Strategic Interaction in Political Competition: Evidence from Spatial Effects across Chinese Cities

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Abstract

Promotion of local officials in China is decided by their upper-level governments which evaluate their performance largely based on local economic growth. Such a promotion scheme leads to tournament competition among local government leaders at the same level. We test the hypothesis of tournament competition by studying the spatial effects across Chinese prefectural-level cities. Employing recently developed tools in spatial econometrics, we document a strong spatial effect for city-level total investment which fuels short-run economic growth. This spatial effect is shown to occur only for cities within the same province, but not for neighboring cities located in different provinces. We also find that within the same province, the spatial effect mainly exists for cities with similar economic ranking but not for cities that are geographically proximate. The spatial effect tends to diminish for city leaders who are close to the end of their political careers. These findings suggest that the spatial effect in investment is driven by strategic interactions among political rivals in tournament competition. We rule out alternative factors such as economic spillovers and tax competition as the key drivers of the spatial effect.

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1 Introduction

The phenomenal economic growth in China has spawned a large literature that studies the Chinese economy from various perspectives. One distinguished branch links this economic growth to tournament competition among local government officials (Zhou, 2009; Xu, 2011). A key hypothesis in this perspective is that, in order to maximize their chances of political promotion, local government officials compete against one another in spurring total investment and boosting the growth of the local economy. This GDP-based political competition significantly contributes to the investment-driven high growth of the Chinese economy as a whole.

The theoretical grounding of tournament competition is well summarized in Xu (2011) as possessing two key components – political centralization and economic regional decentralization. With political centralization, higher level officials in the hierarchical political system maintain personnel control over their lower level counterparts, so that the former are able to promote the latter based on their performance.[1] On the other hand, regional economic decentralization gives local officials plenty of leeway to promote the local economy. Due to economic decentralization, local officials are able to leverage local investment by using a number of instruments. Examples include directly affecting the investment decisions of state-owned enterprises, allocating land and loans from local state-owned banks, using Local Financing Platforms to finance various investments,[2] and providing pro-business policies and services (e.g. offering tax reductions and subsidies and speeding up the administrative approval of large projects) to attract FDI and investment from other regions in China. Bardhan and Mookherjee (2006) assert that China is the only country in the world where local governments have played a leading role in economic growth.

The goal of our study is to present evidence that local officials in China indeed engage in tournament competition by strategically leveraging investment. An analysis of such strategic behavior will shed light on at least two prominent features of the Chinese economy. The first is China's much debated high investment rate. According to the National Bureau of Statistics of China, the ratio of total investment over GDP was as high as 48% in 2012.[3] The second feature is the political business cycle of investment in China – the fluctuations in gross capital formation closely correlate

[1] China's local governments have four hierarchical levels: province, prefectural city, county, and township.

[2] Local Financing Platforms refer to government-backed investment companies through which provincial, prefectural and county governments raise funds for the construction of roads, airports, bridges, power plants and other projects. These investment companies typically use land or government assets as collateral to leverage bank loans.

[3] At the city level, our data show that total investment as a percent of GDP has been increasing steadily since 2000, reaching 47% in 2005, the last year in our sample.

with the timing of national party congresses held every five years, as documented in Li (2012). Despite its importance, to the best of our knowledge, few empirical studies touch on the strategic behavior of Chinese local officials in investment, and we aim to fill this niche in the literature.

We study prefectural-city level total investment, and identify three clear patterns of spatial correlation. The first is a border effect. We find a strong spatial correlation among cities within the same province, but little correlation for cities that are geographically proximate but from different provinces. The second pattern is a GDP ranking effect. Within the same province, the spatial effect mainly exists among cities with similar ranking of per capita GDP, but not among geographical neighbors. The third is an age-of-leader effect. We find that spatial effect strength is correlated with the ages of city leaders, and that due to the age limit, the spatial effect is strongest among leaders who face their final chance of promotion and smallest among those who face no chance of promotion.

These main findings reflect three key features of China's performance-based promotion system. First, the promotion of prefectural-level city leaders is decided by the provincial government, which means that only city leaders in the same province are political rivals for promotion and they do not compete with city leaders from other provinces. Second, in order to level the playing field, a relative performance evaluation is conducted among political peers with similar economic potential. In other words, geographical neighbors, even within the same province, are not proper rivals. Finally, due to the age limit, local officials have a finite time horizon. Since the chance of promotion is almost zero when they hit the age limit, there is heated competition among officials who are near their last chance of promotion.

