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Research Article

Effects of Land Finance on Resource Misallocation in Chinese Cities during 2003–2017: A Dynamic Panel Econometric Analysis

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Based on the review of previous studies and the analysis of the dynamic changes of misallocation of capital and labour in China during 2003–2017, this study has adopted the Dynamic Panel Econometric Model to investigate the effects of land finance on resource misallocation at national, regional, and urban tier levels. The results show that resource misallocation has a significant feature of temporal dependence, while the misallocations of capital and labour in China have experienced different dynamic changes during the investigation period. In addition, land finance has aggravated resource misallocation at the national level, while spatial heterogeneity is established at regional and urban tier levels, which deserves much more attention in further studies. The conclusions will not only provide a relatively scientific and accurate reference for the effective allocation of production factors but also be conducive to the coordinated and sustainable development of China's economy in the long run.

1. Introduction

Since the reform and opening up in 1978, China's marketization has improved significantly, while there still exists the mechanism barrier of resource misallocation so far [1]. Due to the fiscal decentralization in 1994, there was sharp decline in local revenue, while the responsibilities of local expenditure basically remained unchanged, which led to the high fiscal pressure and local governments had to seek other revenue sources [2–5]. Since land leasing revenue does not belong to the budgetary revenues and should not be shared with the central government, it has become one of the most important solutions to promote urbanization, industrialization, and modernization in China [6, 7]. As a result, local governments have heavily relied on land conveyance income in recent years, which has accounted for 53.5% of the local governments' total revenue during 2000–2017 [8, 9]. Hence, land-centered development model has been the most remarkable feature in China [10, 11]. Therefore, considerable academic attention has been raised for land finance (*tudi caizheng*) to check the security of China's economic achievements, because it enables local governments to capture land value and spend it on urban and rural infrastructure [12]. Although plenty of literatures have evaluated the outcomes and impacts of land finance, few have seriously addressed its impacts on resource misallocation in China, which has aroused our interest and become the initiative aspiration of this study.

Under the parallel system of fiscal decentralization and administrative centralization, Chinese central government has delegated the pricing power of production factors to local governments, which eventually leads to the distortion of factor prices and the existence of resource misallocation [13, 14]. As a result, the factor market in China was still incomplete and the free flow of factors was restricted until now [15]. For instance, under the traditional extensive development model, the high-efficient enterprises cannot absorb more production factors, while the low-efficient

enterprises still exist, which leads to the actual output being lower than the potential optimal output and the loss of total factor productivity and results in misallocation of capital and labour eventually [16–18].

At present, some scholars have paid attention to the measurement and causes of resource misallocation in China by using provincial-level data [15]. However, considering that most economic activities take place in cities, the utilization of city-level data is necessary to capture the spatial heterogeneity [19, 20]. In addition, the resource misallocation among different regions and urban tiers has not only led to the low-efficiency of resource allocation but also brought about challenges to the coordinated and sustainable development of China's economy in the long term; thus it is important and necessary to investigate the spatial distribution pattern of misallocation of capital and labour, respectively [21, 22]. Furthermore, most empirical studies in the field of econometric analysis have adopted the OLS method, while the omission of the dynamic (temporal lag) effects may lead to biased or inconsistent results [15]. Last but not least, considering the probability of spatial heterogeneity, it is essential to test the robustness by using different studying samples [20].

Compared with the existing literature, this study has four contributions, which may shed light on further studies. Firstly, different from the former researches by using provincial-level data, this study has locked the research objects into the city-level data, which can better reveal the effects of land finance on resource misallocation in China. Secondly, this study has illustrated the spatial distribution pattern of misallocation of capital and labour, respectively, which can further clarify the dynamic changes of resource misallocation during the investigation period. Thirdly, this study has adopted the Dynamic Panel Econometric Model to explore the effects of land finance on misallocation of capital and labour in China, which will not only help to reveal the consequence of land finance and the temporal dependence of resource misallocation but also enrich the theories of coordinated and sustainable development. Last but not least, this study has comprehensively investigated the effects of land finance on resource misallocation at national, regional, and urban tier levels, which can provide inspiration for scientific and accurate policymaking, and it is one of the practical contributions to promote effective allocation of production factors.

The remainder of this study is organized as follows. The second section has provided a brief introduction of variables selection, data source, and model specification. The dynamic changes of resource misallocation in space are illustrated in the third section. It is then followed by the empirical analysis of financial development affecting resource misallocation at national, regional, and urban tier levels. The final part provides the main conclusions, puts forward the policy implications, and informs the research prospect. To exhibit the studying steps of the work progress intuitively, this study has adopted a flowchart diagram in a graphical way (Figure 1).

