Fiscal Reform, Land Expansion, and Urban Growth in China[*]

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Abstract

The central government of the People's Republic of China enacted a fiscal reform known as the "Province-Managing-County" (PMC) reform in the early 2000s. This reform eliminated the prefecture city government as the intermediate layer between the province and the county. We apply a difference-in-difference method using a panel data set of 263 cities nationwide over the period of 1999-2011 to examine how the introduction of the PMC reform affects the economic growth of the cities. Our results show that on average implementing the PMC reform moderately increases city growth by 0.8 percent. We argue that this unexpected positive growth effect of the reform is induced by the expansion of land supply of the reformed cities, which in the post-reform period have faced the need to look for revenues outside the budget system, mainly extra-budgetary funds in the form of leasing land. Our analysis provides evidence on this argument, and reveals that the reformed cities tend to expand land leasing at a speed that is 15 percent higher than the non-reformed cities. Furthermore, we show that the impacts of the reform tend to be strengthened over time following the introduction of the reform. Our results are quite robust across several robustness checks.

Keywords: Province-Managing-County Reform; Land Lease; City Growth; China

JEL Classifications: H11; H77; R11; R52

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1. Introduction

The current tax system in China, known as the "Tax Sharing" system, has frequently and increasingly been criticized. Some concerns relate to its low administrative efficiency under a hierarchical fiscal managing system and to the very large gap between revenue and expenditure assignments at the local level (World Bank, 2002; Martinez-Vazquez et al., 2014). Indeed, many local governments, particularly county and township governments, have experienced difficulties in financing public goods and services (Luo et al., 2007). In response, the central government enacted a fiscal reform known as the "Province-Managing-County" (PMC) reform in the early 2000s. This reform was intended largely to improve administrative efficiency and to lessen the fiscal stress of county governments by eliminating the prefecture city government as the intermediate layer between province and county. The PMC reform therefore transformed the existing hierarchical fiscal managing system from a province-managing-city and city-managing-county model to a model in which the province directly and separately manages the prefecture city and county on fiscal matters. It is believed that the removal of the potential "exploitation" of city governments will give the reformed county government more local discretion so that it will enjoy smoother fiscal transactions with provincial governments. The broad intent is to enhance administrative efficiency and local economic development.

This transformation of the landscape of fiscal structures at the city level seems likely to induce significant changes in city governments' taxing behaviors and expenditure patterns, changes that may be positively or negatively associated with economic growth of the city. The reform-induced decrease of city revenues may induce city governments to look for revenues outside the budget system,[1] mainly extra-budgetary funds in the form of leasing lands for

[1] Under the current highly centralized political system in China, local government officials are promoted or demoted by the upper level governments based on criteria strongly associated with economic performance. In trying to stay

business, which are at present the most important source of extra-budgetary revenues for local governments in China. The expansion of land availability may thus lead to a higher rate of urban economic growth (Lichtenberg and Ding, 2009; Ding and Lichtenberg, 2011). However, other research has raised the concern that the PMC reform may reduce the necessary resources for the development of the city, with negative impacts on the urbanization process in China, because the reform eliminated the authority of city governments to exploit county revenues, to assign excessive expenditure responsibilities to the county, and to withhold fiscal transfers from provincial governments (Zheng, 2009).

However, the existing literature does not provide any empirical evidence supporting these arguments, mainly focusing on the impact of the reform on the performance of county governments and largely ignoring the effects on city governments.[2] Identifying the potential impacts of the PMC reform on the cities, especially its growth impacts, is essential for a systematic evaluation of the reform. This is our purpose here.

We use panel data that covers 263 prefectural-level cities from 1999 to 2011 to examine how the introduction of the PMC reform has affected the economic growth of the cities; these data also help us to identify the channel, i.e., the expansion of land leasing, by which the reform affects city growth. We find that the PMC reform has indeed improved overall city growth and that this growth appears to be gained at the expense of expanding "land grab" behaviors of local governments. Moreover, our results suggest that the impacts of the reform are increasing over time after the reform and also that the effects of the reform tend to be stronger for "poor" cities.

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ahead of the professional career ladder, local government officials in general have a strong incentive to maximize their revenues that could be used to support local economic growth more quickly.

[2] For example, some recent researchers have pointed to the reform's effectiveness in strengthening county government fiscal capacity and promoting county economic growth (Cai and Huang, 2010; Liu et al., 2011; Zheng et al., 2011).Others provide evidence that the reform may have reshaped county governments' patterns of public spending toward a higher level of productive expenditure and a lower level of welfare expenditure (Liu et al., 2012; Wang et al., 2011).

The rest of the paper is organized as follows. Section 2 provides a brief introduction on the institutional background for the PMC reform in China. Section 3 introduces and discusses the data. Section 4 sets up the empirical methodology and presents the main results. Section 5 presents some robustness tests, and section 6 discusses the dynamic and heterogeneous effects of the reform. The last section concludes.

2. A Brief Introduction to the PMC Reform in China

2.1. Institutional Background

The People's Republic of China has maintained a highly centralized political system with a homogeneous but "hierarchical" structure of governance since its formation in 1949. Currently, there are five levels of governments in China. Starting with highest, these levels are: the centre, provinces, prefectures and prefecture-level cities (hereafter, cities), counties, and townships. Under the hierarchical system, each subnational level of government is wholly subordinate to the next higher order of government, and so the intergovernmental fiscal relationships are typically defined and implemented between the government at the corresponding level and its immediate upper level of government (i.e., centre-managing-province; province-managing-city; city-managing-county; county-managing-township).

Nevertheless, the hierarchical system is accompanied by a weak institutional setup of fiscal arrangements. The current tax sharing system has for the first time in history clearly defined the revenue assignments between the central and provincial governments, but it has also left open an unclear assignment of expenditure responsibilities among the different levels of governments (Xu, 2011; Liu and Martinez-Vazquez, 2014). Also, sub-provincial fiscal arrangements are not formalized by any laws or regulations. Instead, the central government

grants provincial governments the discretion to set up their own intergovernmental fiscal relationships within the provinces. Practically, provincial governments have mostly followed the hierarchical fashion to determine their fiscal relationships with city governments, and have authorized city governments to specify their relationships with county governments (Martinez-Vazquez et al., 2008; Liu et al., 2014). Thus this institutional setup implies many different fiscal arrangements at the sub-provincial level that depend on the specific province.

Even so, two essential features are common in virtually all provinces. First, the multi-layer government structure seems to have hampered administrative efficiency. The intermediate layers of governments, usually city governments, tend to act as a "grabbing" rather than a "helping" hand, which distorts top-down communications and bottom-up reporting between the upper and lower levels of governments. Most often, in order to pursue their own interests, city governments have an incentive to retain the authority and the resources given them from the central or provincial governments that otherwise should be directed to county governments. Because of this, lower-tiered governments (i.e. county and township governments) have lost their independence in making appropriate policies for their jurisdictional development and in implementing them on the basis of local conditions. This expansion in city government discretion has also made it more difficult for the policy objectives of the centre to be realized at lower sub-national level even if the central government intervenes in local issues at the county and sometimes even at the township government levels (Martinez-Vazquez et al., 2008).

Second, a large gap seems to have emerged between revenue and expenditure assignments at the local level. In line with the twin objectives of raising the central government's revenues and strengthening the control of the central government in the fiscal system, the "Tax Sharing" system reform in 1994 successfully recentralized revenues to the central level via a

clear classification of central taxes, local taxes, and shared taxes (Jin et al., 2005; Qiao et al., 2008). A parallel centralizing trend of revenues appears to be occurring at the sub-national levels as well, with increasing revenue shares at the provincial and city levels at the expense of county and township shares. By contrast, expenditure assignments at the different levels of government are today largely what they were decades ago under the planned economy, which assigned sub-national governments (especially county and township governments) excessive expenditure responsibilities that are not consistent with much international practice. For instance, city and county governments account for all expenditure on unemployment insurance, social security, and welfare, and county and township governments together provide 70 percent of budgetary expenditures for education and nearly three-fifths of those for health (World Bank, 2002). This large gap between revenue and expenditure assignments has led to mounting fiscal pressures for financing public goods and services at local levels. In response to these pressures, local governments have been forced to look for revenues outside the budget system, mainly in the form of extra-budgetary funds.

