

The Nonlinear Impact of Land Price Distortion on Common Prosperity: Evidence from China

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Abstract

Land, as an essential resource to support economic and social development, is a key element affecting the process of common prosperity in China. Existing literature confirms that land price distortion significantly impacts the urban-rural income gap, economic growth and urbanization. However, the impact and mechanisms of land price distortion on common prosperity are still unclear. This paper explores the above issues based on the panel data of 30 provincial administrative regions in China from 2006 to 2020. The results find that the relationship between land price distortion and common prosperity is “inverted U-shaped”. Further analysis shows regional heterogeneity in the influence of land price distortion on common prosperity. Specifically, the eastern region has the above “inverted U-shaped” relationship between land price distortion and common prosperity, which is absent in the central, western, and northeastern areas. The mechanism analysis confirms the mediatory effects of population urbanization and housing price in the influence process. This paper provides policy recommendations for the government to rationally and effectively utilize land resources and achieve the goal of common prosperity.

Keywords: Land Price Distortion; Common Prosperity; Population Urbanization; Housing Price

1.0 Introduction

Promoting economic development and achieving social justice is a global issue. China, as the largest developing country, has always been striving to narrow the gap between the rich and the poor, realize fair distribution and steadily promote of common prosperity. Nonetheless, there are large disparities in development and income distribution between rural and urban areas, and regions in China, affected by factor distortion and resource mismatch. There is a long way to go to realize the common prosperity. As an essential resource to support economic and social development, land is closely related to people's welfare and is a key element in promoting common prosperity. However, for rapid GDP growth in early China, land resources were utilized crudely, leading to distortions in land prices. This has a significant and complex impact on the common prosperity.

In China, local governments generally promote regional development through the utilization of land resources. Particularly, after the reform of the tax-sharing system, the pressure on local governments for financial expenditures has been increasing. It forces them to rely on revenues of land-use rights concessions to maintain financial expenses. Land concessions can increase

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the extra-budgetary income of local government, provide financial support for infrastructure construction, and promote regional economic development. Nevertheless, the intervention of local governments in the land concessions price has led to land price distortions. To be more specific, on the one hand, the local governments depress the industrial land price, attracting industrial companies to move in and promoting regional industrial development. On the other hand, the governments raise the commercial and residential land prices to obtain high land-use rights income (Y. J. Liu, Yang, Song, & Gu, 2023). This behaviour causes both land expansion and inefficient use, and triggers environmental pollution and other problems not conducive to sustainable economic development. At present, it is the critical period of fulfilling common prosperity in China. Studying the impact and mechanism of land price distortions on common prosperity has significant implications for controlling land price distortion and realizing common prosperity.

The related literature focused on the following two aspects. The first is research on the connotation and measurement of common prosperity. The connotation of common prosperity generally includes “enrichment” and “sharing”. Specifically, enrichment covers material prosperity and non-material sense prosperity. Sharing refers to the standardization of basic public services and the continuous narrowing of the wealth gap (Zhou, Lv, Zou, & Gu, 2024). Scholars have constructed and measured the common prosperity index system, based on an accurate understanding of the common prosperity connotation. Generally speaking, the index system of common prosperity needs to comprehensively consider the level of prosperity and the degree of sharing. Most existing studies have constructed the system from the economy, society, education, medical care, environment and other perspectives. Chen, Ping, Jia, and Li (2023) believed that common prosperity can be summarized into economic growth, social governance, and ecological revitalization. The coupling coordination degree was used to measure common prosperity. Xie, Zhang, and Song (2024) measured the common prosperity level based on enrichment, sharing and international development. They explored the evolutionary trend of the common prosperity level in China and each province. The results indicated that the level of common prosperity in China and its provinces shows a gradual upward trend. However, the regional spatial heterogeneity is gradually rising. Similarly, Zhao, Long, and Yin (2023) decomposed common prosperity into development, sharing and sustainability. And measured the common prosperity level of China's provinces and examined the trend of change and differences. They found that although the common prosperity level of each province has increased significantly, the gap between them is still large. Regionally, the common prosperity level is highest in eastern China, followed by central China and lower in western China

Research on the second aspect is the impact of land price distortions on regional development. The existing literature concentrates mainly on the influence of land price distortions on the urban-rural income gap, economic growth and urbanization. Firstly, in terms of the urban-rural income gap, the expansion of the land finance scale significantly promotes the urban-rural income gap (Z. X. Wang & Zhang, 2023). Urban-biased land policies result in urban-rural income growth imbalance, thus also positively affecting the urban-rural income gap (S. L. Wang, Tan, Yang, Lin, & Zhang, 2019). In addition, Li, Chen, Zhang, and Shi (2023) studied the relationship between industrial land expansion and the urban-rural income gap. They found that although expanding industrial land can reduce the urban-rural income gap, the mismatch of land resources significantly contribute to it. Secondly, in regrade to economic growth, land distribution inequality is positively correlated with economic growth in the short term, but inhibits it in the long term (Cipollina, Cuffaro, & D'Agostino, 2018). Moreover, land grant revenues can directly contribute to economic growth, but using it for public productive

