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Land costs, government intervention, and migration of firms: The case of China

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ABSTRACT

By using unique firm relocation data in China, we first document the relocation behavior of Chinese firms and show that less government intervention (relative to market forces) can improve economic efficiency by facilitating industrial relocation which saves on costs. Ever since China joined the World Trade Organization (WTO) in 2001, investments have poured into the coastal region, which in turn, have almost tripled land costs in the major coastal cities. We exploit this land cost shock in the early 2000s to identify its effect on the relocation behavior of firms. Specifically, we instrument land price growth with the access of a city to foreign markets (approximated by distance to Shanghai), and then estimate the differential impact of land costs on firms regarding land reliance. Our major findings are as follows: (1) the migration rate of Chinese firms in China is on average 3.2%, (2) Rising land costs drive firms to migrate, and firms that use more land-intensive technology are more compelled to migrate, and (3) in regions where the local government intervention is stronger (the market is less developed), the relocation decision of Chinese firms is distorted in the sense that firms are less likely to relocate despite surging land prices due to government intervention.

1. Introduction

Firm relocation is an important phenomenon to study as it may cause dramatic shifts in economic activity and employment at the regional level, and it involves with the firm's essential business decision (such as entry, exit or production decisions). However, there are few papers that have conducted empirical analysis on this topic due to the data limitation. In this paper, by using unique firm relocation data in China, we first document the relocation behavior of Chinese firms. We further examine how intervention from the Chinese government distorts the process of firm migration. In an ideal economic world, firms make optimal decisions that are free of distortion so that efficient resource allocation is achieved through market mechanisms. However, in the case of China, we show evidence that strong government intervention (relative to the market forces) reduces economic efficiency by distorting industrial relocation.

To the best of our knowledge, this paper is among the first empirical works that study the firm relocation issue in China. There are very few studies on firm relocation in the economics literature. Holmes and Stevens (2004) documents how the spatial distribution of manufacturing activity in the U.S. has changed over time. Yoonsoo (2006) summarizes relocation patterns in the U.S. manufacturing

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industry over the period of 1972 to 1992, using plant- and firm-level data from the U.S. Census of Manufactures. However, Yoonsoo (2006) points out that research to date has provided only a very limited understanding of the role of individual firms in the geographic shift of manufacturing activity. Recently, Lampón, Cabanelas, and Carballo-Cruz (2017) discusses the firm relocation from an international perspective and highlights the role of the internal production factor for the explanation of firm relocation. For studies related to China, Wei and Bai (2009) reviews the trend of the relocation of Chinese listed company headquarters and discusses the possible factors which might affect the relocation decision. Feng (2017) uses the local firm data from Chongqing city in China and examines the relationship between firm ownership and relocation cost, and the local government environmental regulation. Evidence of Chinese firm relocation is very limited, and our paper tries to fill this gap by providing a comprehensive analysis on this issue.

In this study, we use the Chinese Annual Survey of Industrial Firms (ASIF) database and exploit shock to land prices in the early 2000s to identify its effect on the relocation behavior of firms in China. Ever since China joined the World Trade Organization (WTO) in 2001, investments have poured into the coastal region, which have almost tripled land costs in the major coastal cities. We instrument land price growth with the access of a city to foreign markets (approximated by distance to Shanghai), and then estimate the differential impact of land costs on firms in terms of land reliance, which is a newly constructed variable that measures the dependence of the production of firms on the factor of land.

We have several findings in the paper. We first document Chinese firm relocation behavior and find that the firm migration rate from 2004 to 2007 in China is on average 3.2%. We show that rising land costs drive firms to migrate, and this effect is larger for firms that use more land-intensive technology. For example, everything else being equal, if housing prices were to increase by 100% during 2004 to 2007, the probability that firms in the garments industry relocate would be higher than that of firms in the chemicals and pharmaceutics industry by 3%. Moreover, we provide evidence showing that Chinese local governments might distort the process of Chinese firm migration. Specifically, in regions where the local government intervention is stronger (the market is less developed), the relocation decision of Chinese firms is distorted in the sense that firms are less likely to relocate despite surging land prices due to government intervention. Taking private firms as an example, Chinese government intervention on average reduces the relocation probability of local private firms from 4.1% to 2.7%, and reduces the relocation probability of SOE firms from 6.1% to 4.3%.

This paper contributes to the literature in several ways. First, this study contributes to the literature on firm relocation, as decisions to relocate are as important as the entry and exit decisions of firms. A relocated firm in China will have substantial impact on the local economy. However, firm relocation has been rarely studied due to the data availability, not to mention China case. To the best of our knowledge, this paper is among the first empirical works that study the firm relocation issue in China.