2.2. The PMC Reform

As a response to these concerns and to strengthen the role of county governments in improving local governance, the central government launched the so-called PMC reform in the early 2000s, which eliminated the previous fiscal relationship between city and county governments and replaced it with a direct fiscal relationship between provincial and county governments. According to the regulations of the Ministry of Finance, the PMC had several main features.[3] First, revenue assignments and expenditure responsibilities must be clearly defined among provinces, cities, and counties. On the basis of these assignments, city governments are

[3] See "Opinions of the Ministry of Finance on Boosting the Fiscal Reform of "Province-Managing-County", available online at http://www.lawinfochina.com/law/display.asp?db=1&id=8023&keyword=Counties .

not allowed to shift any of their expenditure responsibilities to their own county governments (and vice versa). Second, fiscal transfers, tax rebates, and other subsidies must be allocated separately and directly to cities and counties by provincial governments. Any applications from cities and counties for additional ad hoc transfers have to be sent directly to provincial governments, and these allocations must be evaluated and allocated directly by provincial governments. City governments may continue to make transfers to county governments, but these transfers must go through the provincial governments' budget accounts. Third, city and county governments must separately and independently compile their own annual budgets and final financial reports. Fourth, provincial governments must set up separate and independent accounts to manage all fiscal fund transactions between provinces and cities and also between provinces and counties, and any kinds of fiscal fund transactions between cities and counties must be abolished. In addition, provincial governments must directly determine the revenue-sharing schemes between cities and counties. Finally, annual settlements of any kinds of financial accounts must be directly conducted between provinces and cities and also between provinces and counties. If any transactions remain to be settled between cities and counties, they have to go through the provincial governments.

The PMC reform was formally initiated in some provinces around 2004, and the reform was widely carried out across the nation following this. By the end of 2009, 22 provinces in China had commenced reform on a pilot basis (Liu et al. 2011).[4]

In line with the policy objectives, the implementation of the PMC reform successfully increased counties' fiscal capacities, and so improved their abilities to provide public goods and services. At the same time, the PMC largely reshaped the landscape of the fiscal balance sheets

[4] Zhejiang province is an exception, where the fiscal PMC model has been maintained since the every beginning of the establishment of the country in 1949.

at the city level. It was expected that city revenues would fall significantly, for several reasons. One factor was the termination of a city government's authority in setting specific schemes of revenue assignments between cities and counties, which had been usually seen to be designed in a way favoring city interests before the reform; an additional factor was city government discretion in withholding (or embezzling) fiscal transfers from the central or provincial governments, transfers that were supposed to be directed to county governments. However, city expenditure responsibilities are now clearly regulated by provincial governments, and the ability of city governments to shift part of their expenditure responsibilities to county governments is completely cut off.

Overall, then, it is expected that city governments will experience a shortfall in revenue sources, along with an increase in expenditure responsibilities. As a result, it seems likely that city governments will seek other possible revenues outside the budget system to fill the gap generated by the PMC reform.

2.3. Land Lease as a Source of Local Government Revenue

Over the years since the tax-sharing system reform in 1994, the recentralization of revenue assignments and the weakness of revenue bases have led local governments to experience mounting fiscal pressures for financing their expenditure needs, especially for infrastructure investment and social service provision. These have added to the local incentives to expand collection of extra-budgetary revenue by increasing local land lease.[5] Local governments were provided with the opportunity to exploit land as a source of revenue because the 1994 fiscal reform grants subnational governments a great deal of discretion to act as entrepreneurs in the local land market and allows them to keep all the land-leasing revenues they mobilize (Peterson,

[5] In China, local governments maintain ownership of the land and offer land use rights in the form of ground leases that allow a developer to build on the land (Anglin et al., 2014).

2006; Nitikin et al., 2012). Figure 1 provides an overview of the quantitative importance of land lease revenue as a source of subnational government revenues. In China as a whole land lease revenue grew from less than 10 (6) percent of total subnational government budgetary revenues (expenditures) in 1999 to 61 (35) percent of total subnational government budgetary revenues (expenditures) in 2011. In 2011, revenues based on land lease amounted to 3212.6 billion RMB, compared to total budgetary revenues (expenditures) of 5254.7 (9273.3) billion RMB for all levels of subnational governments.

The extensive expenditure needs of local governments and their monopoly on land decision-making have made land lease revenue an especially attractive revenue source. Given this, the PMC-induced decrease of city revenue and a potential increase of expenditure responsibilities are likely to motivate city governments to further expand land leasing behaviors to fill the gap.[6]

3. Data

Our panel dataset covers 263 prefectural-level cities between 1999 and 2011. Table 1.A provides a detailed definition and sources of all the variables, and summary statistics are given in Table 1.B. Below, we explain some key information about the dataset in further detail.

Since the nature of the PMC reform is to break down the fiscal relationship between the prefecture-level city governments and their former subordinated county governments, identification of the impacts of the PMC reform on city governments needs to focus exclusively on the level of urban/city districts of the city, which are under the direct control of city government regardless of the reform. In another words, the basic unit of our analysis is the city

[6] As demonstrated by Lichtenberg and Ding (2009), incentive-based fiscal and government reforms in China have given rise to land conversion decisions of local governments and long run urban expansion of the Chinese cities.

aggregation of all its urban districts, excluding its belonging counties.[7] Most of our data are obtained from various issues of the *China City Statistical Yearbook*, such as city GDP growth rate, GDP per capita, capital investment, population, government expenditure. The land lease data come from various issues of the *China Land and Resources Yearbook*, which covers annual land lease cases for prefecture-level cities.

Our key variable of interest is a dummy variable for the introduction of the PMC reform. This variable is assembled manually by looking into the official documents released by each provincial government on implementing or enlarging the PMC reform within provinces.[8] These official documents generally highlight the background of the reform and explicitly lay out a detailed list of counties that will be included in the reform. Since the reform was implemented on a pilot basis in every province, it is usually the case that each province gradually expands to include different groups of counties in the reform across years. We thus collect this information for all provinces and create for every county a dummy variable for whether the PMC reform has been implemented in the county in each year. Finally, we aggregate this information to the city level to create the dummy for the introduction of the PMC reform at the city-level, which equals 1 if at least one of a city' subordinated counties has implemented the PMC reform in a particular year and 0 otherwise. Figure 2 displays the number of cities that have implemented the PMC reform and their accumulative percentage in each year. As noted before, the Zhejiang province is the only province that has long maintained the fiscal PMC model over the entire historical period of the new China, which is reflected in Figure 2 by the 11 cities in this province that are indicated as reformed cities before year 2004. Excepting these cities, Figure 2 clearly shows that

[7] Note that a typical prefecture-level city in China is composed of urban districts (i.e., "*qu*") and counties (i.e., "*xian*").

[8] These official documents are usually with the title of "Circular of the People's Government of X Province Concerning the Implementation of 'Province-Managing-County' Fiscal Reform" or "Circular of the People's Government of X Province Concerning the Expansion of the Scope of 'Province-Managing-County' Fiscal Reform".

year 2004 was the start of the recent PMC reform in China. After that, the reform gradually spread to other parts of the country, and by the end of 2011 65 percent of the Chinese cities have implemented this reform. Among these reformed cities, 34 cities were included in the reform in year 2004, 17 cities were in year 2005, 9 cities were in year 2006, 77 cities were in year 2007, and another 68 cities were included between years 2008-2011.