investment can dampen economic growth (Gao, 2019) . Similarly, Ji, Guo, Zhong, and Wu (2020) empirically found that land financialization can promote economic growth. However, factors including regional disparities and semi-urbanization ultimately hinder sustainable economic development. Finally, concerning urbanization, although land finance promotes rapid urbanization, sustainability can be jeopardized in the long run (Zheng, Wang, & Cao, 2014). Nevertheless, land system reform can effectively allocate land resources, enhancing the quality of urbanization. For example, Z. F. Wang, Xu, Wang, and Meng (2020) examined the impact of the land reserve system on urbanization and found that this policy can significantly promote urbanization.

Existing literature is more concerned with the connotation and measurement of common prosperity, and land price distortion on regional development. However, little literature directly discusses how land price distortion affects common prosperity, and its mechanism is unclear. The previous analysis confirms that land element is essential for realizing common prosperity., how does land price distortion influence common prosperity? How does this effect differ in regions? What are the mechanisms of this impact? Exploring the above questions is of great significance in clarifying the logic of land price distortion and common prosperity, which helps the government to precisely grasp the path of realizing common prosperity. Given this, this paper takes panel data from 30 provincial administrative regions of China from 2006 to 2020 as the study sample. Based on measuring the common prosperity level using the entropy-weighting-TOPSIS method, this paper adopts the fixed-effects model to study how land price distortion impacts common prosperity. The mediating-effects model is further utilized to clarify its conduction paths. The possible marginal contributions of this paper are twofold. First, this paper explores the direct influence effect and indirect impact mechanism of land price distortion on common prosperity at theoretical and empirical levels. It enriches the literature on the impact factors of common prosperity. Second, unlike the traditional linear intermediation model, this paper uses a nonlinear intermediation model to test the impact path of land price distortion on common prosperity. It clarifies the internal logic between the two to guide the government to promote common prosperity.

2.0 Theoretical mechanism and research hypothesis

Following the reform of the tax-sharing system, local governments' financial power has contracted while administrative power has expanded. That has resulted in increased pressure on fiscal expenditures and rising debt risks. Therefore, local governments have had to seek extra-budgetary revenues under the performance appraisal system focusing on GDP growth. This alleviates the pressure on fiscal expenditures, realizes promotion incentives, and promotes rapid regional economic development. The tax reform fails to incorporate land finance revenue in the fiscal budget. So local governments, to maximize their revenues, rely on their monopoly in the primary land market to sell land for diverse uses at different prices. Specifically, industrial land was offered at low prices to attract enterprises to move in, obtaining a large amount of tax revenue. At the same time, local governments sell residential and commercial land at high prices to make up for the opportunity cost of land, thus gaining high premiums. The above “double second-hand” land supply strategy has caused land price distortion.

After the government expropriates farmers' land, rural landless farmers will move to the non-agricultural sector in the city with higher marginal productivity and wages. This provides cities with abundant labor resources, conducive to increasing the population urbanization. At the same time, the rural labor entering the city to work raises the per capita income level of rural residents, to a certain extent, narrowing the urban-rural income gap (Su, Liu, Chang, & Jiang,

2015). In addition, governments offering low-priced industrial land can attract more manufacturing enterprises to settle in and form the industrial cluster. It accelerates regional industrialization and increases tax revenues. The high-priced commercial and residential land can promote the real estate industry development, which can drive the related industries even the entire region's development (Sun, Feng, Tang, Kuang, & Javeed, 2022). Meanwhile, a large amount of land leasing fee is obtained. The land grant revenues can promote regional economic growth. It also can provide financial support for infrastructure construction, public service systems and environmental protection projects (Sun et al., 2022). From this perspective, land price distortion helps to realize common prosperity.

However, with the increasing distortion of land prices, its negative impact on the common prosperity has gradually emerged. First, high residential land prices may cause rising house prices. This increases the cost of living for migrant workers and reduces the willingness of the migrant population to settle (Y. Z. Zhang & He, 2023). To a certain extent, it hinders the inflow of rural labor, not conducive to population urbanization. Second, the low-priced industrial land makes plenty of low-end manufacturing enterprises move into the region. It causes environmental pollution and inefficiency in land resource utilization, hindering tertiary industry development and industrial structure upgrade (Y. J. Liu et al., 2023). Finally, although relying on land concessions can obtain fiscal revenue, the land is a non-renewable resource. China needs agricultural land for grain production to meet the needs of more than a billion people. Massive land expropriation and intervention in its grant prices are detrimental to sustainable economic development.

To summarize, land price distortion affects common prosperity complexly, and the impact direction depends on the magnitude of the positive and negative effects. Land concessions can provide funds for the government when land price distortion is weak. The improvement of infrastructure and the growth of the regional economy contribute to common prosperity. Whereas, influenced by regional financial pressure and promotion incentives, the disadvantages of land price distortion become clearer. The widening income gap and the increasing environmental pollution make the negative impact outweigh the positive. The realization of common prosperity is impeded. For this reason, this paper puts forward hypothesis 1.