2. Variables Selection, Data Source, and Model Specification

2.1. Variables Selection

2.1.1. Resource Misallocation. "Effective allocation" refers to an ideal state of the Pareto optimality, where resource can flow freely, while resource misallocation means a deviation from the optimal allocation state correspondingly [23]. Based on and improving the study of Bai and Liu [15], this study has calculated the resource misallocation of capital and labour, respectively. Firstly, this study has estimated the marginal output of capital by using the Cobb and Douglas production function.

$$Y_{it} = AK_{it}^{\beta_{Ki}} L_{it}^{1-\beta_{Ki}}, \tag{1}$$

$$K_{it} = \frac{I_{it}}{P_{it}} + (1-\delta)K_{i,t-1}, \tag{2}$$

where Y_{it} denotes the local GDP in city i at year t, which is converted to constant price GDP with 2003 as the baseline year by using the provincial consumer price index; A denotes the Solow value; β_{Ki} denotes the marginal output of capital; K_{it} denotes the capital stock, which was calculated by using the perpetual inventory method in equation (2); L_{it} denotes the number of employed people at year end in urban entities in each city. I_{it} denotes the total investments in fixed assets on the current level; P_{it} denotes the provincial price index (Due to the lack of urban data, this study has replaced it by the corresponding provincial price index for investments in fixed assets) for investments in fixed assets with 2003 as the baseline year; δ denotes the depreciation rate, which has been set as 9.6% by referring to the existing literature [24]. After the treatment of logarithm, equation (1) can be converted into equation (3) as follows:

$$\ln\left(\frac{Y_{it}}{L_{it}}\right) = \ln A + \beta_{Ki}\ln\left(\frac{K_{it}}{L_{it}}\right) + \mu_i + \lambda_t + \varepsilon_{it}. \tag{3}$$

Due to the differences in economic and technological levels, the marginal output may not be consistent in each city. Therefore, this study has estimated the cross section coefficients of β_{Ki} by using the least-squares dummy variable (LSDV) method. The estimation results indicate that all those cross section coefficients of β_{Ki} are significant in statistics; thus the utilization of the least-squares dummy variable (LSDV) method is proper. Finally, the resource misallocation of capital and labour was calculated as follows:

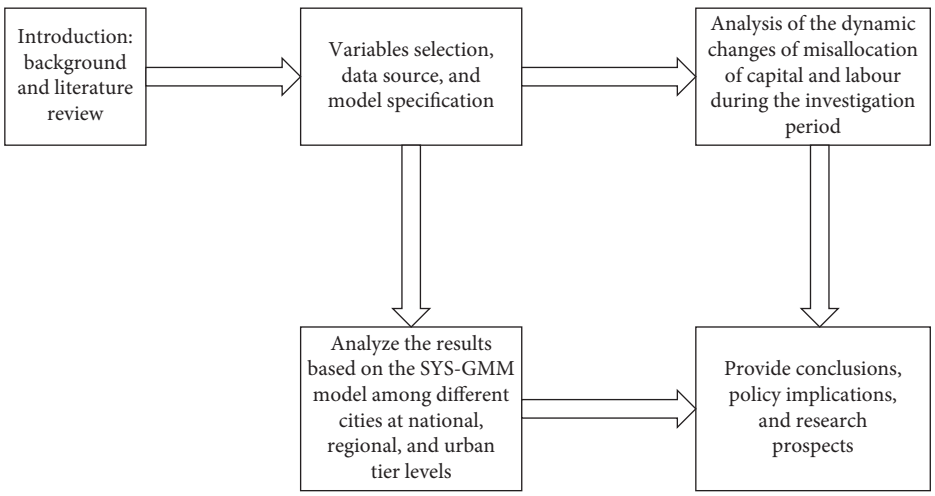

Figure 1: Flowchart of the work progress.

$$\begin{aligned}
\beta_K &= \sum_{i=1}^{N} s_i \beta_{Ki}, \\
\beta_L &= \sum_{i=1}^{N} s_i (1 - \beta_{Ki}), \\
s_i &= \frac{p_i y_i}{Y}, \\
\gamma_{Ki} &= \frac{(K_i/K)}{(s_i \beta_{Ki}/\beta_K)}, \\
\gamma_{Li} &= \frac{(L_i/L)}{(s_i (1 - \beta_{Ki})/\beta_L)}, \\
\mathrm{Kmis}_i &= \frac{1}{\gamma_{Ki}} - 1, \\
\mathrm{Lmis}_i &= \frac{1}{\gamma_{Li}} - 1,
\end{aligned} \tag{4}$$

where β_K denotes the contribution value of weighted capital output, β_L denotes the contribution value of weighted labour output, s_i denotes the share of local GDP in the whole GDP, γ_{Ki} denotes the absolute distortion factor of capital price, γ_{Li} denotes the absolute distortion factor of labour price, Kmis_i denotes the capital misallocation in city i, and Lmis_i denotes the labour misallocation in city i. If the value of capital misallocation or labour misallocation is greater than 0, it indicates the establishment of insufficient allocation; if the value of capital misallocation or labour misallocation is less than 0, it indicates the establishment of excessive allocation; and the greater absolute value means the graver resource misallocation. Specifically, all the absolute values of capital misallocation and labour misallocation have been introduced into the regression equations.