Another novelty of this study is that the work contributes to the small but growing literature of institutional intervention from a different angle: government distortion of firm migration. There is a growing strand of research which shows that government distortion will result in significant resource misallocation and thus efficiency loss. The McKinsey Global Institute (1998) argues that labor-market regulations drive up the cost of labor in supermarkets relative to informal retailers and cause low productivity in the retail sector in Brazil. Recently, Bai, Hsieh, and Qian (2006) examines whether Chinese government driven investments result in inefficient low capital return, and their estimates based on national accounts data suggest that the return to capital in China has remained high despite the remarkably high investment rates. Hsieh and Klenow (2009) uses microdata of manufacturing establishments and measures the impact of resource misallocation on total factor productivity (TFP) in China and India versus the U.S. In this paper, we examine the impact of shocks to land prices on the relocation behavior of Chinese firms and specifically evaluate the impact of government intervention on the firm relocation process. We provide new empirical evidence that suggests that strong government intervention (relative to the market forces) distort industrial relocation which might result in efficiency loss.

The rest of the paper is organized as follows. Section 2 provides the institutional background of China. Section 3 discusses the data and the measurement issues. Section 4 provides the regression models. Section 5 presents the empirical results. Section 6 concludes.

2. Institutional background

In 1998, the *Notice of State Council on Deepening Reform to Urban Housing System and Speeding up the Housing Construction or the 23rd Decree* issued by the State Council was a milestone in the Chinese housing system reform. The notice abolished the welfare housing system and all employees turned to private housing market to purchase or rent their home. This marked the start of the modern private housing market in China.

Under this context, the housing market flourished rapidly. According to the Census of the National Bureau of Statistics of China, the constructed number of private housing as a share of the total annual flow supply increased more than doubled from 1986 to 1993. The supply then stabilized for the remainder of the decade before resuming an upward trend to 72% in 2006. The annual amount of housing space supplied by the private market increased almost 20-folds from mid-1980s to 2007. 16.3% and 12.2% of the urban households in China lived in owned or rented private housing units in 2005, respectively, compared to only 9.2% and 6.9% in 2000. Naturally, the housing prices increase dramatically.

To control the escalating prices, Chinese government actively intervened the housing market. First, government successfully increased the supply of small and medium sized houses in 2004, which appeared to curb real estate prices. Second, the State Council issues several policies to prevent the reduction in rural residential areas from being used as urban construction land to balance the ecology and the development between rural and urban areas. For instance, low density and large residential house projects were prohibited on farmland in 2006. The transfer of residential land was tightened since 2009. Furthermore, it was stipulated that the percentage of commercial housing land was not to be less than 70% of residential land in 2010. The regulations around the construction conditions provided ways for the government to act against violations of the laws and regulations concerning land use.

In sum, the development of the Chinese real estate market led a significant land price increase which may have important

Table 1
Firm summary statistics.

	Mean	p50	Min	Max	S.D.	No. of obs.
Age of firm	8.33	5.00	0.00	50.00	9.83	15,2771
Total no. of employees	201.95	96.00	0.00	2200.00	326.70	15,2919
Export dummy	34.8%	0.0%	0.0%	100.0%	47.6%	124,887
Firm export ratio	20.7%	0.0%	0.0%	102.0%	35.9%	124,128
Migration rate	3.2%	0.0%	0.0%	100.0%	17.7%	152,919

implications in firm relocation decisions. It is evident that government land policies have had significant impacts on land use and prices. We will examine the possible implications of such policies and investigate the role of the government on the firm relocation process.

3. Data

The purpose of this paper is to provide a better understanding of the relocation behavior of Chinese firms due to the land price increases, and how the Chinese government distorts this behavior. To implement the analysis, we use and merge several datasets.

3.1. Industrial data set and firm relocation

To measure relocation activities at the firm-level, we use the Annual Survey of Industrial Firms (ASIF) database provided by the National Bureau of Statistics of China for the period between 1998 and 2007. This data set contains detailed accounting information of all state-owned manufacturing firms, as well as non-state manufacturing enterprises including private and foreign firms with annual sales of over RMB5 million (US$0.6 million based on 2005 exchange rate). The data of over 100,000 firms are collected each year. Their total outputs account for more than 85% of the industrial outputs of China. As an important micro-level data set in China, the ASIF database has been increasingly used in a number of research studies, including Song, Storesletten, and Zilibotti (2011), Li and Li (2013), and Brandt, Van Biesebroeck, and Zhang (2012).

The ASIF database contains crucial information about firm location, as well as other information at the firm level such as the age and size of the firm, education level of the employees, sales information among others. Firm identification code is available to link the same firm over time. In addition, the ASIF database also contains other variables that are crucial for this study, especially the type of firm ownership. Due to the entry and exit of firms, the sample fluctuates in number, with around 30,000 firms available in the dataset throughout the entire sample period. The total number of observations in our sample is 2,213,013. In our regression exercises, we drop observations that have missing values in any of the regression variables or are outliers. State-owned enterprises (SOEs) account for around 13.5% of the observations in the data. We define firm relocation as follows: if a firm has the same registration number but different firm location information than that of the starting year, we assume that it has relocated. In the base line regression, we compare the location information in 2004 and 2007, and construct relocation measures for all of the firms in the sample. Table 1 is a summary of the basic statistics of the ASIF variables used in our empirical exercises.