Hypothesis 1: As land price distortion increases, its impact on common prosperity shifts from promotion to suppression. This means the relationship between land price distortions and shared prosperity is “inverted U-shaped”.

To obtain sufficient land leasing fees and achieve economic growth goals, local governments expropriate land and adopt a “double second-hand” land supply strategy, causing distorted land prices. Low-priced industrial land promotes regional industrial development, while high-priced commercial and residential land expands the size of the construction and real estate industries. Landless peasants are attracted by the high wages in these non-agricultural sectors to seek jobs in cities, resulting in higher levels of population urbanization. However, manufacturing enterprises generally are capital-intensive enterprises with less demand for labor (Dai, Niu, Zhang, & Niu, 2022). The construction and real estate industries are also gradually inclined to high education and skilled labor. Thus, the employment space of the rural population who do not have high-level technical skills is constantly squeezed, and the employment problem becomes tougher. Moreover, with the deepening of land price distortion, the massive gathering of low-end manufacturing enterprises hinders the industrial structure upgrade. Meanwhile, the continuous rise in housing prices increases the living costs of the inter-regional migrant

population (Y. Z. Zhang & He, 2023). The above factors drive back rural migrants and decrease population urbanization. In addition, population flows to cities can affect the common prosperity process. On the one hand, population urbanization reduces the rural population, increases the per capita income level of rural residents, and narrows the income gap between urban and rural areas. Furthermore, population concentration is a necessary precondition for regional economic development (Yang, Guo, Zhang, Yao, & Zhang, 2024). On the other hand, cities have a powerful radiating effect. Population transfer to cities can promote urban development, while driving economic and cultural progress in rural areas, contributing to realizing common prosperity (Qi, 2003). Based on the above analysis, this paper proposes hypothesis 2.

Hypothesis 2: An “inverted U-shaped” relationship exists between land price distortion and population urbanization, with a consequent “inverted U-shaped” effect on common prosperity.

To compensate for the opportunity cost of industrial land, local governments restrict the commercial and residential land supply to raise the price, which leads to rising housing prices. Simultaneously, the land grant revenue is used for infrastructure construction, bringing a real estate premium (F. Y. Liu, Chen, Zhang, Zhang, & Song, 2022). However, due to the high profits of the real estate industry, numerous capital plunge into real estate-related fields. The number of houses is in oversupply, leading to a decline in housing prices. Therefore, land price distortion affects the rise and fall of housing prices. As a national economy support industry, the real estate industry is bound to affect common prosperity substantially. For one thing, the booming real estate industry will spur the related industries development. This influence is constantly transmitted, ultimately boosting the economic development of the whole society. It not only brings great wealth to society and start-up capital for urban development, but also creates massive employment opportunities. For another thing, purchasing a home is usually a prerequisite for settlement in the city and enjoying the same public resources as urban residents. Therefore, people may settle down in regions with lower housing prices and usually relatively backward economies, thus promoting the economic development of these areas. But if the speed of house prices increase exceeds that of residents' income increase, the wealth gap between those who have purchased houses and have not will continue to expand. Non-homebuyers' wealth will shrink virtually, and have to cut back on other aspects of consumer spending (Yin & Su, 2022), detrimental to enhancing the residents' sense of well-being. In addition, a large amount of capital in the real estate industry will lead to the “de-industrialization” phenomenon, making the economy virtualized (Peng, Wang, Sun, & Guo, 2022). For the above analysis, this paper proposes hypothesis 3.

Hypothesis 3: The relationship between land price distortion and house prices is “inverted U-shaped”, thus having an “inverted U-shaped” effect on common prosperity.

3.0 Model, Data and Variable

3.1. Model Setting

3.1.1. The basic model

To explore the nonlinear effect of land price distortion on common prosperity, this paper constructs a fixed effect model, as shown in Equation (1):

$$C_{it} = \beta_0 + \beta_1 LPD_{it} + \beta_2 LPD_{it}^2 + \sum_{j=1}^4 Control_{itj} + \partial_i + \varepsilon_{it} \quad (1)$$

Where i represents the province, and t denotes the year. C_{it} is the explanatory variable, the common prosperity. LPD_{it} is the core explanatory variable, the land price distortion, and LPD_{it}^2 is the square of the land price distortion. $Control$ is the control variable set. ε_{it} is the error term. The research object of this paper is 30 provincial-level administrative regions, with strong individual heterogeneity. So the provincial individual effect is controlled to limit omitted variables problem.