2.1.2. Land Finance. This study adopts the shares of land leasing revenue to GDP to be the proxy indicator of land finance, because the land leasing revenue can accurately measure the scale of local government's financial income from land transfer and belongs to extrabudgetary revenue or government fund revenue, which has left greater discretionary space for local governments, while the taxable revenue related to land such as farmland occupation tax belongs to the general budget income with rigid expenditure.

2.1.3. Control Variables. According to the literature review and data availability, the control variables that may affect resource misallocation include government intervention, foreign direct investment, industrial structure, infrastructure, and urbanization. (1) Government intervention (GI) is measured by the shares of fiscal expenditure to GDP. (2) Foreign direct investment (FDI) is measured by the shares of the actual foreign investment to GDP, and, with the use of the exchange rate between CNY and USD of the corresponding year, this study has transformed this variable to constant price with 2003 as the baseline year. (3) Industrial structure (IS) is measured by the shares of GDP for secondary industry. (4) Infrastructure (INF) is measured by the per capita road area. (5) Urbanization rate (UR) is measured by the urbanization rate of permanent resident population. Specifically, the data description of all logarithmic variables is reported in Table 1.

2.2. Data Source. Samples in this study are panel data from 285 prefecture-level and above cities for the period of 2003–2017, and the data sources include the China City Statistical Yearbook, the China Urban Construction Statistical Yearbook, and the China Land and Resources Almanac.

2.3. Model Specification. In order to investigate the impact of land finance on resource misallocation, this study has constructed the basic equation by adopting the OLS Model. Specifically, for processing potential heteroscedasticity of the

Table 1: Summary statistics.

Variables	Unit	Observation	Mean	S.D.	Min	Max	Skewness	Kurtosis
$\ln RM_{it}$_Kmis	—	4275	1.087	0.802	−5.386	4.029	−1.272	5.291
$\ln RM_{it}$_Lmis	—	4275	−1.773	1.145	−8.693	2.829	−1.033	2.211
$\ln LF_{it}$	%	4275	3.633	0.688	−3.881	4.726	−2.142	8.888
$\ln GI_{it}$	%	4275	2.887	0.655	0.321	6.593	0.547	1.858
$\ln FDI_{i}$	%	4275	0.105	1.372	−8.333	4.350	−0.814	1.003
$\ln IS_{it}$	%	4275	3.849	0.252	2.197	4.511	−1.055	2.377
$\ln INF_{it}$	m^2	4275	2.195	0.660	−3.997	5.636	−0.448	2.711
$\ln UR_{it}$	%	4275	3.817	0.583	1.528	5.663	−0.552	−0.470

regression model setting, all variables were used as their logarithmic term.

$$\ln RM_{it} = a_0 + \beta \ln LF_{it} + \sum \gamma_j x_{ijt} + \mu_i + \lambda_t + \varepsilon_{it}, \quad (5)$$

where RM_{it} denotes the resource misallocation in city i at year t, a_0 denotes the constant term, LF_{it} denotes the land finance in city i at year t, β denotes the coefficient of land finance, x_{ijt} denotes a series of control variables in city i at year t, γ_j denotes the corresponding coefficient of control variables, μ_i denotes the city-fixed effect, λ_t denotes the year-fixed effect, and ε_{it} denotes the error term.

Considering the impact of economic inertia, resource misallocation may have a temporal dependence; that is, previous resource misallocation may have a significant impact on that of current period. Hence, this study has constructed the Dynamic Panel Econometric Model, which can further control the endogeneity caused by missing variables and other issues and improve the accuracy of the estimation results. The functional formula can be expressed as follows:

$$\ln RM_{it} = a_0 + a_1 \ln RM_{i,t-1} + \beta \ln LF_{it} + \sum \gamma_j x_{ijt} + \mu_i + \lambda_t + \varepsilon_{it}, \quad (6)$$

where $RM_{i,t-1}$ denotes the first-phase lag term of resource misallocation and a_1 denotes the corresponding coefficient of it.

Generally, the first-differenced GMM (DIFF-GMM) and the system GMM (SYS-GMM) are the two most widely used methods of the Dynamic Panel Econometric Model, mainly because they can control the potential endogenous and heteroskedastic problems of variables. Compared with the DIFF-GMM, the SYS-GMM can improve the validity and consistency of the estimation results, because it contains the difference estimation and the level estimation in a system simultaneously and adds the lagging difference variable as an instrumental variable in the level equation [25]. Moreover, the GMM model (including both DIFF-GMM and SYS-GMM) can be calculated by a one-step or two-step method according to its weight matrix, and the latter is not easily interfered with by heteroscedasticity. Hence, this study has conducted the two-step method to estimate the Dynamic Panel Econometric Model.

In order to meet the preconditions of no second-order sequence correlation and the exogeneity of the tool variables, this study has conducted the Arellano-Bond test (including AR(1) and AR(2)) to investigate the potential serial correlation problem of residuals and the Sargan test to check the validity of instrumental variables [15]. The null hypothesis of AR(2) means there is no second-order sequence correlation, and the null hypothesis of the Sargan test means the instrumental variables with first-order lag are effective, with no overrecognition constraint. If the P values of AR(2) and Sargan are greater than 0.1, the above two preconditions of GMM are considered to be established, and the estimation results are consistent and reliable.