Figures 3 and 4 provide an overview of the evolution of average city growth and land expansion in the Chinese cities over time, classified by the groups of reformed cities and non-reformed cities. In both figures, the solid lines reflect the average value for the cities that have ever implemented the PMC reform between 1999 and 2011. As a point of comparison, the dashed lines depict the corresponding average value across cities that have not implemented the reform by the end of 2011, and the vertical dashed line represents year 2004, which is the first year that the reform was introduced in some cities. The trends for the two group cities are quite comparable in both figures. While Figure 4 reveals a persistent tendency of higher land leasing in the reformed cities than in the non-reformed cities, especially for the years after 2004, the trends of average city growth are more or less close to each other in Figure 3, suggesting a less visible effect of the reform.

However, it is important to remember that these figures only offer descriptive information about average city growth and land expansion. They do not control for important the differences across cities and years that are included in our formal regression models. In addition, for the group of reformed cities (i.e., the solid lines in the figures), a majority of them introduced the reform in different years after 2004, which complicates identification of the possible observable policy impacts of the reform. Accordingly, the next section presents our methodology for measuring these impacts.

4. The PMC Reform and Its Impact on City Growth: Basic Results

4.1 Econometric Specification

We exploit the fact that the PMC reform was introduced in different cities and years, to estimate its causal impact on urban growth in reformed and non-reformed cities. Specially, we estimate a difference-in-difference (DID) or, more generally, a fixed-effects model of the form:

$$y_{it} = \alpha + \beta PMC_{it} + \gamma X_{it} + \eta_i + \eta_j + \psi_t + \varepsilon_{it} \qquad (1)$$

where the dependent variable (y_{it}) is the GDP growth rate of the urban districts of city *i* at year *t*, X_{it} includes various control variables, η_i is the time-invariant and city-specific effect for city *i*, η_j is a vector of province dummies that control for mean differences in city growth rate across provinces, ψ_t is a set of year dummies, and ε_{it} is an i.i.d. error term. PMC_{it} is the variable of interest, a dummy variable indicating the implementation of the PMC reform in city *i* at year *t;* that is, PMC_{it} equals 0 for years before the PMC reform was introduced in a city, and equals 1 for the first year and all the subsequent years of the PMC reform. Since recent studies demonstrate that pervasive serial correlation in DID models may produce severely downward-biased standard errors (Bertrand et al., 2004), we use Huber-White standard errors throughout.

As control variables X_{it}, we include factors typically found to significant in determining economic growth and also variables for which data are available at the city-level in China. These include the capital investment rate, the population growth rate, government expenditure, inflation, and land availability. The capital investment rate is measured as the ratio of total fixed capital investment to GDP. Along with the population growth rate, these variables are usually treated as two of the fundamental determinants of economic growth. Government expenditure, captured by the ratio of total government expenditure to GDP, is expected to be positively associated with

economic growth, given that Chinese governments have been actively involved in promoting the growth of the economy. Inflation is proxied by the consumer price index at provincial level.[9] Inflation may reduce the level of business investment and the overall efficiency with which productive factors are put to use, resulting in a lower rate of economic growth. One last factor is land availability, since it has been shown that land availability at the city-level in China is a constraint on urban economic growth (Ding and Lichtenberg, 2011). Land availability is captured by the total amount of land leasing by city governments (taken in log form). As discussed later, this variable is the main source through which the PMC reform has exerted impacts on city growth.

4.2 Basic Results

The basic results of model (1) are presented in Table 2. We run six regressions, where columns (1) to (6) add different control variables continuously. Across all six regressions, we find a positive and statistically significant coefficient for the introduction of the PMC reform, indicating that the reformed cities tend to experience a higher rate of economic growth than the non-reformed cities. This result is contrary to the prevailing concern of the potential detrimental effect of the reform on city growth. The magnitudes of the coefficients are similar across the different specifications, averaging approximately 0.8, implying that the introduction of the PMC reform on average moderately increases city growth by about 0.8 percent.

The results for the control variables are mostly consistent with those obtained in the growth literature. Capital investment and government expenditure are positively and significantly correlated with urban growth, confirming the traditional wisdom on treating these two variables as important driving forces of economy growth. Inflation has a negative and significant coefficient, consistent with the hypothesis that inflation increases investment

[9] Data for inflation are not available at city level.

uncertainty, and therefore reduces economic agents' incentives to invest. While population growth has a consistent negative coefficient, it is not statistically significant. Lastly, total land leasing plays a positive role in promoting city growth, a result that is line with previous findings that land availability is an important input for urban growth in China.

4.3 The Source of the PMC Reform's Positive Effect on City Growth

Our finding of a positive effect of the PMC reform on city growth may surprise critics of the reform, as they usually believe that city governments are the "victim" of the reform. However, as discussed earlier, the PMC reform may have given city governments an incentive to expand their land leasing behaviors in order to fill the revenue losses, a result that we identified in our previous analysis as a positive contributing factor for city growth.

In order to test this hypothesis and so to clarify the source through which the PMC reform positively affects city growth, we form the following DID model:

$$l_{it} = \alpha + \beta PMC_{it} + \gamma Z_{it} + \eta_i + \eta_j + \psi_t + \varepsilon_{it} \qquad (2)$$

where the dependent variable l_{it} is the log of the total amount of land leasing area of city *i* at year *t* (or the control variable included in the city growth model (1)), and Z_{it} is a set of city characteristics that may affect its land expansion behaviors, including GDP per capita, the share of secondary section in GDP, total population, and government deficit. The first three variables capture the external needs of the city for land supply, and it is expected that economic development level, industrialization level, and population size all call for an expansion of a city's land supply (Deng et al., 2008). Government deficit, defined as the difference between government expenditure and revenue as a percentage of GDP, reflects the internal need of city governments for land expansion as a way to finance the gap. In light of the time it takes for

governments to respond, we use a one-period lag of this variable in the estimations. All other variables in model (2) are the same as in model (1).

Table 3 presents the results. The PMC reform dummy has a consistent positive and statistically significant coefficient, supporting our hypothesis of the incentive effect of the PMC reform on land expansion of the reformed cities for extra-budgetary revenues. The estimated coefficient of the reform dummy has a value around 0.14 across different specifications, implying that the reformed cities tend to expand land leasing at a rate of 15 percent higher than the non-reformed cities.[10]

As for the effects of control variables, we find that a higher level of economic development and a larger population size require a larger expansion of land supply to sustain city development, while government deficit leads to an expansion of land lease in the next period. Although industrialization level has the expected positive sign, it is in general statistically insignificant.

5. Robustness Checks

5.1 Reduced Form Estimations

In order to test for the robustness of the basic results, we conduct sensitivity analysis along three dimensions. First, we re-estimate models (1) and (2) with a reduced sample size that excludes the capital city of each province. The rationale here is that the legal status of a capital city is not really comparable to other prefecture cities in the same province since they may differ dramatically in terms of administrative and fiscal status. In addition, since provincial governments physically locate in capital cities and since these cities are also generally endowed with the best economic and political resources for development, the change of vertical fiscal

[10] Note that $e^{0.14}=1.15$.

management models is anticipated to have smaller impacts on these cities and their belonging counties. Thus, we expect that the magnitude of the reform should increase when the capital cities are removed from the sample.

Second, instead of focusing on the effect of the introduction of the PMC reform directly, another way to capture this effect is to look at the intensity of the reform within the city. To do this, we replace the PMC reform dummy variable with a variable that is defined as the percentage of counties that have implemented the PMC reform in the total number of counties for a city in each year. A positive estimated coefficient of this variable would indicate that intensifying the reform leads to a larger policy effect.