3.1.2 The intermediary model

Generally, there are two kinds of intermediary effects under a nonlinear relationship (Lin & Feng, 2022). First, the mediating variable has a secondary relationship with the explanatory variable and a linear relationship with the explained variable. The model is shown in equations (2)-(4).

$$med_{it} = \beta_0 + \beta_1 LPD_{it} + \beta_2 LPD_{it}^2 + \beta_3 \sum_{j=1}^4 control_{itj} + \partial_i + \varepsilon_{it} \quad (2)$$

$$C_{it} = \gamma_0 + \gamma_1 LPD_{it} + \gamma_2 LPD_{it}^2 + \gamma_3 med_{it} + \gamma_4 \sum_{j=1}^4 control_{itj} + \partial_i + \varepsilon_{it} \quad (3)$$

$$IND = \beta_2 \times \gamma_3 \quad (4)$$

Secondly, there is a linear relationship between the mediating variables and the explanatory variable, and a quadratic relationship with the explained variable. The model is shown in equations (5)-(7):

$$med_{it} = \beta_0 + \beta_1 LPD_{it} + \beta_2 \sum_{j=1}^4 control_{itj} + \partial_i + \varepsilon_{it} \quad (5)$$

$$C_{it} = \gamma_0 + \gamma_1 LPD_{it} + \gamma_2 med_{it} + \gamma_3 med_{it}^2 + \gamma_4 \sum_{j=1}^4 control_{itj} + \partial_i + \varepsilon_{it} \quad (6)$$

$$IND = \beta_1 \times \gamma_3 \quad (7)$$

Where med is the mediating variable, and IND signifies the curvilinear indirect effect of the explanatory variable on the explained variable through the mediator variable. Other variables have the same meaning as in the base model.

3.2 Variables Selection

3.2.1. Explained variables

The explanatory variable is common prosperity. To accurately measure the common prosperity level, this paper refers to the previous studies (T. T. Zhang, Wang, Li, & Wang, 2023; Zhao et al., 2023) to build a comprehensive evaluation index system of common prosperity. Five primary indicators are identified based on enrichment and sharing dimensions, including high-quality economic development, spiritual wealth, balance, public services, and ecological civilization. It is further divided into 9 secondary and 20 tertiary indicators (Table 1).

Available literature commonly uses the entropy method, entropy weight-TOPSIS method, and principal component analysis method to estimate the common prosperity index. In contrast, the entropy weight-TOPSIS method can more comprehensively consider the information of the evaluation indicators and proximity to the optimal solution. The results obtained are more accurate. Therefore, this paper adopts the entropy weight-TOPSIS method to measure the common prosperity level.

Table 1: Common prosperity index system

subsystem	primary indicators	Secondary indicators	Tertiary indicators	measurement unit	Indicator direction
enrichment	high-quality economic development	economic development	GDP per capita	Yuan	+
			Per capita disposable income	Yuan	+
			Value added of tertiary industry as a share of GDP	%	+
			Labor productivity of the whole society	Yuan	+
		scientific and technological innovation	The ratio of R&D expenditure to GDP	%	+
			Patent grants per 10,000 population	piece	+
	spiritual enrichment	Cultural education	The ratio of education expenditure to GDP	%	+
			Public library books per capita	piece	+
		social stability	Traffic accidents per capita	piece	-
sharing	balance	variance	The ratio of per capita income of urban and rural residents	-	-
			Theil index	-	-
			Gini index	-	-
	public service	healthcare	Medical and health institution beds per 1,000 population	piece	+
			Medical and health technicians per 1,000 population	piece	+
		Infrastructure	Public vehicles per 10,000 people	piece	+
			Per capita urban road space	square metre	+
		Social Security	The ratio of social security expenditures to GDP	%	+

	ecological civilization	Ecological environment	Forest coverage	%	+
			Carbon emissions per unit of GDP	Tons/millio n	-
			Per capita green area of parks	square metre	+

3.2.2. Explanatory variables

The core explanatory variable is land price distortion. This paper refers to the approach of Y. J. Liu and Geng (2019). The residential land price-industrial land price distortion and the commercial land price-industrial land price distortion are considered simultaneously. Since they are of equal importance, their weights are set to 1/2. The calculation method is as follows:

$$LPD = 1/2 \times LPD_1 + 1/2 \times LPD_2 \quad (8)$$

$$LPD_1 = \sum_{j=1}^n \frac{H_{ij}}{I_{ij}} Z_{ij} \quad (9)$$

$$LPD_2 = \sum_{j=1}^n \frac{C_{ij}}{I_{ij}} Z_{ij} \quad (10)$$

LPD represents the land price distortion, LPD_1 denotes the distortion between residential land price and industrial land price, and LPD_2 indicates the distortion between commercial land price and industrial land price. The data on China Land Value Monitoring Network (<https://www.landvalue>) are land prices of city. Therefore, this paper categorizes cities depending on provinces. In equation. (9) and (10), i is the province, j is the city, and H_{ij} , C_{ij} , and I_{ij} represent the residential, commercial, and industrial land prices of city j in province i . Z_{ij} is the price distortion weight of city j in province i . It is expressed using the current GDP ratio of city j in province i to the sum of all cities in province i .