3. The Dynamic Changes of Resource Misallocation in Space

To illustrate the dynamic change of the spatial distribution pattern of capital misallocation in an intuitive way, the capital misallocations in 2003 and 2017 are presented in Figure 2. As Figure 2 illustrates, the spatial distribution pattern of market misallocation is relatively stable during the investigation period, and most of the insufficient allocation cities locate in the coastal areas, especially in the Bohai Sea Economic Circle, the Yangtze River Delta, and the Pearl River Delta. Due to the high level of marketization in the above-mentioned areas, the capital price is relatively higher than the national average level, so the actual input of capital is lower than the theoretical value of effective allocation, which indicates insufficient allocation of capital. However, most cities are in the state of excessive allocation of capital, which indicates the utilization efficiency of capital in those cities is relatively low, so it is necessary and important to improve the utilization efficiency of capital in those cities through deepening the reform of market mechanism.

Correspondingly, to illustrate the dynamic change of the spatial distribution pattern of labour misallocation in an intuitive way, the labour misallocations in 2003 and 2017 are presented in Figure 3. As Figure 3 illustrates, the spatial distribution pattern of labour misallocation has changed remarkably during the investigation period; many cities in the central and western regions have changed from excessive allocation to insufficient allocation, while some cities in the Yangtze River Delta and the Pearl River Delta have changed from insufficient allocation to excessive allocation, which indicates that the migrants from west to east have not only to some extent optimized the labour allocation pattern but also caused the emerging issue of population congestion in the east and the rapid loss of population in the central and

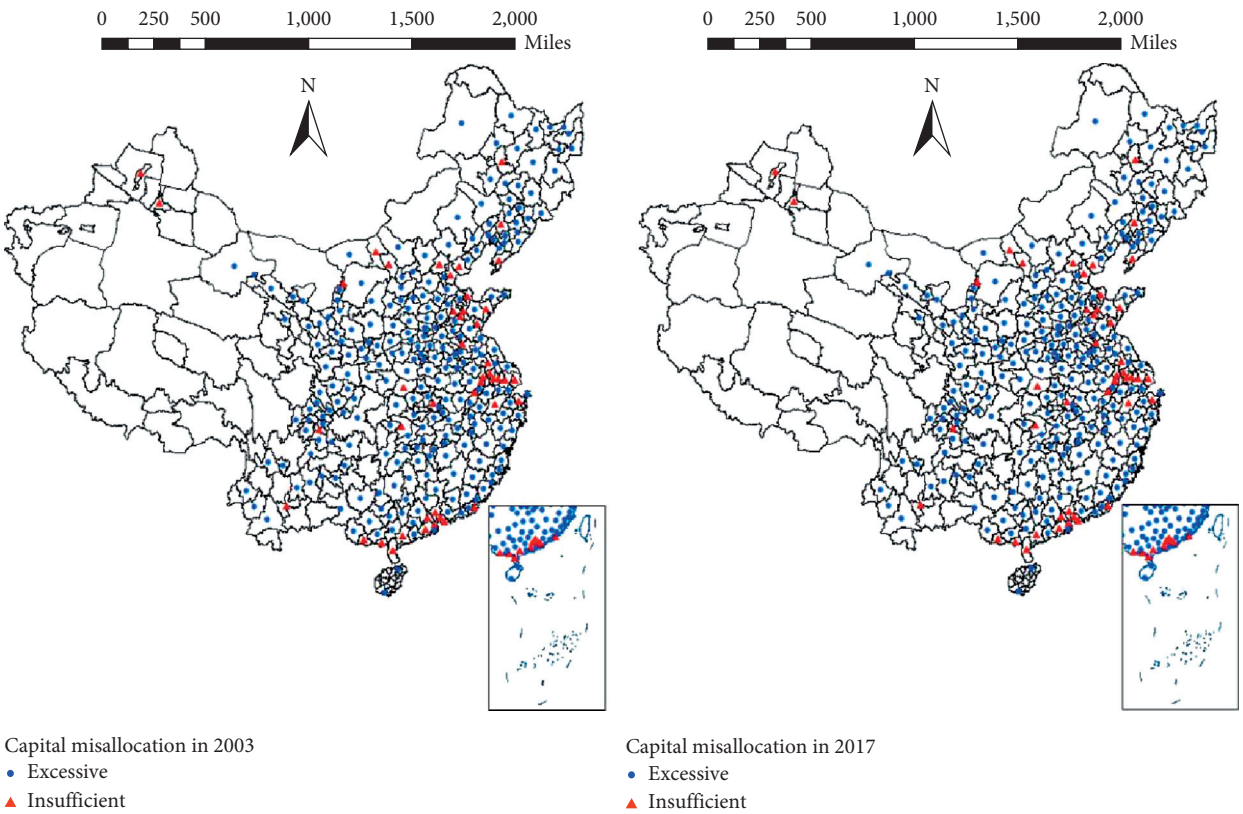

Figure 2: The spatial distribution pattern of capital misallocation in 2003 and 2017.