Third, we take into account the potential endogeneity issue of the introduction of the PMC reform.[11] It is a general concern in the DID estimations that, after conditioning on the observable characteristics, the changes of outcome variables in the treated and untreated cities would not be parallel in the absence of the PMC reform. However, we believe that this selection bias issue should not be a concern in our context because the direct targeting subjects of the reform are county governments and the selection criteria are the corresponding county characteristics, which in theory are not related to the performance of the city districts (e.g., the dependent variable). Nevertheless, this issue may still arise if the timing of the PMC reform is affected by the fiscal circumstances of the belonging counties of the city that is linked with the city's economic performance.

To account for such possibilities, we use an instrumental variable (IV) approach. We find three instruments for the introduction of the PMC reform in the city: a dummy indicating whether a province has officially announced its decision to implement the PMC reform within its

[11] Note that models (1) and (2) allow and control for the endogeneity of the introduction of the PMC reform caused by its correlation with province, city, and year fixed effects.

territory on a pilot basis (i.e., it equals 0 for years before the year that the provincial government announced its decision to implement the reform, and 1 for the years after the decision was announced and all the subsequent years); and two other dummies indicating whether a city contains at least one county that is defined by the central government as one of the major counties for producing grain or cotton, respectively. The use of the first instrument is self-evident, as only a province that has decided to implement the reform should have a particular county and its immediate responsible city selected as a reformed county/city. The use of the last two instruments can be justified by the guiding principles for the implementation of the PMC reform issued by the Ministry of Finance of China (i.e., the central authority that leads the PMC reform). More specifically, it is explicitly regulated in the official document "Opinions of the Ministry of Finance on Boosting the Fiscal Reform of "Province-Managing-County" that provincial governments should "largely incorporate counties that produce a large amount of grain, oil plants and cotton into the reform with priority". The underlying reason for this regulation is to make sure that this policy can be better extended to the most needed agricultural counties where fiscal stress has been most severe in the pre-reform period. Following this principle, counties recognized by the central government as major counties for producing grain or cotton are more likely to be chosen as reformed counties. Therefore, it is these features that we contend these three variables are reasonable instruments for the introduction of the PMC reform.

Tables 4 and 5 summarize these robustness results for the impact and its source of the PMC reform on city growth, respectively. To save space, we only present the estimation results for the baseline specification and the speciation with a full set of control variables. In all the estimations presented in both tables, the PMC variable has a persistent positive and statistically significant coefficient, indicating that our previous results are quite robust across these

alternative specifications. Columns (1) and (2) in Table 4 reveal a relative larger estimated coefficient of the PMC reform in comparison to the corresponding results in Table 2, which in turn is consistent with our prediction that dropping the capital cities from the sample is likely to increase the effect of the PMC reform. In columns (3) and (4) of Table 4, we replace the PMC reform dummy with our measure of the intensity of the reform, and we find a statistically significant coefficient for this variable, suggesting that with the increase of county numbers in implementing the PMC reform within a city, its magnitude impact on city growth increases Columns (5) and (6) in Table 4 report the corresponding results from instrumental variable approaches that treat the PMC reform as endogenous. The F-test statistics from the first stage regression and the over-identifying restriction tests are noted at the bottom of Table 4. As shown, the F-statistics are very large and statistically significant, indicating that the three instruments are good predictors of the PMC reform variable; the p-values of the Hansen J statistics suggest that we cannot reject the hypothesis of no correlation between the instruments and the error term in the regressions. The results in columns (5) and (6) are similar and comparable to those in the cases treating PMC reform as an exogenous variable. Overall, our previous finding on the positive growth effect of the PMC reform is not altered by taking the potential endogeneity issue of the introduction of the PMC reform into account.

Similarly, Table 5 provides the corresponding robustness results for our previous detected impact of the PMC reform on the land leasing behavior of city governments, which serves as a potential channel through which the reform exerts its final impact on city growth. These results are also largely the same as our earlier results.

5.2 Structural Model Estimations

Our previous strategy relies on single equation estimations to establish the indirect linkage running from the introduction of the PMC reform to an expansion of land lease and then to a higher level of city growth. However, these estimations may be inefficient if the error terms in equations (1) and (2) are correlated. The problem becomes even more severe when this correlation is generated by possible omitted variables that affect both equations, leading to biased estimates. In addition, higher city growth may in turn cause land expansion to support its development.

In order to address these concerns, we estimate equations (1) and (2) simultaneously using three-stage least squares (3SLS) estimation. The system is identified as not all explanatory variables in the land lease equation are determinants of city growth; those additional control variables, especially the one-period lag of government deficit, implicitly serve as instruments for the potential endogenous land variable in the growth equation, and vice versa. The 3SLS estimations improve estimation efficiency by taking the correlation between the two error terms into consideration. For further robustness checks, we perform several structural estimations: we treat the land lease variable as an exogenous variable in the system, leading to a seemly uncorrelated regression (SURE) model; we also treat this variable as endogenous; and finally we alternatively include or not the city growth variable in the land lease equation. Table 6 presents the estimation results.

In all cases, the PMC reform variable has a persistent positive and significant coefficient in both equations, and the land lease variable in the city growth equation has an expected positive and significant coefficient. This provides clear and robust evidence to support a channel running from the introduction of the PMC reform to an increase of land lease of city governments and so a higher rate of city growth. In addition, focusing on the magnitude of the

estimated coefficient of the PMC reform in the city growth equation in Table 6, it becomes smaller compared to the corresponding estimated value in the single equation estimations in Table 2, which suggests that the structural estimations help to disentangle the impacts of the reform on city growth through land expansion from other possible sources.

6. Dynamic and Heterogeneous Effects of the PMC Reform

6.1 Dynamic Effects of the PMC Reform

The standard regression DID models (1) and (2) provide no insight on the dynamics of the impacts of the PMC reform; that is, how quickly do city governments expand land leasing and city growth after the reform is implemented, and do these impacts accelerate, stabilize, or decline over time? To explore these dynamics, we modify the models to include leads and lags of the PMC reform (Autor, 2003; Bellou and Bhatt, 2013). Specifically, we re-estimate models (1) and (2), but in place of PMC_{it} we include a series of time dummies for the years leading up to a city's implementation of the PMC reform (i.e., indicator variables for 1, 2, 3, 4, and 5 years prior to the reform), the year of reform, and the years after reform (i.e., indicator variables for 1, 2, 3, 4, 5, 6, and 7 years after the reform).[12] By focusing on the lags of the PMC reform, these new specifications allow us to examine the short and long run response of the cities to the reform. In addition, the leads variables (i.e., the year dummies leading up to the reform) provide us an opportunity to check whether there is any evidence of pre-existing trends, which in turn serves as an alternative way to verify whether our main results suffer from selection bias.[13]

[12] Note that the covered period for our analysis is 1999-2011, and the first year for the implementation of the PMC reform is 2004 (excepting the Zhejiang province).

[13] The identifying assumption for the DID model is that the control cities act as a valid comparison group for the treated cities. If this assumption does not hold, then the estimated effects of the reform may simply reflect a continuation of the trend that already exists prior to the reform.

The results of the base specifications augmented with the leads and lags of the PMC reform are presented in Tables 7 and 8 for the growth equation and land expansion equation, respectively. Looking at the year dummies leading up to the PMC reform, we observe estimates that are not statistically different from zero in almost all estimations in both tables, showing little evidence of an anticipatory response of the cities about to implement a reform. In the year of the reform, the estimates are positive and statistically insignificant in the growth equation, after which they remain positive but become strongly significant in the subsequent years.

Turning to the year of the reform and its subsequent year dummies in the land expansion equation, all the estimates are positive and statistically significant. The results reveal two noteworthy findings. First, the PMC reform has an immediate impact on the cities' fiscal budget and so an immediate impact on the land leasing decision of city governments, which in turn takes a one-year lag to transform the impact into city growth. Second, the dynamic results indicate a strengthening effect of the PMC reform over time after the reform is introduced, roughly a tripling of the effect over a 7 year implementation of the reform.