3.2. Land reliance and shocks to real estate prices

The land price information is obtained from the CREIS database. The CREIS, a subordinate of the China Index Academy, is a widely used and recognized dataset for the property market in China. Since 2000, the CREIS database has tracked land parcel transactions nationally and provided comprehensive land price information. In this study, we mainly use the average land price change information between 2004 and 2007 across different regions in China.

A key contribution of this study is the use of the land reliance of different industries to identify the effects of shocks to land prices on firms. Information on land reliance is not commonly available. In the empirical analysis, we address this issue by using the average share of expenditure on land rents by different industries as the indicator of land reliance. The data used to construct this variable comes from the World Bank's Productivity and Investment Climate survey of China in 2002. In this survey, the World Bank collaborated with the Chinese government and conducted a large random survey at the firm-level that involved 1500 firms in China. The survey obtained data on inputs and outputs, as well as objective aspects around the investment climate. Note that the survey does not include all industries. Nevertheless, the major industries in China are included, including auto and auto components, electronics, chemicals and pharmaceuticals, food, garments, and metals and machinery.[1]

Based on this World Bank survey, we construct a measure of the land share of expenditures as follows. Question 79 of this survey asks firms: “How much did rent for land or buildings (if owned, please enter value of depreciation) cost your establishment in thousands local currency unit (LCU) during the fiscal year of 2002?” Moreover, Question 74 asks for information on the total sales of each firm. We then divide the land/building costs by the total sales of the firms to obtain the measure of firm reliance on land. The

[1] For details of the data description and methodology, readers can refer to “Enterprise Analysis Unit - World Bank Group https://www.enterprisesurveys.org”.

Table 2
Land reliance and migration rate of different industries.

Industry	Land reliance	Migration rate	Mean business income (1000 RMB)	No. of firms
Auto and auto components	0.71%	3.40%	130,967.40	7686
Electronics	0.82%	5.77%	131,370.50	25,468
Chemicals and pharmaceuticals	0.48%	2.90%	69,857.28	25,237
Food	0.52%	3.17%	49,122.42	5674
Garments	1.04%	2.68%	31,486.31	12,081
Metals and machinery	1.00%	2.95%	39,160.76	46,002
SOEs	0.79%	4.34%	72,526.76	49,226
Private firms	0.83%	2.73%	26,001.86	67,316
Foreign firms	0.84%	5.37%	124,357.82	36,377
Total	0.82%	3.23%	64,375.96	152,919

Note: SOEs denote state owned enterprises.

calculated shares are listed in Table 2. Among the different industries, the industry that relies the most on land is garments, as well as metals and machinery. In contrast, the food industry relies much less on land for its production process.

3.3. Measure of government intervention: National Economic Research Institute Index

In addition to the data at the firm level, we also make use of the National Economic Research Institute (NERI) Index of Marketization of China's provinces to measure the quality of market-supporting institutions at the provincial level. Measures of institutional quality at the provincial level in China are rarely available. A well-known exception is the NERI index published by the National Economic Research Institute (NERI) (Fan, Wang, & Zhu, 2007). The NERI index has been widely used in the economics, finance, and accounting literature to measure the supporting quality of the Chinese local market (see Li, Meng, & Zhang, 2006; Feng & Johansson, 2014).

The NERI measured the relative progress in marketization for the provincial governments in China from 2001 to 2007 (Fan et al., 2003; Fan, Wang, & Zhu, 2005, 2007). Appraisals of the regional institutions are made by using several factors, namely, the relationship between the government and the market, development of the non-state sector, development of the markets, development of market intermediaries, and the legal environment.

The index measures are given a score between 0 and 10 with a higher score indicating a higher level of marketization. The average score for the marketization of 31 provinces in China (including five autonomous minority ethnic regions and three municipalities directly under the control of the central administration) for the base year (2001) is 4.64, and this average score increases to 6.52 for 2005. The province with the highest score in China is Shanghai, and the lowest is Tibet.[2]

4. Empirical strategy

4.1. Baseline model with land reliance as measure

Before considering the effect of government intervention, we start with a simple linear model, which allows us to estimate the effect of the rising land costs on the migration of firms:

$$M_i = \alpha_0 + \alpha_1 \Delta P_j + \alpha_2 X_i + \alpha_l + \varepsilon_i \quad (1)$$

where M_i is an indicator of whether firm i relocates during the period from the base year to year t. In our analysis, we ignore the time script because we use a fixed period. If a firm relocates, M_i is equal to 1; otherwise it is 0. The key independent variable, ΔP_j, is the land price increase in city j. Control variables of the regression include a set of firm attributes X_i at time 0, which may affect the relocation decision of firms. Specifically, we include the age, type of ownership, size, type of industry and export ratio of the firm. We pay particular attention to α_1, the effect of land price increases on firm relocation decisions. We expect α_1 to be positive because, everything else being equal, increasing local land prices provides incentives for firms to relocate, and thus should increase the relocation rate.