3.2.3. Control variables

This paper selects the openness to the world, the pressure on the fiscal balance, the degree of marketization, and the size of the consumer market as the control variables. The calculations are as follows: the openness to the world (*open*) is expressed as the ratio of the sum of imports and exports to the GDP. Using the average exchange rate for the year, the imports and exports totals are converted from dollars to yuan. The ratio of the general public budget deficit to the general public budget revenues represents the pressure on the fiscal balance (*press*). The degree of marketization (*market*) is calculated as the ratio of state-controlled above-scale industrial enterprises to above-scale industrial enterprises. The per capita retail sale of social consumer goods represents the consumer market scale (*retail*).

3.2.4. Mediating variables

The mediating variables are population urbanization (*urban*) and house prices (*lnhouse*). The ratio of the urban resident population to the total population represents the population urbanization level. House price is indicated as the average sales price of commercial houses, and is logarithmically treated.

3.3 Data description

This paper uses data from 30 provincial-level administrative regions in mainland China from 2006 to 2020. Land price data is drawn from the China Land Value Monitoring Network (<https://www.landvalue>). Since this data is only updated until the third quarter of 2021, the period of this paper ends in 2020. Other data are obtained from the China Statistical Yearbook, statistical yearbooks of each province, CEI, and Choice. Some missing data are made up by interpolation (using stata software).

The descriptive statistic is shown in Table 2. The means of common prosperity is 0.2546, the maximum is 0.7544, the minimum is 0.0852, and the standard deviation is 0.1039. It indicates different regions have a big gap in the common prosperity standard, consistent with reality. The means of land price distortion is 8.5680, the maximum is 24.3348, the minimum is 1.7193, and the standard deviation is 4.6633. It also indicates a wide disparity in land price distortion degrees between regions. In 2020, Chongqing Municipality had the highest land price distortion level of 11.6056, and Qinghai Province had the lowest price distortion level of 1.7314. In addition, the control variables and mediating variables are also mostly significantly different.

Table 2: Descriptive statistics

	Variable	Mean	Standard error	Minimum	Maximum
Explained variables	C	0.2546	0.1039	0.0852	0.7544
Explanatory variables	LPD	8.5680	4.6633	1.7193	24.3348
	LPD2	95.1077	104.6963	2.9560	592.1842
	open	0.3036	0.3478	0.0076	1.7113
Control variables	press	1.3223	1.0055	0.0517	5.7447
	market	0.1104	0.0768	0.0113	0.4017
	retail	1.7223	1.2017	0.1924	6.8784
Mediating variables	lnhouse	8.6004	0.5807	7.4431	10.5365
	urban	0.5578	0.1372	0.2746	0.8958

4.0 Results

4.1 Benchmark Results

The regression results regarding the effect of land price distortion on common prosperity are shown in Table 3. The Hausman test rejects the original hypothesis, so we use a fixed effects model for estimation. To improve the accuracy and robustness of the analysis, the standard errors in this paper are clustered at the provincial level. (1)-(4) rows are the regression results of adding control variables sequentially. It can be seen that the regression coefficient of land price distortion (LPD) is always positive, and that of the quadratic term of land price distortion (LPD2) is always negative. Both of them are significant at the level of 1%, thus hypothesis 1 is initially proved. That is, there is an “inverted U-shape” relationship between the distortion of land prices and the common prosperity.

To further prove Hypothesis 1, this paper follows Lind and Mehlum (2010). Using the Utest command to test whether there is an “inverted U-shaped” relationship between land price distortions and common prosperity. As shown in Table 4, the extreme point of the inverted U-shaped curve is 9.1120, within the data interval of land price distortion [1.7193,24.3348]. The 95% confidence interval of the extreme point [4.6386,12.3222] is also within the data interval. The lower slope of the land price distortion is 0.0040, which is significantly positive at the 1%

level. The upper slope is -0.0082, which is remarkably negative at the 1% level. The results rejected the original hypothesis of a linear or U-shaped relationship, proving the existence of an "inverted U-shaped" relationship.

Possible explanations for the "inverted U-shape" effect of land price distortion on common prosperity are as follows. At the low land price distortion stage, the governments obtain land transferring fees by granting commercial and residential land at high prices. Simultaneously, the governments increase tax revenues by selling low-priced industrial land to attract manufacturing enterprises to enter. The land revenue is used for regional development, infrastructure construction, and health care protection, thus promoting common prosperity. However, as the land price distortion degree increases, the negative impact of land price distortion on the common prosperity gradually comes to light. Land over-exploitation led to issues such as urban sprawls, the widening gap of the urban-rural, and environmental pollution. The impact of land price distortions on common prosperity shifts from positive to negative.