Concerns might arise that spatial correlation of investment observed in our data might be caused by factors other than tournament competition, such as an economic spillover effect and tax competition. To address these concerns, we argue that the alternative explanations are hardly consistent with all the observed patterns, especially the age-of-leader effect. Nevertheless, additional tests are conducted to further rule out these alternative explanations. In summary, the combined results strongly support the view that the documented spatial effect of total investment is a result of strategic behavior of local government officials in tournament competition.

It is worthwhile to compare the tournament competition among local officials in China with the Western style yardstick competition as studied in Besley and Case (1995) and the ensuing literature. In both cases, competition involves assessment of relative performance, but in very different ways. The assessment in yardstick competition is done by voters, reflecting the bottom-up power structure in a democratic society; while the tournament competition in China is based on a top-down power structure in which a high-level authority picks a winner from a set of political contestants. The difference in power structure is also related to constraints that the contestants face. China's local officials have a larger capacity to influence the local economy and react strategically to their political rivals than incumbents in a democratic regime, because the latter have limited discretion due to checks and balance from the legislature. Another difference is the assumed information structure. Yardstick competition assumes that voters are poorly-informed about the ability or efforts of the incumbent politicians, so they have to rely on policies/outcomes of neighboring states or cities as benchmarks. On the other hand, tournament competition assumes that the higher-level authority has sufficient information about the economic performance of their subordinates, which is a realistic assumption given the hierarchical system in China. A perhaps more important difference is that, in tournament competition, only the performance of contestants within the tournament (cities in the same province in our case) and not the performance of neighbors outside the tournament (e.g. cities sharing a common border but across different provinces) will be compared. This is one of the main sources of evidences for the strategic behavior of local officials in China.

Our paper is closely related to two strands of literature. The first strand of literature discusses the link between promotion of a local government official (cadre) and the economic performance of the city under his/her administration.[4] Whiting (2001) provides some anecdotal evidence that Chinese cadres are evaluated according to the performance of local economies. Li and Zhou (2005) present empirical evidence that provincial economic performance systematically impacts provincial officials' promotion and termination in their political careers. Chen et al. (2005) further show that such political turnover also depends on the officials' performance relative to their immediate predecessors. Using the data from 1989 to 2009, Choi (2012) confirms the positive correlation between the likelihood of promotion of provincial leaders and the GDP growth in their jurisdictions.

Along this line of research, two papers are closely related to the interpretation of our empirical findings. First, Maskin et al. (2000) document a significantly positive correlation between the change in rank in provincial GDP growth and the change in political status of provincial officials during 1976-1986. Thus local officials are likely to engage in regional tournament competition in which relative performance is critical. Second, Wu et al. (2013) show evidence that city spending on transportation infrastructure correlates strongly with real GDP growth and and that a higher GDP growth rate is related with better odds of promotion for local officials. On the contrary, higher

[4] Xu (2011) provides an excellent summary of the empirical findings within a coherent theoretical framework.

city-level environmental investment is significantly negatively correlated with odds of promotion. Therefore, local government officials can strategically foster certain types of investment to maximize their odds of promotion. These empirical observations are complementary with our finding that the total investment of one city has a strong spatial effect on the others within the same province but education expenditure doesn't. While most existing studies demonstrate how promotion of Chinese local officials is performance-based, our unique contribution to this literature is that we show evidence about how local officials respond strategically to the behavior of their political rivals given the performance-based promotion scheme.

The second strand of literature uses spatial econometrics models to study strategic interactions. Static models are most common in the literature. Examples include Case et al. (1993) that study the interdependence of state expenditures, Brueckner (1998) on interdependence in the choice of growth-control measures by cities in California, Bordignon et al. (2003) that estimate local property tax equation based on Italian data,[5] Fredriksson et al. (2004) that study strategic behavior in three interrelated policies, Devereux et al. (2008) that investigate the competition of OECD countries over corporate tax rates, and Revelli and Tovmo (2007) that show a strong spatial correlation in the production efficiency of Norwegian local governments. A dynamic spatial model is used in Devereux et al. (2007) to study simultaneous vertical and horizontal competition in tax settings. Zheng et al. (2013) employ a traditional spatial econometrics model to study the central government's infrastructure investment across Chinese cities. On the theoretical side, Breuckner (2003) offers an overview, and Devereux et al. (2007, 2008) provide a utility maximization approach to derive the estimation equation for the tax competition.