To further examine the impact of land price changes on firm relocation decisions, we propose an augmented model. In particular, we augment the model as follows:

$$M_i = \alpha_0 + \alpha_1 \Delta P_j R_l + \alpha_2 X_i + \alpha_j + \alpha_l + \varepsilon_i \quad (2)$$

In this regression, we add a term of interaction between land price growth in city j: ΔP_j, and the reliance of the industry l (to which the firm belongs) on land in its production process, R_l. In the following empirical analysis, we will use the share of land in the total expenditures of a firm to proxy it. We expect α_1 to be positive, suggesting that the effect of increasing land prices on relocation is not uniform across firms, but increases with reliance on land. The notion is straightforward: increasing land rents should increase the

[2] For details, readers can refer to Fan et al., 2003, 2005, 2007.

production costs of firms with land-intensive functions more than other firms. In addition, we also control for the city fixed effect α_j to account for unobserved factors, such as agglomeration rent and local government quality. We also control for the industry fixed effect α_l to account for factors, such as industry-specific policy changes or technology shocks that may affect the relocation decision of firms. An example of this is the spillover of production technology of automobiles, which will affect regions that specialize in automobile production by increasing their land price growth rates due to more investment, and at the same time, reducing the number of automobile firms that exit due to increased productivity.

4.2. Government intervention

In addition, we can further extend Eq. (2) to investigate how government intervention distorts the migration of firms. Specifically, we augment the model by including an indicator of how much the local government supports the market:

$$M_i = \alpha_0 + \alpha_1 \Delta P_j R_l G_j + \alpha_2 \Delta P_j R_l + \alpha_3 R_l G_j + \alpha_4 R_l + \alpha_5 X_i + \alpha_j + \varepsilon_i \quad (3)$$

where ΔP_j represents the land growth in jurisdiction j, and $R_l$represents the reliance of the industry l (to which the firm belongs) on land. G_j is an indicator of the extent of government intervention in region j and Z_i includes relevant firm attributes. Note that G_j and its interaction with ΔP_j is absorbed by city-specific fixed effects. X_i include age, form of ownership, size, type of industry and the export ratio of the firm.

We expect $\alpha_1$to be positive, which means that firms in regions with a pro-market local government are more likely to migrate to other regions, ceteris paribus. Why would an anti-market government have a higher impact on distortion in the firm migration process? First, local governments do not like firms to relocate due to economic incentives. Local governments benefit from the tax revenue of firms and profits from SOEs. When firms relocate, the local government suffers loss of fiscal revenue and the local community suffers loss of employment opportunities. Hence, local governments are incentivized to retain firms. Regions with governments who have more extensive power may have different channels to distort the market and therefore firm migration decisions. Therefore, we should expect α_1 to be negative.

Moreover, even for firms within the same city, the response of firms with different forms of ownership may differ as they may be affected differently by the local government. As lower level governments in China have more power to influence SOEs and some of the private firms, we expect that the effect of the distortion to be the largest for SOEs, and some of the local private firms, but has the least impact on foreign firms.

4.3. IV estimation

The simple regression in Eq. (2), however, may suffer from endogeneity due to omitted variables, such as the agglomeration effect, which can affect the relocation decision of firms. In regions with positive agglomeration rent, firms may make more profit and growth of investments may be more rapid than that of other regions, thus producing a more rapid increase in land prices. This then introduces a negative correlation between increases in land price and firm relocation. The agglomeration rate, however, is not observed here. Hence, omitting this variable introduces a negative bias to the coefficient of land price increase. Another endogeneity issue that cannot be addressed by Eq. (2) is the reverse causation from the location of firms on land prices. A firm that relocates to another region leaves an empty space, thus increasing local land supply. This would also introduce a negative correlation between relocation and local land price increases.

To address the endogeneity issue, we propose an instrument variable for the interaction of land price increase and land reliance in Eq. (2). The IV is the interaction between the land reliance of a firm and distance between the city where the firm is located and Shanghai, which is the most important trade center in China. We argue that this is a valid IV for the following reasons. First, trade and FDI are primary reasons for increasing land prices, which are more sizable in cities that are close to an international market. As Shanghai is the major hub for the rest of China to access the international market, the distance of a city to Shanghai is a key factor of investment and hence land demand.