6.2 Heterogeneous Effects of the PMC Reform

The starting point of our analysis is based on the general observation that, by cutting off the fiscal relationship between city and county governments, the PMC reform will result in city governments losing revenues and also expanding their land leasing policy. The validity of this argument depends crucially on the fiscal circumstances of the city before the reform, especially the relative fiscal circumstances of the city districts and its belonging counties. For cities that are relatively rich in comparison to their belonging counties, it is reasonable to expect that the "grabbing" hand of these city governments before the reform would be less severe than their

counterpart cities that are relatively poor compared to their belonging counties. Thus, the introduction of the PMC reform should have a less salient effect on the richer group of cities.

To capture this potentially heterogeneous effect and also to serve as a way of providing further evidence for our main hypothesis, we re-estimate the city growth model (1) and the land expansion model (2) by adding two more variables: the relative rich extent of the city, defined as the ratio of the GDP of city districts to the GDP of the entire city (i.e., combination of city districts and counties); and an interaction term between the introduction of the PMC reform and the relative rich extent of the city. We are particularly interested in the estimated coefficient of the interaction term, as a negative value would provide evidence that the quantitative impacts of the PMC reform become smaller with the increase of the relative income of the cities.

Tables 9 and 10 report the new estimation results for the city growth equation and the land expansion equation, respectively. Across all estimations in both tables, the estimated coefficients of the PMC reform dummy remain positive and statistically significant. Also, the coefficients of the interaction term are consistently negative, confirming the existence of a heterogeneous effect of the reform; that is, the positive effects of the reform on city growth and on land expansion become weaker when the cities are relatively richer comparing to their belonging counties. Although the estimated coefficients of the interaction term are in general statistically insignificant in Table 9, the joint test for the PMC reform dummy and the interaction term is generally significant at the 5 percent level. Finally, the effects of the remaining control variables in both equations are largely unchanged.

7. Conclusions

We find that the PMC reform has increased economic growth of the reformed cities, on average at the rate of about 0.8 percent. This is somewhat counter to the anecdotal criticism on the PMC reform, which worries about the potential detrimental effects of the reform on city growth. Even so, we believe that one must be careful with the interpretation of this result, as our further analysis indicates that city growth is gained at the cost of expanding land supply. Reformed cities tend to expand land leasing at a speed that is 15 percent higher than the non-reformed cities.

Given that the aggressive urban land expansion over the past decades in China has led to a series of social problem including large scale losses of farmland, rapidly rising house prices, and increased social disruptions, the effect of the PMC reform on the land grabbing behaviors of city governments requires serious evaluation by the central authority. Indeed, from a policy perspective, if the continued expansion of urban land use and so the continued loss of farmland is deemed undesirable by the national authorities, then there will be a need for taking the interests of prefecture city level governments into consideration when implementing further PMC-type reforms. Rethinking the assignment for revenue sources to match expenditure responsibilities for different levels of governments is critical for the success of the PMC reform.

In all, flattening the pyramid of local governance is a highly difficult task, and systematic evaluation of the current ongoing PMC reform requires considering all of its possible impacts on all levels of governments. Further reforms should be built on the knowledge – both positive and negative – that we hope to learn from this research.

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Table 1.A. Description and Sources of Variables

Variable	Definition	Source
GDP growth rate	Annual GDP growth rate	China City Statistical Yearbook
Total land lease	Total areas of land lease in hectares (log)	China Land and Resources Yearbook
PMC reform	Dummy variable for the implementation of the PMC reform	Official documents released by provincial governments
PMC intensity	Percentage of counties that have implemented the PMC reform in total number of counties for a city	Official documents released by provincial governments
Capital investment	Ratio of total amount of fixed capital investment to GDP	China City Statistical Yearbook
Population growth	Annual population growth rate	China City Statistical Yearbook
Inflation	Consumer price index at provincial level	China City Statistical Yearbook
Gov. expenditures/GDP	Ratio of government expenditure to GDP	China City Statistical Yearbook
Rich level of the city	Ratio of the GDP of city districts to the GDP of the entire city	China City Statistical Yearbook
GDP per capita	GDP per capita (log)	China City Statistical Yearbook
Secondary sector/GDP	Ratio of the secondary sector in total GDP	China City Statistical Yearbook
Total population	Total population (log)	China City Statistical Yearbook
Gov. deficit/GDP	The difference between government expenditure and revenue as a percentage of GDP	China City Statistical Yearbook

Table 1.B. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP growth rate (%)	3289	13.01	4.92	-21.52	35.86
Total land lease (log)	3232	5.49	1.36	-2.12	9.02
PMC reform	3237	0.32	0.47	0	1
PMC intensity	3146	0.25	0.40	0	1
Capital investment	3251	0.51	0.25	0.05	1.79
Population growth (%)	3269	5.56	3.76	-7.24	31.97
Inflation (%)	3289	102.19	2.52	96.80	110.09
Gov. expenditures/GDP	3252	0.12	0.06	0.02	0.66
Rich level of the city	3242	0.44	0.23	0.07	1.00
GDP per capita (log)	3159	9.86	0.80	7.52	12.58
Secondary sector/GDP	3189	50.80	12.98	8.05	92.30
Total population(log)	3172	4.37	0.59	2.66	6.27
Gov. deficit/GDP	3247	0.06	0.06	-0.09	0.62

Table 2. Effect of the PMC Reform on City Growth

	(1)	(2)	(3)	(4)	(5)	(6)
PMC reform	0.991***	0.802**	0.806**	0.851***	0.770**	0.754**
	(3.022)	(2.508)	(2.524)	(2.648)	(2.418)	(2.335)
Capital investment		3.328***	3.357***	3.309***	2.780***	2.688***
		(5.367)	(5.398)	(5.296)	(4.401)	(4.240)
Population growth			-0.028	-0.023	-0.022	-0.024
			(-0.795)	(-0.664)	(-0.636)	(-0.665)
Inflation				-0.252**	-0.287***	-0.261**
				(-2.372)	(-2.675)	(-2.446)
Gov. expenditures/GDP					11.422***	11.616***
					(5.216)	(5.408)
Total land lease						0.266*
						(1.761)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,237	3,199	3,199	3,199	3,195	3,144
R-squared	0.249	0.266	0.267	0.268	0.275	0.276
Number of cities	263	262	262	262	262	262

Note: Robust t-statistics are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Effect of the PMC Reform on City Land Lease

	(1)	(2)	(3)	(4)	(5)
PMC reform	0.151**	0.131**	0.141**	0.143***	0.138***
	(2.521)	(2.376)	(2.559)	(2.613)	(2.605)
GDP per capita		0.518***	0.493***	0.571***	0.567***
		(3.500)	(3.349)	(3.586)	(3.383)
Secondary sector/GDP			0.002	0.002	-0.002
			(0.498)	(0.467)	(-0.444)
Total population				0.274*	0.350**
				(1.876)	(2.281)
Gov. deficit/GDP, *t*-1					1.046†
					(1.513)
Province FE	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	3,185	3,085	3,022	3,022	2,747
R-squared	0.598	0.611	0.616	0.617	0.544
Number of cities	263	261	261	261	260

Note: Robust t-statistics are in parentheses; *** p<0.01, ** p<0.05, * p<0.1; † represents significance at the 10% level under one-tail test.