Our paper differs from this line of literature in two respects. First, we link the spatial effect with a unique feature of Chinese political system – tournament competition among city leaders. As previously discussed, tournament competition has different testable implications from the yardstick competition extensively studied in the existing literature. For instance, a geographical neighbor is a good benchmark for comparison in a yardstick competition, but it may not be the case in a tournament competition where performance comparison occurs only within the reference group of political rivals who do not share a common border. Second, we use the estimation method for a dynamic spatial panel model developed in Lee and Yu (2010). This method allows multiple

[5] Other studies on tax competition include Besley and Case (1995), Besley and Smart (2007), Bosch and Solé-Ollé (2007), Brueckner and Saavedra (2001), Edwards and Keen (1996), Buettner (2001), Devereux et al. (2007), Hayashi and Boadway (2001), Revelli (2006), and Rork (2003). Baicker (2005) and Solé-Ollé (2006) analyze spatial effects driven by expenditure competition.

definitions of neighbors (e.g. two spatial weights matrices), and hence represents more general specification. We employ this new method to test the relative importance of economic distance versus geographical distance, which is not feasible using traditional models with only one spatial weights matrix.

The rest of the paper is organized as follows. Section 2 discusses the theoretical and institutional background that leads to tournament competition. Section 3 introduces the empirical specifications and data. Basic empirical results are presented in Section 4. Section 5 further discusses the link between spatial effects and tournament competition. Section 6 briefly concludes.

2 A Simple Model of Strategic Interaction in Investment

Our main goal is to empirically test whether the total investment of one city responds strategically to that of the others. Before carrying out the test, we lay out a simple model to clarify the mechanisms that lead to strategic interaction among city officials.

The starting point is an economy with no government intervention, and the standard growth theory predicts a welfare-maximizing level of total investment, denoted by I_i^* which is associated with the optimal investment rate and GDP growth. Here we allow cities to be heterogenous and I_i^* is city specific.

As discussed in the introduction, local officials have incentives to leverage total investment above the optimal level to increase their chances of promotion. On the other hand, costs will occur to local officials for engaging in such investment leverage, because they need to make efforts to deal with issues like damage to the environment, potential reduction of future economic growth and other concerns. The benefits and costs of investment leverage are summarized in the following optimization problem for local officials:

$$\begin{aligned} &\max_{I_i} \xi_i \cdot u(I_i - \bar{I}_i) - v(e_i), \\ &s.t.\ e_i = (I_i - I_i^*)^2, \end{aligned} \tag{1}$$

where $\bar{I}_i = \sum_{j \neq i} w_{ij} I_j$ is the average level of investment of rivals for the i^{th} city, and e_i is the effort level of the officials. We assume the officials' utility is a function of the difference $I_i - \bar{I}_i$, exactly because of the unique situation in China: (i) investment is a major driver of GDP growth; (ii) for local officials, chances of promotion increase with the GDP growth of his/her own city relative to rivals.

In equation (1), ξ_i is the random shock to utility that leads to strategic interaction among cities, which will be clear later on.[6] v is the disutility of efforts. When an official chooses the level of investment equal to the optimal one I_i^*, no effort is needed, thus $e_i = (I_i - I_i^*)^2 = 0$. Effort is required only when officials try to distort investment away from the optimal level.

Usual assumptions about utility/disutility functions apply here, namely,

$$u^{'}(.) > 0, \qquad u^{''}(.) < 0, \tag{2}$$

$$v^{'}(.) > 0, \qquad v^{''}(.) > 0. \tag{3}$$

Essentially we assume the effectiveness of investment leverage is subject to diminishing marginal effects. For example, local officials can push state-owned banks to make more loans, but the general economics rule works and the marginal effect of the loans decreases. On the other hand, the efforts of local officials have increasing marginal costs. These assumptions ensure that the optimization problem is well-defined with interior solutions.

A city takes $\bar{I}_i$ as given, and the optimal investment level for government officials is determined by the following first order condition

$$\xi_i \cdot u^{'}(I_i - \bar{I}_i) = 2v^{'}(e)(I_i - I_i^*). \tag{4}$$

It is convenient to assume the mean of random shock ξ_i is one. When the economy receives no random shock, $\xi_i = 1$ for each i. In this case, it is straightforward to show that a steady state equilibrium exists in which (i) each city takes $\bar{I}_i$ as given, and chooses I_i that satisfies equation (4), and (ii) for any city, the perceived average investment of rivals equals the actual investment. Obviously, no strategic interaction can be observed in the steady state.