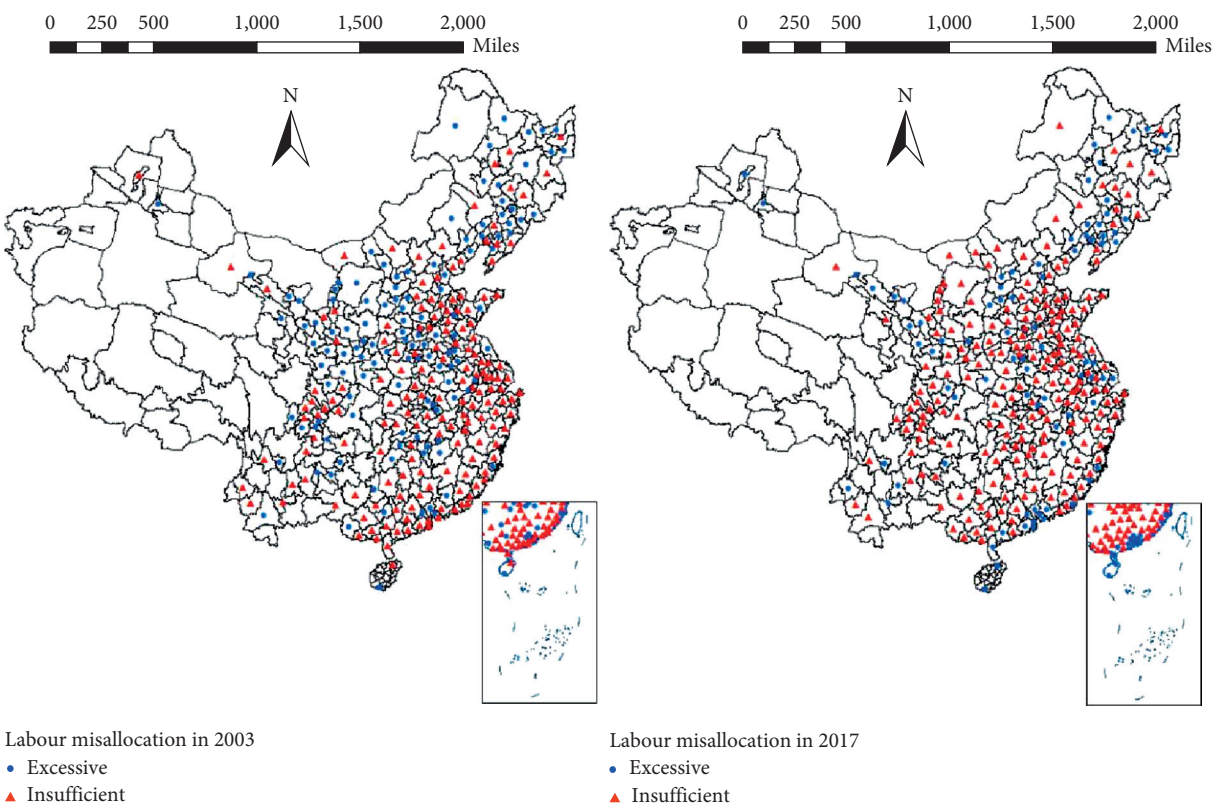

Figure 3: The spatial distribution pattern of labour misallocation in 2003 and 2017.

western regions. Therefore, the improvement of the labour allocation efficiency still has a long way to go.

4. Empirical Analysis and Discussion

4.1. National Empirical Analysis. This study has adopted Stata 15.0 to estimate the OLS Model in equation (1) and the Dynamic Panel Econometric Model in equation (2), and the results are reported in Table 2. As shown in Table 3, AR(1) is significant at 1% and AR(2) and the Sargan statistics are not significant at 10%, which indicates that the first-order sequence correlation exists, while the second-order sequence correlation does not exist; instrumental variables with first-order lag are effective, with no overrecognition constraint. Moreover, the results based on the OLS Model are not very robust, and the significance of coefficients is relatively poor, which may be due to the endogenous problems and highlights the superiority of the Dynamic Panel Econometric Model [15]. As mentioned earlier, this study has selected the results based on the SYS-GMM model for discussion.

No matter the dependent variable is capital misallocation or labour misallocation, the effects of the first-phase lag of resource misallocation, land finance, government intervention, and industrial structure on resource misallocation are significantly positive, which indicates that the above-mentioned variables have aggravated the degree of misallocation of capital and labour at the national level. Under the extensive development mode dominated by land finance and secondary industry, although the rapid economic growth has been achieved through government intervention, the resource misallocation has also intensified and solidified over time, which will eventually hinder the improvement of economic efficiency and the realization of sustainable development in the long run.