Table 4. Robustness Tests of PMC Reform on City Growth: Reduced Form Estimations

	Reduced subsample		PMC intensity		IV estimation	
	(1)	(2)	(3)	(4)	(5)	(6)
PMC reform	1.134***	0.927***			1.026***	0.734**
	(3.339)	(2.772)			(3.174)	(2.328)
PMC intensity			1.976***	1.668***		
			(5.097)	(4.307)		
Capital investment		2.747***		2.354***		2.691***
		(4.168)		(3.791)		(4.739)
Population growth		-0.017		-0.013		-0.024
		(-0.462)		(-0.356)		(-0.710)
Inflation		-0.292**		-0.282***		-0.260**
		(-2.445)		(-2.608)		(-2.450)
Gov. expenditures/GDP		11.753***		11.264***		11.629***
		(5.345)		(5.167)		(5.560)
Total land lease		0.220†		0.215†		0.266*
		(1.383)		(1.374)		(1.948)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,028	2,942	3,146	3,054	3,237	3,144
R-squared	0.249	0.278	0.249	0.275	0.249	0.276
Number of cities	246	246	256	255	263	262
Cragg-Donald F Statistic	.	.	.	.	2075	2195
Hansen J statistic (p-value)	.	.	.	.	0.577	0.481

Note: Robust t-statistics are in parentheses; *** p<0.01, ** p<0.05, * p<0.1; † represents significance at the 10% level under one-tail test. The reduced sample does not include the capital city of each province; the PMC intensity represents the percentage of counties that have implemented the PMC reform in the total number of counties for a city; the instruments in the IV estimations include a dummy indicating whether a province has officially announced its decision to implement the PMC reform within its territory and two other dummies indicating whether a city contains at least one county that is defined by the central government as one of the major counties for producing grain or cotton, respectively.

Table 5. Robustness Tests of PMC Reform on City Land Lease: Reduced Form Estimations

	Reduced subsample		PMC intensity		IV estimation	
	(1)	(2)	(3)	(4)	(5)	(6)
PMC reform	0.162***	0.148***			0.228***	0.233***
	(2.636)	(2.684)			(4.345)	(4.531)
PMC intensity			0.198***	0.193***		
			(2.890)	(2.947)		
GDP per capita		0.593***		0.578***		0.581***
		(3.458)		(3.387)		(4.503)
Secondary sector/GDP		-0.003		-0.003		-0.002
		(-0.744)		(-0.722)		(-0.570)
Total population		0.449***		0.357**		0.351***
		(3.307)		(2.336)		(2.824)
Gov. deficit/GDP, *t*-1		0.873†		0.930†		0.975**
		(1.269)		(1.380)		(2.052)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,980	2,590	3,095	2,696	3,185	2,745
R-squared	0.606	0.555	0.608	0.544	0.597	0.543
Number of cities	246	245	256	253	263	258
Cragg-Donald F Statistic	.	.	.	.	2317	1873
Hansen J statistic (p-value)	.	.	.	.	0.170	0.294

Note: Robust t-statistics are in parentheses; *** p<0.01, ** p<0.05, * p<0.1; † represents significance at the 10% level under one-tail test. The reduced sample does not include the capital city of each province; the PMC intensity represents the percentage of counties that have implemented the PMC reform in the total number of counties for a city; the instruments in the IV estimations include a dummy indicating whether a province has officially announced its decision to implement the PMC reform within its territory and two other dummies indicating whether a city contains at least one county that is defined by the central government as one of the major counties for producing grain or cotton, respectively.

Table 6. Robustness Tests of PMC Reform: Structural Model Estimations

	SURE		3SLS		3SLS	
	City growth	Total land lease	City growth	Total land lease	City growth	Total land lease
PMC reform	0.447*	0.134***	0.443*	0.134***	0.430*	0.109**
	(1.877)	(3.394)	(1.846)	(3.397)	(1.795)	(2.500)
Capital investment	2.631***		2.634***		2.767***	
	(6.781)		(6.782)		(7.183)	
Population growth	0.041*		0.041*		0.039*	
	(1.770)		(1.777)		(1.735)	
Inflation	-		-		-	
	0.352***		0.351***		0.285***	
	(-3.308)		(-3.299)		(-2.724)	
Gov. expenditures/GDP	5.801***		5.838***		5.712***	
	(4.064)		(4.028)		(3.974)	
Total land lease	0.362***		0.375***		0.376***	
	(4.170)		(3.148)		(3.165)	
City growth						0.040*
						(1.693)
GDP per capita		0.560***		0.557***		0.603***
		(6.474)		(6.444)		(5.035)
Secondary sector/GDP		-0.002		-0.001		-0.003
		(-0.601)		(-0.576)		(-0.809)
Total population		0.377***		0.374***		0.414***
		(3.618)		(3.595)		(3.220)
Gov. deficit/GDP, *t*-1		1.092***		1.104***		0.745
		(2.629)		(2.659)		(1.171)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,740	2,740	2,740	2,740	2,740	2,740
R-squared	0.248	0.789	0.248	0.789	0.248	0.780

Note: t-statistics are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 7. Dynamic Effects of the PMC Reform on City Growth

	(1)	(2)	(3)	(4)	(5)	(6)
5 years before	-0.029	-0.072	-0.068	-0.046	-0.010	-0.053
	(-0.059)	(-0.144)	(-0.136)	(-0.093)	(-0.021)	(-0.107)
4 years before	-0.330	-0.373	-0.372	-0.396	-0.397	-0.499
	(-0.736)	(-0.835)	(-0.833)	(-0.886)	(-0.893)	(-1.116)
3 years before	-0.217	-0.154	-0.148	-0.177	-0.168	-0.198
	(-0.519)	(-0.368)	(-0.357)	(-0.422)	(-0.400)	(-0.469)
2 years before	-0.197	-0.038	-0.034	-0.001	0.009	-0.062
	(-0.425)	(-0.083)	(-0.073)	(-0.001)	(0.019)	(-0.133)
1 year before	0.073	0.144	0.167	0.183	0.179	0.139
	(0.155)	(0.309)	(0.359)	(0.395)	(0.385)	(0.298)
Year of the PMC reform	0.335	0.309	0.330	0.378	0.377	0.309
	(0.674)	(0.631)	(0.677)	(0.774)	(0.768)	(0.627)
1 year after	1.092**	1.002**	1.006**	1.045**	0.978*	0.932*
	(2.143)	(1.970)	(1.983)	(2.061)	(1.933)	(1.833)
2 years after	1.231**	1.096**	1.118**	1.194**	1.101**	1.023*
	(2.256)	(2.022)	(2.070)	(2.200)	(2.023)	(1.860)
3 years after	1.749***	1.502**	1.493**	1.592***	1.517**	1.453**
	(2.854)	(2.440)	(2.427)	(2.612)	(2.482)	(2.351)
4 years after	2.800***	2.629***	2.652***	2.687***	2.585***	2.518***
	(4.698)	(4.406)	(4.463)	(4.505)	(4.252)	(4.145)
5 years after	2.471***	2.195***	2.228***	2.224***	2.116***	2.066***
	(3.391)	(2.997)	(3.043)	(2.998)	(2.826)	(2.774)
6 years after	2.753***	2.392***	2.394***	2.410***	2.274***	2.230***
	(4.293)	(3.708)	(3.726)	(3.769)	(3.511)	(3.466)
7 years after	3.367***	3.058***	3.079***	3.144***	2.982***	2.916***
	(4.993)	(4.518)	(4.548)	(4.629)	(4.374)	(4.350)
Capital investment		3.028***	3.064***	3.016***	2.498***	2.445***
		(4.902)	(4.952)	(4.852)	(3.962)	(3.879)
Population growth			-0.032	-0.027	-0.026	-0.029
			(-0.919)	(-0.783)	(-0.761)	(-0.835)
Inflation				-0.261**	-0.295***	-0.264**
				(-2.490)	(-2.801)	(-2.509)
Gov. expenditures/GDP					10.868***	11.005***
					(4.974)	(5.136)
Total land lease						0.184†
						(1.288)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,289	3,251	3,251	3,251	3,247	3,191
R-squared	0.259	0.274	0.275	0.276	0.283	0.285
Number of cities	267	266	266	266	266	266

Note: Robust t-statistics are in parentheses; *** p<0.01, ** p<0.05, * p<0.1; † represents significance at the 10% level under one-tail test.