Second, a key concern is reverse causation. The relocation of firms may affect the land supply, thus producing a spurious relationship. However, as our IV is geographical distance, it should not be affected by the relocation of firms. Hence, reverse causation is addressed. A possible concern of the validity of this IV is that many other factors may be related to distance aside from land prices. For example, the agglomeration effect can be related to distance. However, note that the IV is not distance alone, but the interaction between distance and land reliance. As long as the relationship between these omitted factors and distance does not depends on the land reliance of a firm, then our IV satisfies the exclusive restriction.

5. Empirical findings

In our baseline regressions, we focus on the period from 2004 to 2007 and examine how the price increases in the housing market during this period of time affect the relocation behavior of firms. In robustness checks, we will also vary the periods of time to check the robustness of our estimates. In all of the regressions, we report robust standard errors clustered at the city-industry level.

5.1. Baseline regressions

We begin by examining the relationship between shocks to real estate prices and the relocation decision of firms, without

Table 3
Baseline regressions.

Variable	(1)	(2)	(3)
	Simple OLS	Adding interaction	Adding firm attributes
Land price	−0.050***		
	(−3.257)		
Land price * land reliance		5.497***	5.579**
		(2.873)	(2.576)
Land reliance		−4.334	−5.311*
		(−1.587)	(−1.715)
Firm age			−0.006***
			(−5.643)
Firm size			0.006***
			(5.821)
Firm export dummy			0.018***
			(4.612)
Firm export ratio			−0.017***
			(−3.453)
Constant	0.077***	0.041***	0.032**
	(5.107)	(3.512)	(2.269)
Observations	55,559	47,875	38,204
R-squared	0.006	0.144	0.198

Note: OLS denotes ordinary least squares.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

considering the effect of local government intervention. Specifically, we estimate Eq. (1) with a parsimonious specification, which includes housing price changes at the city-level and an industry fixed effect. Counter to our expectations, we find that in cities with more rapid increases in housing prices that firms are actually less likely to relocate (Column 1 of Table 3). This invalidates our hypothesis, but is possible as omitted variables may bias the model estimates negatively as discussed in Section 4.

To address the endogeneity issue, we first estimate Eq. (2), which includes the interaction between housing price increases and the land reliance of firms. Housing price increases are not included in the regression as their effect is absorbed by city-specific fixed effects, which control for all city specific factors including at the agglomeration level. The estimate of the interaction term is now positive, as expected, and highly significant (Column 2 of Table 3). This means that for cities with rapidly increasing property prices, industries that rely more on land for their production process are more likely to relocate. To gauge the magnitude of this estimate, we calculate the relative response in relocation probability for each industry in Column 2 of Table 3. Consider the chemicals and pharmaceuticals industry, which has the lowest intensity of land use (0.48%) in our sample, and the garments industry, which has the highest intensity of land use (1.04%) (see Table 2). The estimate suggests that, everything else being equal, if housing prices were to increase by 100% during 2004 to 2007, the probability that firms in the garments industry relocate would be higher than that of firms in the chemicals and pharmaceutics industry by 3.2 percentage points,[3] which is non-trivial given the average relocation rate of 3.2% during the sample period.

In Column 3, we check the robustness of the estimates by including firm attributes that may affect the relocation decision. Specifically, we include the age, size, and export ratio of the firm as well as the labor share of college graduates. The estimate that we obtain for the interaction between housing prices and land reliance is very similar to the estimates in Column (2). The result suggests that land reliance makes the firm more sensitive to a price shock, which is consistent with the findings in Columns 2.

Taken together, the baseline regressions suggest the non-trivial effect of shocks to land prices on firm relocation decisions and in the following analysis, we will provide evidence that shows government intervention also significantly distorts the firm migration process.

5.2. Evidence of government intervention

As discussed, it is possible that local governments of China are still largely anti-market, and have created barriers to the relocation of firms. In this case, we hypothesize that the effect of housing price shocks on firms differ based on the form of ownership. Specifically, the effect should be the weakest for SOEs, which are the most prone to government intervention, and the strongest for foreign firms, the decision of which is much more similar to those in the market economy. According to the data, the migration probability of SOEs, local private firms, foreign firms are 4.34%, 2.73% and 5.37%, respectively. However, this pattern could be affected by other factors that differ between firms with different forms of ownership and affect the relocation rate. To provide more rigorous outcomes, we shall address this issue by using econometric regressions in the following section.

[3] 5.796*100%*(1.04%–0.48%).

Table 4
Ownership effect on firm relocation: indirect evidence of government distortion.