Table 3: Benchmark Results

	(1)	(2)	(3)	(4)
	C	C	C	C
DPL	0.01957*** (0.0052)	0.0206*** (0.0049)	0.0197*** (0.0049)	0.0049*** (0.0016)
DPL2	-0.0007*** (0.0002)	-0.0008*** (0.0002)	-0.0007*** (0.0002)	-0.0003*** (0.0001)
open	-0.3841*** (.00367)	-0.3574*** (0.0348)	-0.3563*** (0.0361)	-0.1391*** (0.0357)
press		0.0653*** (0.0122)	0.0646*** (0.0124)	0.0216*** (0.0078)
market			-0.1634 (0.1309)	0.0723 (0.0454)
retail				0.0634*** (0.0045)
cons	0.2741*** (0.0323)	0.1735*** (0.03915)	0.1974*** (0.0414)	0.1345*** (0.0179)
Observations	450	450	450	450
R-squared	0.4970	0.5580	0.5620	0.8465

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

4.2 Robustness test

To ensure the reliability of the regression results, this paper conducts a series of robustness tests. First, the regression method is replaced. Using the panel-corrected standard error method (PCSE) to conduct regression, the result is shown in row (1) of Table 4. The impact of land price distortion on common prosperity still shows a significant "inverted U-shaped" relationship. Second, some literature uses the ratio of residential land prices to industrial land prices to measure land price distortion. Therefore, we utilize it to replace the explanatory variable. The result is shown in row (2) of Table 4, and the significant "inverted U-shaped" relationship between land price distortion and common prosperity still holds. Third, excluding municipalities. The regression results are shown in column (3) of Table 4 after excluding Beijing, Tianjin, Shanghai, and Chongqing. The regression coefficient of land price distortion is positive at the 5% level, and that of the quadratic term of land price distortion is negative at the 1% level. It is consistent with the base regression results.

Table 4: Robustness test results

	(1)	(2)	(3)
	C	C	C
LPD	0.0055*** (0.0014)	0.0048** (0.0021)	0.0035** (0.0015)
LPD2	-0.0002*** (0.0001)	-0.0003*** (0.00013)	-0.0002*** (0.0001)
open	0.0278* (0.0154)	-0.1467*** (0.0336)	-0.1443*** (0.0258)
press	0.0095*** (0.0021)	0.0205*** (0.0073)	0.0139** (0.0057)
market	0.0311 (0.0226)	0.0931** (0.0405)	0.1048** (0.0421)
retail	0.0765*** (0.0033)	0.0639*** (0.0048)	0.0678*** (0.0040)
_cons	0.0694*** (0.0097)	0.1363*** (0.0150)	0.1276*** (0.0155)
Observations	450	450	390
R-squared	0.8520	0.8470	0.8590

Finally, to address the endogenous problem caused by omitted variables and measurement errors in the base regression process, this paper adopts the instrumental variable method to conduct the regression again (Table 5). Considering the possible lags and reverse causality in land price distortions affecting common prosperity, two instrumental variables are selected in this paper. One is the first-order lag term of land price distortions (DPL_1). It is highly correlated with land price distortion in the current period, but not with the error term. The second is the mean of land price distortion in neighboring provinces (DPL_near). Generally, the land price distortion degree of province i is correlated with its neighbors, while that of neighboring provinces does not directly impact the common prosperity of province i . The fitted values of land price distortion and its quadratic term are obtained in the first-stage regression, and then substituted into the second-stage regression. The estimation results show that the coefficient of land price distortion is positive at the 10% significance level, and that of its quadratic term is negative at the 5% significance level. It is in line with the results of the benchmark regression. In addition, the Kleibergen-Paap rk LM statistic and Kleibergen-Paap rk Wald F statistic indicate the problem of unidentifiable and weak instrumental variables not present. Moreover, the number of instrumental variables is the same as the core explanatory variables, and there is no over-identification problem. Therefore, the findings still stand after treating the potential endogeneity.

Table 5: Endogeneity check results

	first-stage regression		second-stage regression
	(1) DPL	(2) DPL2	(3) C
DPL	—	—	0.0127* (0.0075)
DPL2	—	—	-0.0006** (0.0003)
DPL_1	0.6231*** (0.0503)	16.1151*** (1.7166)	—
DPL_near	0.4395*** (0.0964)	7.8069*** (2.4865)	—
Control variable	Yes	Yes	Yes
individual effect	Yes	Yes	Yes
Kleibergen-Paap rk LM statistic	—	—	9.2640 <0.0023>
Kleibergen-Paap rk Wald F statistic	—	—	11.9730 [7.0300]
N	450	450	450

4.3 Heterogeneity analysis

The above study shows that land price distortion has an "inverted U-shape" impact on common prosperity. China is a vast country, with different economic development levels and land resources endowment in various regions. Therefore, this paper further analyzes the regional heterogeneity of the land price distortion affecting common prosperity. Based on the division of economic zones by the National Bureau of Statistics in 2011, we divide the 30 provincial-level administrative regions into four major areas: eastern, central, western and northeastern. Then, a sub-sample regression is conducted. The results show a significant regional heterogeneity in the effect of land price distortion on common prosperity. In the east, there is an "inverted U-shaped" relationship between land price distortion and common prosperity. The extreme value is 11.3889, higher than that of the country. When the land price distortion degree is higher than 11.3889, the impact of land price distortion on common prosperity changes from positive to negative. However, the land price distortion level in most of the provinces in the east has reached this inflection point. Thus, relying on the "double second-hand" land supply strategy to promote common prosperity does not suit these eastern provinces.