Table 8. Dynamic Effects of the PMC Reform on Land Expansion

	(1)	(2)	(3)	(4)	(5)
5 years before	0.152**	0.120*	0.089	0.089	0.085
	(2.224)	(1.820)	(1.293)	(1.301)	(1.112)
4 years before	-0.010	-0.055	-0.054	-0.048	-0.009
	(-0.134)	(-0.730)	(-0.712)	(-0.633)	(-0.113)
3 years before	0.061	0.008	0.010	0.015	0.030
	(0.902)	(0.118)	(0.149)	(0.219)	(0.405)
2 years before	0.091	0.023	0.028	0.032	0.044
	(1.276)	(0.320)	(0.399)	(0.450)	(0.566)
1 year before	0.089	0.034	0.039	0.046	0.055
	(1.185)	(0.459)	(0.519)	(0.607)	(0.673)
Year of the PMC reform	0.191**	0.133*	0.137*	0.144*	0.160*
	(2.318)	(1.654)	(1.701)	(1.787)	(1.825)
1 year after	0.192**	0.127	0.134*	0.143*	0.160*
	(2.365)	(1.617)	(1.717)	(1.811)	(1.819)
2 years after	0.276***	0.206**	0.221**	0.229**	0.244**
	(2.965)	(2.295)	(2.460)	(2.551)	(2.451)
3 years after	0.270***	0.191**	0.200**	0.208**	0.221**
	(2.701)	(1.975)	(2.075)	(2.157)	(2.036)
4 years after	0.444***	0.366***	0.376***	0.386***	0.397***
	(4.358)	(3.704)	(3.808)	(3.912)	(3.471)
5 years after	0.310***	0.252**	0.257**	0.277**	0.276**
	(2.653)	(2.208)	(2.272)	(2.439)	(2.256)
6 years after	0.385***	0.345***	0.348***	0.364***	0.358***
	(3.160)	(2.902)	(2.945)	(3.075)	(2.806)
7 years after	0.598***	0.528***	0.534***	0.550***	0.561***
	(4.502)	(3.996)	(4.035)	(4.119)	(4.121)
GDP per capita		0.541***	0.520***	0.605***	0.604***
		(3.742)	(3.602)	(3.867)	(3.681)
Secondary sector/GDP			0.002	0.001	-0.002
			(0.355)	(0.308)	(-0.576)
Total population				0.298**	0.361**
				(2.055)	(2.379)
Gov. deficit/GDP, *t*-1					0.816
					(1.230)
Province FE	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	3,232	3,108	3,044	3,044	2,768
R-squared	0.595	0.612	0.617	0.618	0.546
Number of cities	267	263	263	263	262

Note: Robust t-statistics are in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 9. Heterogeneous Effects of the PMC Reform on City Growth

	(1)	(2)	(3)	(4)	(5)	(6)
PMC reform	1.545**	1.388**	1.434**	1.454**	1.318**	1.257**
	(2.503)	(2.281)	(2.358)	(2.360)	(2.168)	(2.055)
Rich level of the city	-2.681	-1.579	-1.505	-1.616	-0.705	-0.748
	(-1.359)	(-0.802)	(-0.770)	(-0.824)	(-0.360)	(-0.367)
PMC×Rich level	-1.573‡	-1.616‡	-1.721‡	-1.659‡	-1.498‡	-1.365‡
of the city	(-1.254)	(-1.280)	(-1.365)	(-1.290)	(-1.189)	(-1.080)
Capital investment		3.278***	3.319***	3.266***	2.795***	2.719***
		(5.238)	(5.285)	(5.177)	(4.422)	(4.271)
Population growth			-0.037	-0.032	-0.032	-0.033
			(-1.033)	(-0.895)	(-0.895)	(-0.913)
Inflation				-0.250**	-0.281***	-0.254**
				(-2.332)	(-2.606)	(-2.374)
Gov. expenditures/GDP					11.073***	11.270***
					(5.068)	(5.229)
Total land lease						0.223†
						(1.461)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,192	3,187	3,187	3,187	3,183	3,134
R-squared	0.256	0.268	0.268	0.270	0.276	0.277
Number of cities	263	262	262	262	262	262

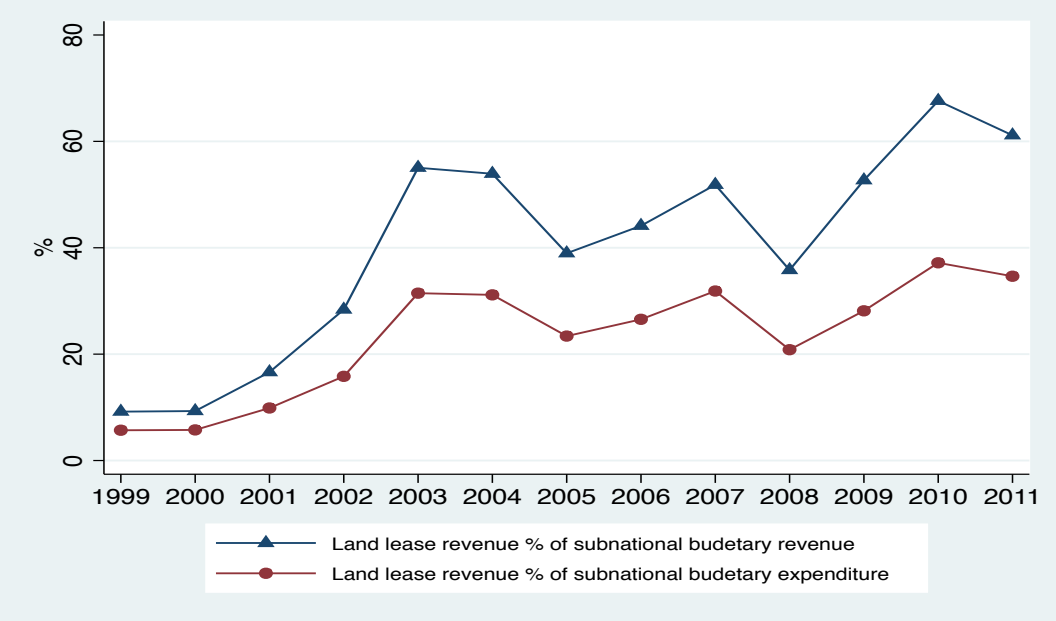
Note: Robust t-statistics are in parentheses; *** p<0.01, ** p<0.05, * p<0.1; † represents significance at the 10% level under one-tail test; ‡ represents the variable is jointly significant at 5% level.

Table 10. Heterogeneous Effects of the PMC Reform on City Land Lease

	(1)	(2)	(3)	(4)	(5)
PMC reform	0.266***	0.310***	0.319***	0.337***	0.331***
	(2.671)	(3.337)	(3.453)	(3.671)	(3.519)
Rich level of the city	0.076	0.242	0.215	-0.404	-0.203
	(0.207)	(0.685)	(0.586)	(-0.855)	(-0.416)
PMC×Rich level	-0.298	-0.473**	-0.471**	-0.500***	-0.497***
of the city	(-1.408)	(-2.476)	(-2.498)	(-2.683)	(-2.598)
GDP per capita		0.481***	0.460***	0.621***	0.624***
		(3.434)	(3.278)	(3.826)	(3.502)
Secondary sector/GDP			0.002	0.003	-0.001
			(0.484)	(0.606)	(-0.235)
Total population				0.416**	0.463**
				(2.076)	(2.114)
Gov. deficit/GDP, *t*-1					0.981
					(1.465)
Province FE	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	3,143	3,075	3,012	3,012	2,742
R-squared	0.595	0.612	0.617	0.618	0.545
Number of cities	263	261	261	261	260