Variables	SOEs		Private		Foreign	
	(1)	(2)	(3)	(4)	(5)	(6)
Land price * land reliance	0.740	0.316	2.549	3.717	19.705***	23.273***
	(0.272)	(0.095)	(1.006)	(1.389)	(2.900)	(3.170)
Land reliance	−1.840	−1.695	−4.014	−6.222*	−12.125	−15.990*
	(−0.530)	(−0.393)	(−1.188)	(−1.688)	(−1.511)	(−1.854)
Firm age		−0.009***		−0.002		−0.003
		(−4.654)		(−1.414)		(−1.239)
Firm size		0.010***		0.003**		0.002
		(5.549)		(2.116)		(1.038)
Firm export dummy		0.023***		0.002		0.013**
		(2.874)		(0.434)		(2.046)
Firm export ratio		−0.043***		0.000		−0.018**
		(−3.490)		(0.007)		(−2.498)
Constant	0.047***	0.028	0.037**	0.035**	0.038	0.040
	(3.154)	(1.367)	(2.569)	(2.109)	(1.375)	(1.309)
Observations	16,768	12,249	17,380	14,072	13,727	11,883
R-squared	0.121	0.207	0.177	0.235	0.223	0.257

*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

We conduct a series of econometric analyses for SOEs, local private firms, and foreign firms and present the results in Table 4 (for conciseness, we only report the estimates for the interaction between housing price shocks and land reliance). Column 1 reports the standard panel estimates following Eq. (2) and controlling for industry and city fixed effects, but without controlling for firm attributes. Significant differences are found between the different forms of ownership. For SOEs, the effect is highly insignificant, and the magnitude of the estimate, 0.74, is the smallest among the different forms of ownership. This is reasonable as SOEs are directly controlled by the government, and their relocation decision is much less likely to be driven by profit-maximization, and more likely by government plans. Column 3 reports the effect on local private firms, which is 2.54, and larger than that of SOEs but still insignificant. This is reasonable as local governments do not have direct control over local private firms, even though they can somehow still influence local firms. However, Column 5 shows a very different story - the effect on foreign firms is 19.7, which is highly significant and much larger than that of local firms. This is expected, and suggests that the potential influence of local governments on the relocation decision of firms is substantial.

The analysis above could be biased by the fact that foreign firms may differ from local firms in firm attributes, such as age, size, export propensity, and technology level. To determine whether this is the case, we add proxies of these factors to the regression (Columns 2, 4, and 6). The estimates of the effect of shock to land prices do not change much. In fact, adding a control variable even slightly increases the gap between foreign and local firms. Hence, it appears that the differential effect on firms with different forms of ownership is not spurious. The results suggest a similar story: the potential influence of local governments on the relocation decision of firms is substantial.

The regressions by different forms of ownership thus provide evidence that suggest government intervention may have been an important factor in reducing the probability of firm migration in China. To provide more direct evidence on the effect of local government intervention on the relocation decision of firms, we estimate Eq. (2) by using a general indicator of whether the local government is pro-market (the NERI index as discussed in Section 3.3). As discussed in Section 4.3, we expect α_1, the coefficient interaction term of land price increase, land reliance and NERI index, to be positive, which means that firms in regions with a pro-market local government are more likely to migrate to other regions, given everything else being the same. To facilitate a comparison, we conduct the regression by using different forms of ownership. We expect that the effect of the government would vary based on the different forms of ownership, for the same reasons discussed above.

The regression results are presented in Table 5, and Columns 1, 2 and 3 show the results for SOEs, private firms and foreign firms, respectively. The estimates are generally consistent with expectations and show that the local marketization level or government intervention mainly affects local private and foreign firms. Specifically, first consider the SOEs in Column 1 of Table 5. Note that α_1 is insignificant, which suggests that government intervention significantly affects the relocation behavior of SOEs. This is reasonable as SOEs are affiliated with governments by nature, and their managers are typically local government officials. Hence, they are essentially “tied” to the local community and relocation is not a free decision for them.

In sharp contrast, α_1 is positive and significant for local private enterprises. This suggests that for cities with less government control, land intensive firms are more likely to relocate in response to housing price shocks. Interestingly, the effect of government intervention on foreign firms is also significant and higher than that on private firms (see Column 3 of Table 5). This is also consistent with our findings: a higher level of marketization in the local area means that foreign firms are more likely to relocate in response to housing price shocks given that all other parameters are constant because they are not subject to government intervention which is not the case for SOEs.

Table 5
Role of government intervention in firm relocation decision.

Variable	(1)	(2)	(3)
	SOEs	Private	Foreign
Land price ∗ land reliance ∗ government intervention	1.251	3.533**	10.836***
	(0.610)	(2.139)	(3.031)
Land price ∗ land reliance	−9.164	−23.73**	−62.134**
	(−0.648)	(−2.019)	(−2.363)
Government intervention ∗ land	−0.677	−2.761*	−9.717***
Reliance	(−0.373)	(−1.687)	(−2.698)
Observations	12,249	15,957	12,740
R-squared	0.199	0.161	0.218

Robust standard errors in parentheses.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