In the center and west, land price distortion has no significant effect on the common prosperity. This is probably because the land price distortion in the central region expands the scale of real estate and the construction industry. That increases employment opportunities, attracts surplus rural labor to the cities, and creates substantial wealth for the society. However, real estate overdevelopment crowds out the space for manufacturing development, impeding real economic growth. Therefore, the two effects offset each other, and the impact of land price distortion on common prosperity in the center is not significant. The western area lags in economic development, and the pressure on fiscal expenditure is strong. Local governments are forced to grant land use rights to obtain extra-budgetary revenues, leading to a relatively high land price distortion. Although land concessions improve infrastructure construction, the western region's backward industrial development and small population result in empty cities.

The positive and negative effects on common prosperity are offset. This inverted U-shaped relationship also does not exist in the Northeast. We further construct a linear panel regression model. A positive effect of land price distortion on common prosperity is found in the Northeast, but the coefficient is only 0.0022. The reason may be that the Northeast has a continuous population outflow, and the construction land demand is also declining. Relying on land concessions to obtain extra-budgetary income to cover fiscal deficits is weak [29]. The low level of land price distortion has less impact on common prosperity.

5.0 Intermediary mechanism analysis

5.1 Population urbanization

To verify whether the mediating effect of population urbanization exists, this paper first regresses population urbanization and land price distortion. As shown in row (1) of Table 6, the result is consistent with the first mediation model. The regression coefficient of land price distortion is significantly positive at the 5% level, and that of the quadratic term of land price distortion is significantly negative at the 5% level. This may be because the government expropriating arable land led to the rural labor surplus. Since the marginal productivity and wages of labor in the non-farm sector are higher than that of the agricultural department, the surplus rural labor starts to move to the cities. Thus, the level of population urbanization rises. However, when the land price distortion reaches a certain value, its impact on population urbanization begins to turn. The employment space of the migrant population is continuously squeezed, and the living cost keeps rising, which reduces their willingness to settle down. Therefore, as the degree of land price distortion increases, the population urbanization level will rise first and then fall.

Subsequently, the overall regression is conducted according to equation (3) and the results are shown in row (2) of Table 6. The coefficient of population urbanization is positive, meaning that the increase in population urbanization level positively affects common prosperity. The major reason may be that rural labor transfer to the city causes the rural population reduction, and the per capita income level of rural residents increases. It reduces the urban-rural income gap (Su et al., 2015). Simultaneously, a large number of population inflow into the cities can promote urban development. In addition, these people can bring the knowledge and skills learned in the cities back to the countryside. It can promote rural industry growth and help realize common prosperity. Land price distortion still has a significant "inverted U-shape" effect on common prosperity. But compared with the benchmark results, the absolute value of the regression coefficients of land price distortion and its quadratic term is decreased. This indicates an "inverted U-shaped" relationship between land price distortions and population urbanization, with a consequent "inverted U-shaped" effect on common prosperity. Hypothesis 2 is confirmed.

5.2 Housing price

To test the mediating effect of population urbanization, we first regress population urbanization and land price distortion. From the regression result in row (3) of Table 6, it can be concluded that the mediating mechanism is also consistent with the first mediation model. The coefficients of land price distortion and its quadratic term are significant at the 1% level and have different signs. This may be because the government restricts the commercial and residential land supply to obtain high land transferring fees. It raises commercial and residential land prices and pushes up house prices. However, due to the huge profitability of the real estate sector, more and more

companies invest massive capital in this sector. This leads to an oversupply of housing and a fall in house prices. Thus, as the degree of land price distortion increases, house prices show an "inverted U-shaped" trend.

Table 6 row (4) is the overall regression results, in which the coefficient of house price is significantly positive. This is likely due to the prosperity of the real estate industry can promote the development of related industries, thus driving the economic development of the whole society. It can provide plenty of funds for regional infrastructure construction, and increase the employment space for low-skilled labor. People may choose to buy houses and settle down in areas with lower house prices, conducive to the economic development of those areas. The rise in housing prices may also hurt the common prosperity. First, the rising housing prices cause a shrinkage of the residents' wealth who have not purchased a home, widening the wealth gap between residents. It impedes the sense of well-being enhancement. Moreover, a large amount of capital investment in the real estate industry will lead to "de-industrialization". But in general, the positive impact of rising house prices outweighs the negative, so conducive to realizing the goal of common prosperity. Land price distortion still has a significant "inverted U-shape" effect on the common prosperity. But compared with the base regression results, the absolute value of the coefficients of land price distortion and its quadratic term is decreased. This suggests an "inverted U-shaped" relationship between land price distortions and house prices, with a consequent "inverted U-shaped" impact on common prosperity. Hypothesis 3 is verified.