In addition, the effect of FDI on capital misallocation is negative but not significant, while the effect of FDI on labour misallocation is significantly negative, which indicates that FDI has to some extent hindered labour misallocation, while there is no clear evidence that FDI has impacted the capital misallocation at the national level. As previous literature notes, the inflow of FDI mainly focuses on traditional resource-intensive and labour-intensive industries, which has caused high-pollution and high-energy consumption problems, but it promotes labour allocation by providing plenty of employment opportunities. Moreover, the effects of infrastructure on capital misallocation and labour misallocation are negative and positive, respectively, but not significant, implying that there is no clear evidence that infrastructure has impacted the resource misallocation at the national level. Furthermore, the effect of urbanization rate on capital misallocation is significantly positive, while the effect of urbanization rate on capital misallocation is negative but not significant, which indicates that urbanization rate has aggravated capital misallocation but tends to hinder the labour misallocation at the national level. There is no doubt that urbanization rate has promoted the urban-rural migrant, while the dual separation of household registration system between urban and rural has to some extent declined the efficiency of labour allocation. In addition, the increasing economic gap between urban and rural areas caused by urbanization rate has also declined the efficiency of capital allocation.

Table 2: Estimation results for the urban tier sample based on the SYS-GMM model.

Variables	First- and second-tier		Third-tier	
	Kmis	Lmis	Kmis	Lmis
$\ln RM_{i,t-1}$	0.865***	0.406***	0.819***	0.503***
	(0.017)	(0.032)	(0.003)	(0.016)
$\ln LF_{it}$	0.050***	0.223	−0.002	0.165***
	(0.014)	(0.152)	(0.005)	(0.042)
Control variables	Yes	Yes	Yes	Yes
AR(1)	0.080	0.002	0.000	0.000
AR(2)	0.126	0.160	0.969	0.904
Sargan	1.000	1.000	1.000	1.000
Observations	490	490	3500	3500

Notes: ***denotes a significance level of 1%; standard errors are reported in parentheses; the results of AR(1), AR(2), and Sargan statistics are the corresponding P value; Kmis and Lmis denote capital misallocation and labour misallocation, respectively.

4.2. Heterogeneity Analysis of Region and Urban Tier. Due to the comprehensive influence of geographical, economical, and institutional factors, the effects of land finance on resource misallocation may present a typical spatial differentiation pattern, and the spatial distribution patterns of misallocation of capital and labour in 2003 and 2017 also show a significant spatial heterogeneity (as indicated in Figures 2 and 3). Therefore, this study will also examine the spatial heterogeneity of the effects of land finance on resource misallocation from the perspectives of regions (Based on the regional division criterion noted by the State Council, the research sample has been split into three groups: Eastern, Central, and Western, and each region includes 101, 109, and 75 cities, respectively) and urban tiers (Based on administrative and economic development levels noted by the National Bureau of Statistics of the People's Republic of China, the research sample has been classified into first-, second-, and third-tier cities. Specifically, the first-tier cities cover the 4 most developed metropolitan areas: Beijing, Shanghai, Shenzhen, and Guangzhou, the second-tier cities cover 31 cities, including most provincial capitals and a few highly developed prefecture-level cities, and the third-tier cities cover all the other 250 cities.), and the results based on the SYS-GMM Model are reported in Tables 2 and 4, respectively.

As shown in Table 4, whether the dependent variable is capital misallocation or labour misallocation, the effects of the first-phase lag of resource misallocation on that of current period are significantly positive among three regions, which indicates that previous resource misallocations have aggravated the degree of resource misallocation of current period at the regional level. In addition, the effect of land finance on capital misallocation is significantly negative in the central region, while the other five coefficients of land finance are significantly positive, which indicates that land finance has significantly aggravated resource misallocation

Table 3: Estimation results for the whole sample.

Variables	OLS		DIFF-GMM		SYS-GMM	
	Kmis	Lmis	Kmis	Lmis	Kmis	Lmis
$\ln RM_{i,t-1}$	—	—	0.629***	0.510***	0.795***	0.495***
	—	—	(0.007)	(0.023)	(0.003)	(0.017)
$\ln LF_{it}$	−0.021**	0.046	0.004***	0.229***	0.015***	0.145***
	(0.008)	(0.031)	(0.006)	(0.083)	(0.005)	(0.047)
$\ln GI_{it}$	−0.003	−0.002	0.043***	0.090**	0.051***	0.082***
	(0.009)	(0.034)	(0.004)	(0.037)	(0.004)	(0.029)
$\ln FDI_{it}$	−0.038***	−0.029	−0.006	−0.032*	−0.002	−0.032*
	(0.005)	(0.019)	(0.003)	(0.021)	(0.002)	(0.018)
$\ln IS_{it}$	−0.196***	0.788***	0.150***	0.230**	0.167***	0.265**
	(0.033)	(0.127)	(0.019)	(0.159)	(0.014)	(0.127)
$\ln INF_{it}$	−0.033***	0.151***	−0.002	0.029	−0.001	0.028
	(0.011)	(0.043)	(0.006)	(0.043)	(0.006)	(0.037)
$\ln UR_{it}$	−0.056***	−0.101***	0.004***	−0.065	0.013***	−0.040
	(0.010)	(0.039)	(0.004)	(0.038)	(0.003)	(0.032)
Constant	2.216***	−4.910***	−0.356***	−2.628***	−0.684***	−2.543***
	(0.126)	(0.480)	(0.066)	(0.602)	(0.051)	(0.515)
AR(1)	—	—	0.000	0.000	0.000	0.000
AR(2)	—	—	0.386	0.300	0.388	0.301
Sargan	—	—	1.000	1.000	1.000	1.000
Observations	4275	4275	3705	3705	3990	3990

Notes: ***, **, and *denote a significance level of 1%, 5%, and 10%, respectively; standard errors are reported in parentheses; the results of AR(1), AR(2), and Sargan statistics are the corresponding P value; Kmis and Lmis denote capital misallocation and labour misallocation, respectively.