Table 6
Role of government intervention in firm relocation decision: Neri index level.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Low Neri	Low Neri	Low Neri	High Neri	High Neri	High Neri
	SOEs	Private	Foreign	SOEs	Private	Foreign
Land price ∗ land reliance	−1.131	0.367	5.439	0.397	9.523	53.043***
	(−0.299)	(0.098)	(0.636)	(0.040)	(1.362)	(3.873)
Land reliance	1.667	−2.078	−2.567	−6.766	−12.165	−38.261***
	(0.315)	(−0.348)	(−0.243)	(−0.666)	(−1.593)	(−2.635)
Firm age	−0.011***	−0.001	0.001	−0.006*	−0.003*	−0.004
	(−4.389)	(−0.467)	(0.131)	(−1.713)	(−1.744)	(−1.594)
Firm size	0.009***	0.002	0.002	0.011***	0.005**	0.002
	(4.321)	(0.562)	(0.580)	(3.517)	(2.461)	(1.091)
Firm export dummy	0.020**	0.015	−0.004	0.027**	−0.002	0.022***
	(2.052)	(1.084)	(−0.394)	(2.100)	(−0.462)	(2.763)
Firm export ratio	−0.053***	−0.031*	0.002	−0.038**	0.009	−0.028***
	(−3.353)	(−1.666)	(0.180)	(−1.974)	(1.245)	(−3.322)
Constant	0.025	0.049	0.052	0.034	0.022	0.010
	(0.963)	(1.632)	(1.155)	(1.118)	(1.274)	(0.237)
Observations	7962	5242	4279	4287	8830	7604
R-squared	0.217	0.256	0.203	0.185	0.208	0.294

All Neri indices are divided into two groups by median value: low and high Neri index groups.
Robust standard errors in parentheses.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

We further examine the effect of government intervention on firm relocation decisions by using different Neri index levels. We divide all of the Neri indices into high and low groups by their median value, and then run regressions based on types of firm in each group. Table 6 shows the regression results. Columns 1, 2 and 3 show the regression results for SOEs, private firms, and foreign firms for the low Neri index group, respectively. We can see that the coefficient α_1 of all three types of firms becomes insignificant, even the foreign firms. This suggests that in regions of China where the government has a low Neri index value, firm relocation decisions will be affected by government intervention.

Columns 4, 5 and 6 show the regression results for SOEs, private firms and foreign firms in regions of China with a high Neri index. The results are very similar to those in Table 5. The coefficient $\alpha_1$for SOEs is still close to zero and insignificant. The coefficient $\alpha_1$for private firms is higher than that of SOEs, but insignificant. However, the coefficient α_1 of foreign firms is significantly positive, which is similar to the result in Table 5. All of these results are consistent with our conclusion: a higher level of marketization in the local area means that foreign firms are more likely to relocate in response to housing price shocks given that all of the other parameters are constant.

Taken together, our estimates that explicitly account for local government intervention further confirm our hypothesis that government intervention indeed distorts the decision of private enterprises.

Table 7
IV estimation results: all firms.

Variable	(1)	(2)
	First stage	Second stage
Land price ∗ land reliance		41.201**
		(2.389)
IV_Shanghai	1.805***	
	(25.803)	
Land reliance	0.762***	−33.286**
	(50.679)	(−2.277)
Firm age	−0.000**	−0.006***
	(−2.031)	(−3.297)
Firm size	0.000**	0.006***
	(2.477)	(3.401)
Firm export dummy	−0.000*	0.019***
	(−1.691)	(2.876)
Firm export ratio	0.000***	−0.019**
	(3.457)	(−2.251)
Constant	0.000***	0.016
	(5.351)	(0.683)
Observations	38,204	38,204
R-squared	0.976	0.199

*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

Table 8
IV estimation results: type of firm.

Variable	(1)	(2)	(3)
	SOEs	Private	Foreign
Land price ∗ land reliance	14.938	42.202*	153.556**
	(0.891)	(1.897)	(2.312)
Land reliance	−13.120	−35.235*	−124.070**
	(−0.943)	(−1.896)	(−2.170)
Firm age	−0.009***	−0.002	−0.002
	(−3.715)	(−0.868)	(−0.719)
Firm size	0.010***	0.003	0.001
	(4.441)	(1.219)	(0.471)
Firm export dummy	0.023**	0.002	0.015
	(2.334)	(0.315)	(1.537)
Firm export ratio	−0.044***	−0.002	−0.018*
	(−2.847)	(−0.172)	(−1.696)
Constant	0.026	0.006	−0.006
	(1.046)	(0.240)	(−0.127)
Observations	12,249	14,072	11,883
R-squared	0.207	0.235	0.257

*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

5.3. IV estimation

Following the discussion in Section 4.3, we further use an instrument variable for the interaction between the land reliance of a firm and distance between the location of a firm and Shanghai, and estimate Eq. (2).[4] Tables 7 and 8 present the regression results of all firms, and only specific types of firms, respectively.