Table 6: Mediation effect regression results

	(1) urban	(2) C	(3) lnhouse	(4) C
LPD	0.0093** (0.0034)	0.0026* (0.0014)	0.0560*** (0.0146)	0.0025* (0.0013)
LPD2	-0.0003** (0.0001)	-0.0002*** (0.0001)	-0.0019*** (0.0006)	-0.0002*** (0.0001)
urban		0.2451*** (0.0832)		
lnhouse				0.0426*** (0.0150)
open	0.1504*** (0.0423)	-0.1760* (0.0315)	0.1510*** (0.1404)	-0.1456* (0.0337)
press	0.0463*** (0.0094)	0.0102* (0.0052)	0.2507*** (0.03776)	0.0109* (0.0062)
market	-0.2325* (0.1175)	0.1293*** (0.0427)	-2.1273*** (0.5161)	0.1630*** (0.0514)
retail	0.0648*** (0.0078)	0.0476*** (0.0082)	0.3827*** (0.0335)	0.0472*** (0.0085)
_cons	0.3159*** (0.0326)	0.0571 (0.0345)	7.4991*** (0.1461)	-0.1851 (0.1142)
Observations	450	450	450	450
R-squared	0.7870	0.8560	0.8290	0.8570

6.0 Conclusions and policy recommendations

6.1 Conclusions

Local governments rely on the "double-second-hand" land supply strategy, low-priced industrial land and high-priced residential and commercial land, to generate land revenues. Thus, local government can guarantee regional economic and social development. However, the long-term land price distortion has a complicated impact on the common prosperity. Therefore, based on the data of 30 provincial-level administrative regions in China, this paper examines the relationship between land price distortion and common prosperity. The empirical results indicate that: (1) there is a significant "inverted U-shaped" effect between land price distortion and common prosperity. When the land price distortion reaches the critical value, its impact on common prosperity will change from promotion to suppression. (2) The impact is regional heterogeneity, with a significant "inverted U-shape" effect in the eastern region and insignificant effects in the other three regions. (3) Population urbanization level and house price are two major paths for land price distortion affecting common prosperity. Land price distortion has an "inverted U-shaped relationship" with population urbanization and house prices respectively. Through them, there is an inverted U-shaped impact on the common prosperity.

6.2 Policy recommendations

Based on the above findings, this paper puts forward the following policy recommendations:

6.2.1 Promote relevant system reforms, and reasonably control the land price distortion.

Local governments have long relied on land concessions to obtain land revenue. Although it can promote economic growth quickly and facilitate common prosperity, this behavior is not sustainable. Therefore, it is necessary to push forward the relevant system reform and reasonably control the land price distortion. First, the national government should continue to advance the tax-sharing system reform. The national government should undertake the responsibilities corresponding to the financial power. This enables local governments to match their fiscal power with administrative power and reduce budgetary pressure. Second, it is recommended to create diversified performance evaluation standards. When measuring the performance of local government officials, it should reduce the proportion of GDP and increase the importance of indicators related to the well-being of residents. Thus, realize the unity of material and non-material prosperity. Finally, the local government should actively explore programs that can replace and supplement land finance, to increase the funding sources and control land price distortion reasonably.

6.2.2 Raising the population urbanization level and coordinating urban-rural development

Land price distortion can guide population mobility between urban and rural areas, and the correlation between population urbanization rate and common prosperity is positive. Therefore, the government should steadily promote population mobility to cities. Meanwhile, reform the household registration system to ensure that cross-regional migrants can enjoy city public services. In addition, more land leasing fees should be utilized for rural infrastructure construction and public product supply. This will coordinate the development of urban and rural areas, and rural hollowing can be avoided.

6.2.3 Increasing support for the real economy and ensuring the healthy development of the real estate industry

The land price distortion has an important impact on housing prices. While as a pillar industry of the national economy, the booming of the real estate industry contributes to common prosperity. However, the continuous rise in housing prices will lead to economic virtualization and widen the wealth gap between residents. It adversely affects social stability and economic development. Therefore, to coordinate the development of the real estate industry and the real economy, local government should increase the support to the real economy and guide the capital flow to it. Moreover, relevant policies should be formulated for the real estate industry to control the price of commercial and residential land, and regulate housing prices. The balanced and healthy development of the real estate industry will be realized, guaranteeing social and economic stability and helping the common prosperity.

6.2.4 Combining the actual situation of different regions to formulate reasonable land development and utilization programs

The impact of land price distortion on common prosperity is regionally heterogeneous. Local governments should determine land development scale and use according to the geographic location, economic development and other factors. Moreover, a reasonable land grant program should be formulated to avoid over-development and waste of land resources. For example, western regions should fully utilize existing industrial parks to reduce industrial land exploitation. At the same time, the supply of commercial and residential land should be increased to attract the population to cities. In addition, the land leasing fee is a one-off charge for 70 years of land use. Accordingly, local governments should rationally use land finance revenues following regional development plans. This will improve infrastructure construction, strengthen public services, expand social security coverage, and thereby realizing common prosperity.

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