial Marketization Index in China 2016.* Beijing: Social Sciences Academic Press. (in Chinese)

Weller, C. (2002). Don't Raise the Retirement Age. *Challenges*, 45 (1), 75-87.

Yan, K., & Liu, C. J. (2015). Calculation of Reasonable Economic Growth Rate in the New Normal in China. *Finance & Trade Economics (Caimao Jingji)*, 1, 17-26.

Yang, Z. G. (2008). Enterprise Employee Basic Pension, Pension Replacement Rate and Population Growth Rate. *Statistical Research (Tongji Yanjiu)*, 5, 38-42.

Yu, H., & Zhong, H. Q. (2009). Analysis of the Sustainability of China's Basic Pension System—Calculations from Three Simulations. *Journal of Finance and Economics (Caijing Yanjiu)*, 9, 26-35.

Yu, L. R. (2012). Can Increased Retirement Age Improve the Payment of the Pension Fund? *South China Journal of Economics (Nanfang Jingji)*, 6, 74-84.

Zeng, Y. (2017). *Sustainability of the Basic Medical Insurance System for Urban Employees in China.* Beijing: Economic Science Press. (in Chinese)

Zeng, Y., Zhang, X. J., & Liu, L. C. (2016). From "Selective Two-Child" to "Universal Two-Child": Can China's Pension Payment Crisis Be Resolved? *Finance & Trade Economics (Caimao Jingji)*, 7, 133-146.

Zhang, Y. (2011). Delayed Retirement Age and Pension Insurance Balance: Mechanism and Policy Effect. *Journal of Finance and Economics (Caijing Yanjiu)*, 7, 4-16.

Zhou, W. B. (2004). *Actuarial Theory, Method and Application of Social Pension Insurance.* Beijing: Economy & Management Publishing House. (in Chinese)