Table 4: Estimation results for the regional sample based on the SYS-GMM model.

Variables	Eastern		Central		Western	
	Kmis	Lmis	Kmis	Lmis	Kmis	Lmis
$\ln RM_{i,t-1}$	0.699***	0.462***	0.944***	0.384***	0.845***	0.424***
	(0.002)	(0.011)	(0.004)	(0.009)	(0.001)	(0.010)
$\ln LF_{it}$	0.034***	0.169***	−0.037***	0.204***	0.092***	0.339***
	(0.003)	(0.023)	(0.002)	(0.034)	(0.002)	(0.032)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	0.002	0.000	0.000	0.000	0.076	0.000
AR(2)	0.110	0.334	0.139	0.201	0.923	0.572
Sargan	1.000	1.000	1.000	1.000	1.000	1.000
Observations	1414	1414	1526	1526	950	950

Notes: ***denotes a significance level of 1%; standard errors are reported in parentheses; the results of AR(1), AR(2), and Sargan statistics are the corresponding P value; Kmis and Lmis denote capital misallocation and labour misallocation, respectively.

in the eastern and western regions but presents a spatial differentiation in the central region. As mentioned earlier, land finance has been criticized for distorting resource allocation for a long time. Compared with the eastern and western regions, the central region has no superiority in geographical location and policy support, so land finance has made up for the gap and promotes the efficiency of capital allocation. However, the effect of partial improvement in capital allocation in the central region cannot offset its negative effect on resource allocation at the national level, so the distortion effect of land finance on resource allocation still needs our full attention in the long run.

As shown in Table 2, whether the dependent variable is capital misallocation or labour misallocation, the effects of the first-phase lag of resource misallocation on that of current period are significantly positive, which indicates that previous resource misallocations have aggravated the degree of resource misallocation of current period at the urban tier level. In addition, the effects of land finance on capital misallocation in the first- and second-tier cities and labour misallocation in the third-tier cities are significantly positive, which indicates that land finance has aggravated the misallocation of capital or labour in the corresponding cities. However, the effects of land finance on labour misallocation in the first- and second-tier cities and capital misallocation in the third-tier cities are positive and negative, respectively, but both are not significant in statistics. In the process of urbanization rate driven by land finance, the rapid increase of capital price has solidified the insufficient allocation of capital in the first- and second-tier cities, while the excessive

outflow of population has also aggravated the insufficient allocation of labour in the third-tier cities (as indicated in Figures 2 and 3).

4.3. Robustness Test. Due to the distortion of factor markets in China, not only does the actual remuneration of production factors such as capital and labour deviate from the due value, but also the optimal effective resource allocation cannot be achieved with the market mechanism; thus the level of resource distortion can also be utilized to measure the degree of resource misallocation [15]. In order to further test the robustness of the above results, this study intends to replace capital misallocation (Kmis) and labour misallocation (Lmis) with capital distortion (Kdis) and labour distortion (Ldis), respectively.

$$\begin{aligned} \text{Kdis} &= \beta_{Ki}\frac{p_i y_i}{rK_i} - 1, \\ \text{Ldis} &= \beta_{Ki}\frac{p_i y_i}{w_i L_i} - 1, \end{aligned} \tag{7}$$

where r denotes the interest rate, which has been set as 10% by referring to the study of [26]; w_i denotes the average wage of urban workers, and it is converted into the price GDP index in 2003. If the value of capital distortion or labour distortion is greater than 0, it indicates the establishment of excessive allocation; if the value of capital distortion or labour distortion is less than 0, it indicates the establishment of insufficient allocation; and the greater absolute value means the graver resource distortion. Specifically, all the absolute values of capital distortion and labour distortion have been introduced into the regression equation.

Based on the new dependent variables, the Dynamic Panel Econometric Model is estimated using the SYS-GMM method, and the robustness results are reported in Table 5. As shown in Table 5, after replacing resource misallocation with resource distortion, the robustness results are basically consistent with the former, so the conclusions of this study are robust and reliable.