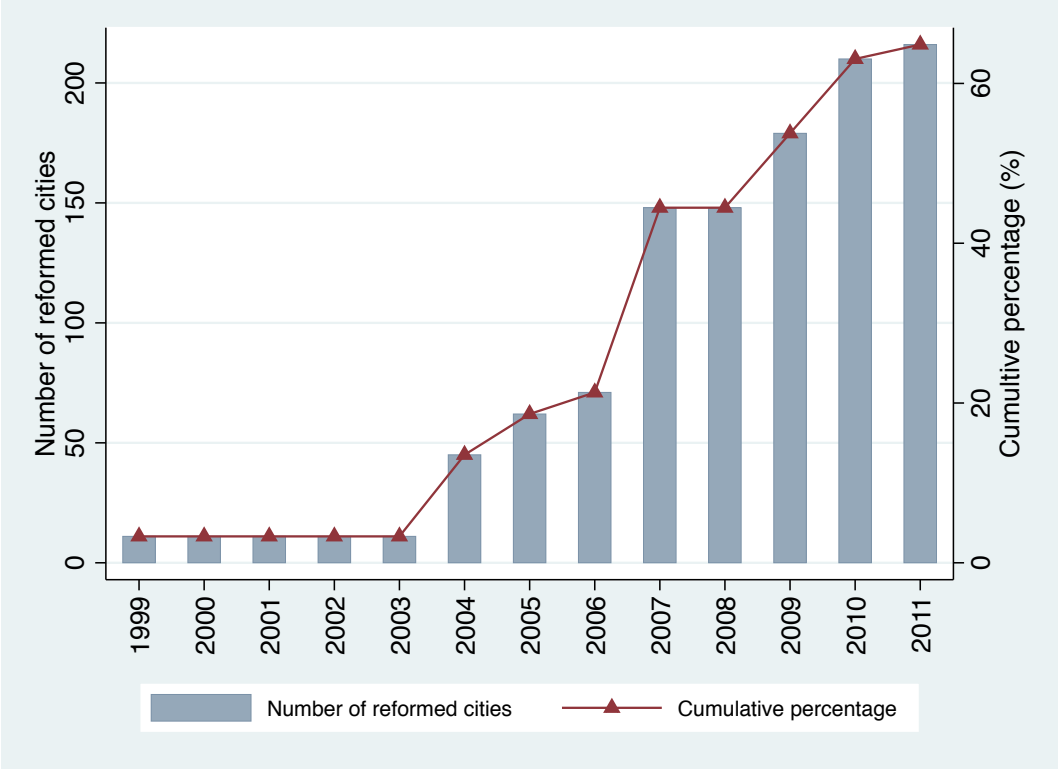
Note: Robust t-statistics are in parentheses; *** p<0.01, ** p<0.05, * p<0.1; † represents significance at the 10% level under one-tail test.

Figure 1. Ratio of Land Lease Revenue to Total Subnational Budgetary Revenue or Expenditure



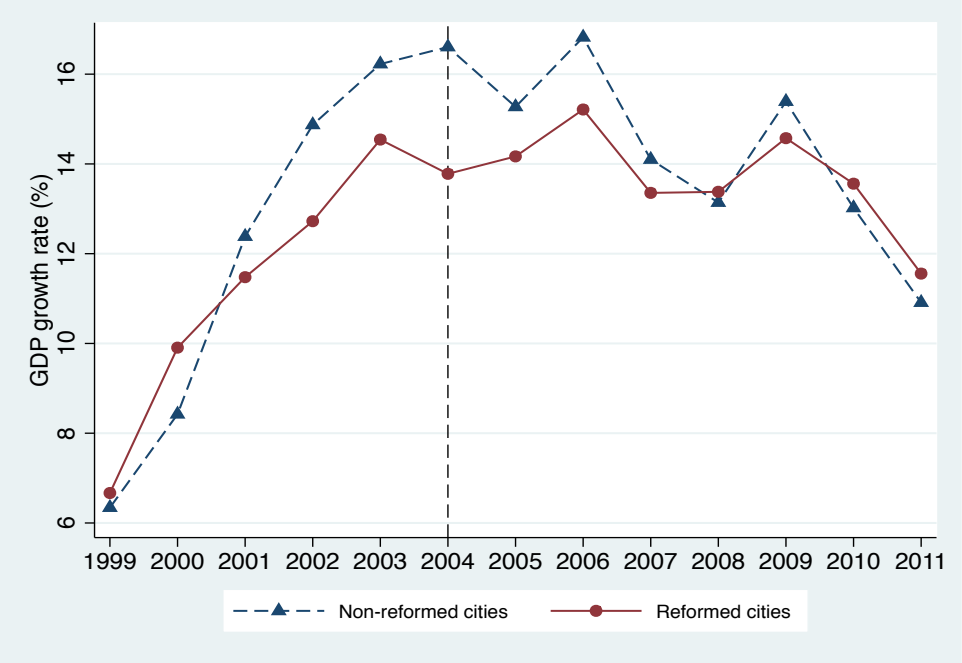
Source: China Statistical Yearbook and China Land and Resources Yearbook, 2000-2012.

Figure 2. Introduction of the PMC Reform in China



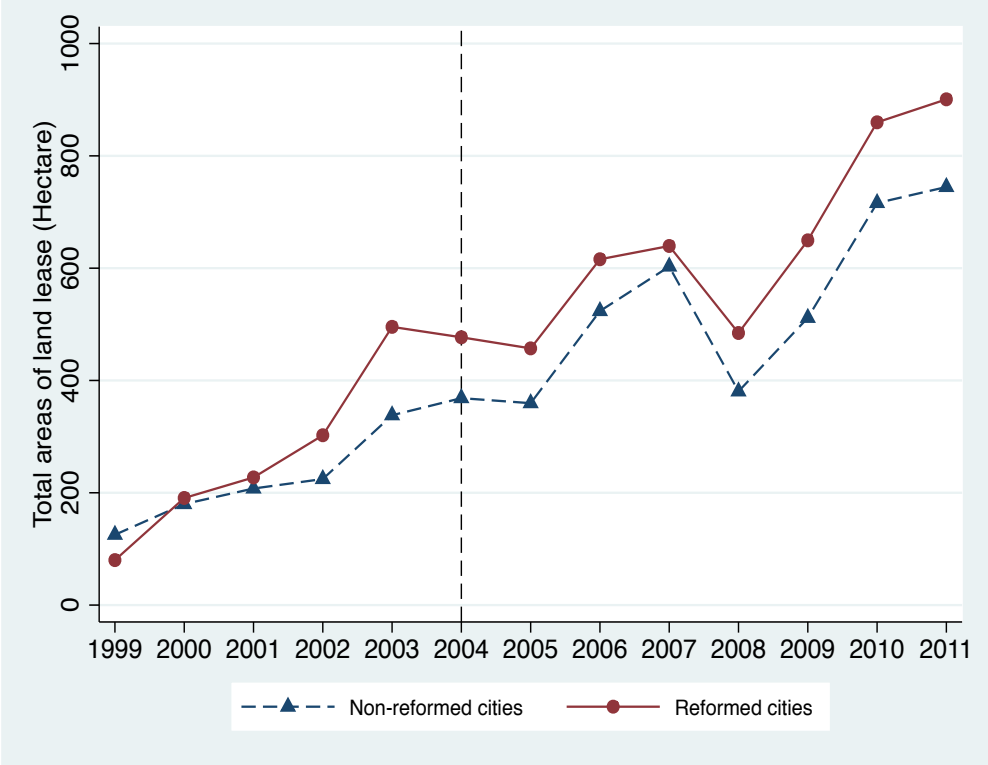
Source: Official documents released by provincial governments, various years.

Figure 3. Trends in GDP Growth of Chinese Cities



Source: China City Statistical Yearbook, 2000-2012.

Figure 4. Trends in Land Leasing of Chinese Cities



Source: China Land and Resources Yearbook, 2000-2012.