Table 7 shows that when all firms are examined, the estimate obtained for the interaction between housing prices and land reliance is similar to those in the baseline regression results shown in Table 4. The result also suggests that land reliance increases the

[4] To check the robustness, we also try a new instrumental variable using the distance between the location of a firm and Chinese five busiest coastal ports (Shanghai, Ningbo, Shenzhen, Tianjin and Qingdao, according the *China Ports Yearbook 2005*). The results based on the new IV are similar and the conclusion remains the same.

Table 9
Robustness check: 2003 to 2006.

Variable	(1)	(2)	(3)
	SOEs	Private	Foreign
Land price * land reliance	4.700	5.883	38.164***
	(0.877)	(1.197)	(3.681)
Land reliance	−12.089*	−12.398**	−47.892***
	(−1.850)	(−2.101)	(−4.036)
Firm age	−0.014***	−0.001	−0.007
	(−4.314)	(−0.389)	(−1.442)
Firm size	0.005**	−0.001	−0.001
	(2.025)	(−0.311)	(−0.363)
Firm export dummy	0.031***	0.016*	0.023**
	(2.811)	(1.830)	(2.568)
Firm export ratio	−0.011	−0.017	−0.033***
	(−0.620)	(−1.601)	(−3.362)
Constant	0.140***	0.102***	0.195***
	(4.651)	(3.172)	(4.678)
Observations	9155	6284	7764
R-squared	0.275	0.461	0.366

Robust standard errors in parentheses.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

Table 10
Simulation results.

Variable	(1)	(2)
	Actual migration	Model – no friction IV
Migration rate - SOE	4.3	6.1
Migration rate - Private	2.7	4.1
Migration rate - Foreign	5.4	5.2

sensitivity of a firm to price shocks. Table 8 shows the IV regression results for type of firm. The coefficient $\alpha_1$for SOEs is still insignificant which is similar to the results in the previous tables. Moreover, the coefficient $\alpha_1$for private firms is higher than that for SOEs and now becomes significant. Finally, the coefficient $\alpha_1$for foreign firms is still the highest among all of the different types of firms and significant. The pattern of the results is consistent with the findings presented in the previous tables and also consistent with our conclusion that a higher level of marketization in the local area means that foreign firms are more likely to relocate in response to housing price shocks given that all of the other parameters are constant because foreign firms are less prone to government intervention which is not the case for SOEs.

5.4. Robustness check by using different time spans

In our baseline regressions, we focus on the period from 2004 to 2007 and examine how housing market price increases during this period of time affect the relocation behavior of firms. In the robustness checks, we use different time periods to check the robustness of our estimates.

Table 9 shows the regression results for type of firm by using the time period from 2003 to 2006. The regressions result in each column are very similar to those in Table 4 which examines the time period from 2004 to 2007. The estimated coefficient α_1 for SOEs is insignificant, which suggests that SOEs are not very sensitive to land price increases. The coefficient α_1 for private firms is also insignificant but significantly positive for foreign firms. All these suggest that the main results obtained in the paper are robust to different time spans.

5.5. Simulation analysis

The empirical evidence above suggests that local government restrictions have significantly reduced the migration of firms. If the government did not intervene, there would have been a much larger scale of firm relocation in the past decade due to surging land prices. To gauge the magnitude of this friction effect on firm migration, we conduct a simple simulation exercise. Specifically, we assume the decision of foreign firms to relocate is market-based and not due to interference of the local governments. Given this

assumption, we apply our model estimates of foreign firms to local firms in our sample (considering their firm-specific attributes) to predict their probability of relocation.

Our simulation results are summarized in Table 10. For each form of ownership, we report the actual relocation probability, and the implied relocation probability assuming that the estimates of the foreign firms apply to local firms. The actual relocation probabilities are listed in Column 1 in Table 10. Compared to the benchmark relocation probability, relocation probability "without institutional constraint" implied is generally higher. Specifically, in Column 2 the relocation probability of SOEs is 6.1%, which is higher than the actual level of 4.3%. And the estimated relocation probability of private firms is 4.1%, which also much higher than the actual migration probability. In sum, without local friction, our implied relocation tendency of local firms would increase significantly.

6. Conclusion

By exploiting a unique firm relocation data in China, we show that weakening government intervention (relative to market forces) can improve economic efficiency by facilitating industrial relocation to save costs.

To the best of our knowledge, this paper is among the first empirical works that study the firm relocation issue in China. Specifically, we first document that the migration rate of Chinese firms in China is on average 3.2% in 2004 to 2007. Second, we show that rising land costs drive firms to migrate, and firms that use more land-intensive technology are more compelled to migrate. Moreover, we provide evidence showing that in regions where the local government intervention is stronger (the market is less developed), the relocation decision of Chinese firms is distorted in the sense that firms are less likely to relocate despite surging land prices due to government intervention. We believe that these findings might have important policy implications for both the practitioners and policy makers. Unfortunately, due to the data limitation, in the current study we cannot specifically estimate the welfare loss due to the government intervention. However, this interesting topic will be left for future study.

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