5. Conclusions, Policy Implications, and Research Prospects

5.1. Conclusions. Based on the review of previous studies and the analysis of the dynamic changes of resource misallocation in China during 2003–2017, this study has adopted the Dynamic Panel Econometric Model to investigate the effects of land finance on resource misallocation at national, regional, and urban tier levels. The main conclusions of this study are as follows. Firstly, the misallocations of capital and labour in China have experienced different dynamic changes during the investigation period, because the spatial distribution pattern of capital misallocation is relatively stable, while the spatial distribution pattern of labour misallocation has changed remarkably between 2003 and 2017. In addition, the first-phase lag of resource misallocation has significantly aggravated the current period of resource misallocation at national, regional, and urban tier levels, which provides a robust evidence for the existence of temporal dependence for resource misallocation in China. Moreover, the significantly positive effect of land finance affecting resource misallocation has been proven at the national level, while spatial heterogeneity is established at regional and urban tier levels, because land finance has hindered capital misallocation in the central region, and the effects of land finance on labour misallocation in the first- and second-tier cities and capital misallocation in the third-tier cities are not significant in statistics. Furthermore, government intervention and industrial structure have also aggravated resource misallocation at the national level; FDI tends to hinder resource misallocation at the national level (the coefficient of FDI on labour misallocation is significantly negative, while the coefficient of FDI on capital misallocation is negative but not significant in statistics), while the effects of infrastructure and urbanization rate on misallocation of capital and labour are not robust at the national level (the coefficient signs of infrastructure and urbanization rate on misallocation of capital and labour are completely different); thus the correction of resource misallocation requires a comprehensive consideration of the impacts of influencing factors.

5.2. Policy Implications. Correspondingly, the policy implications of the above conclusions include several aspects. Firstly, in order to get rid of the temporal dependence of resource misallocation, the formulation of relevant policies should be suited to local conditions. For example, the Yangtze River Delta and the Pearl River Delta have faced dual constraints of insufficient capital allocation and excessive labour allocation at present. In order to improve the efficiency of resource allocation in the above-mentioned areas, not only should the capital price be declined to a reasonable range, but also the outflow of low-end labour should be properly guided in the process of industrial upgrading and new urbanization. Secondly, the dependence of local governments on land finance should be reduced through promoting the transformation from one-time land leasing revenue to real estate tax, so as to alleviate the vertical financial imbalance and the vicious competitions among local governments. Thirdly, the construction of market-oriented mechanism should be promoted, unreasonable government intervention should be reduced, and market segmentation and narrow protectionism between different regions and urban tiers should be broken down, so as to promote the free flow of production factors and improve the efficiency of resource misallocation in the long run. Last but not least, the economic growth pattern from extensive to intensive should be adjusted step by step, such as improving the threshold and quality of FDI, promoting industrial upgrading, and optimizing the rational spatial distribution of capital, labour, and other resources.

5.3. Research Prospects. Although this study for the first time analyzes the effects of land finance on resource allocation in China at national, regional, and urban tier levels, two limitations still deserve being paid attention, and they may

Table 5: Results of robustness tests based on the SYS-GMM model.

Variables	China		Eastern		Central		Western		First- and second-tier		Third-tier	
	Kdis	Ldis	Kdis	Ldis	Kdis	Ldis	Kdis	Ldis	Kdis	Ldis	Kdis	Ldis
$\ln RD_{i,t-1}$	0.801***	0.495***	0.554***	0.474***	0.636***	0.439***	0.615***	0.402***	0.830***	0.444*	0.574***	0.517***
	(0.011)	(0.024)	(0.010)	(0.019)	(0.009)	(0.019)	(0.001)	(0.014)	(0.044)	(0.253)	(0.004)	(0.018)
$\ln LF_{it}$	0.019**	0.178***	0.087***	0.231***	−0.037***	0.104***	0.017***	0.335***	0.009***	0.231	−0.064	0.081***
	(0.010)	(0.056)	(0.006)	(0.052)	(0.006)	(0.082)	(0.002)	(0.041)	(0.034)	(0.713)	(0.005)	(0.049)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(1)	0.001	0.000	0.003	0.000	0.000	0.000	0.093	0.000	0.051	0.079	0.006	0.000
AR(2)	0.855	0.925	0.114	0.317	0.125	0.201	0.992	0.614	0.196	0.141	0.917	0.911
Sargan	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Observations	3990	3990	1414	1414	1526	1526	950	950	490	490	3500	3500

Notes: ***denotes a significance level of 1%; standard errors are reported in parentheses; the results of AR(1), AR(2), and Sargan statistics are the corresponding P value; RD, Kdis, and Ldis denote resource distortion, capital distortion, and labour distortion, respectively.

become the possible research directions for further studies. First, due to the limitations of data availability, we adopt the shares of land leasing revenue to GDP to act as the proxy of land finance, while the impact of land finance from different uses (i.e., industrial, commercial, and housing) on resource misallocation may be not consistent, which should be explored in further studies [5]. Moreover, this study has analyzed the temporal dependence of resource misallocation by introducing the Dynamic Panel Econometric Model, while the spatial dependence of resource misallocation has not been fully analyzed; thus the Dynamic Spatial Econometric Model, which can make up for this research gap, may be adopted in further studies [27]. Therefore, when a wider range of indicators and highly advanced techniques are available, the effects of land finance on resource misallocation in China still deserve further in-depth studies.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Disclosure

Any remaining errors in the paper are the responsibility of the authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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