Now suppose the i^{th} city receives a shock $\xi_i > 1$, then a strategic interaction occurs which leads to co-movement of total investment among rival cities. From Equations (2)-(4), it is clear that city i should increase its total investment. When I_i is increased, $\bar{I}_j$ is also increased so that city j is motivated to increase I_j, which further increases the average investment, motivating other cities to increase investment. This escalation of investment continues until the economy reaches a new steady state equilibrium.

The above strategic interaction depends critically on the assumption that $u^{'}(.) > 0$. That is, an official's action must affect his/her chance of promotion. Some types of investment (e.g. education

[6] Alternatively we can assume random shocks to disutililty and reach similar conclusions.

investment) do not boost economic growth in the short run. In this case $u^{'}(.) = 0$, and the model predicts that officials do not respond to the actions of neighbors at all.

In the following sections, we employ spatial econometrics models to test such strategic interaction in tournament competition. Consistent with this simple optimization model, a strong spatial correlation is found for total investment among cities within the same province. On the other hand, little spatial correlation exists for city-level education expenditures, which is also consistent with the prediction of our simple model.

3 Empirical Specifications and Data

3.1 Empirical Specifications

Spatial econometrics models study how the behavior of an economic agent depends on the behavior of his/her "neighbors" – other contemporaneous agents. Technically, economic activity of agent i at time t, denoted y_{it}, is regressed on the weighted sum of the activity of all other agents, $\sum_{j\neq i}^{n} w_{ij}y_{jt}$, together with a set of control variables. In the above simple model, I_i corresponds to y_{it}, and $\bar{I}_i = \sum_{j\neq i} w_{ij}I_j$ corresponds to $\sum_{j\neq i}^{n} w_{ij}y_{jt}$. Analogous to time lags in time series analysis, we call the term $\sum_{j\neq i}^{n} w_{ij}y_{jt}$ spatial lag. When only one spatial lag is included, the model is a first order spatial model. A higher order model refers to the case with multiple spatial lags, each with differently defined weights w_{ij}. We use both first order and high order models in the analysis.

First Order Spatial Models

The first order spatial model is specified as follows:

$$y_{it} = \gamma y_{i,t-1} + \lambda \sum_{j\neq i}^{n} w_{ij}y_{jt} + x_{it}'\beta + \eta_i + \alpha_t + \epsilon_{it}, \tag{5}$$

where y_{it} is total investment or other economic variables of interest. We include $y_{i,t-1}$ in the regressor to allow for a dynamic effect, which can be considered as a measure of policy inertia or policy stability. An individual (city) effect η_i captures regional differences in resources endowment, cultural characteristics and others. Time effect α_t captures both macro shocks and macro policy effects for each period. The omission of these shocks and policy effects can lead to spurious spatial effects.

x_{it} is a set of control variables that are not time invariant or individual invariant. We consider account balance, fiscal population, GDP per capita, proportion of industrial product value in total GDP, fiscal revenue and transfer payment from the upper-level government. Each is at the prefectural-city level. Estimation results reveal some interesting correlations between these variables and total investment, the dependent variable. It should be noted that including transfer payments in the regression is important. It controls for a potential spatial effect driven by policy shocks initiated by the upper-level government (e.g. launching a provincial-level highway network or increasing transfer payments to each city at the same time), which should be differentiated from spatial effects driven by strategic interaction as predicted in our simple model in Section 2.

High Order Spatial Models

A high order spatial model allows multiple spatial lags. Technically it uses more than one spatial weights matrix, which essentially allows multiple ways of defining neighbors. For example, the regression equation for a second order model is

$$y_{it} = \gamma y_{i,t-1} + \lambda_1 \sum_{j \neq i}^{n} w_{1,ij} y_{jt} + \lambda_2 \sum_{j \neq i}^{n} w_{2,ij} y_{jt} + x_{it}' \beta + \eta_i + \alpha_t + \epsilon_{it}. \tag{6}$$

This second order model is used to study the relative importance of economic and geographical neighbors, as well as the relative importance of neighbors within and across provinces.

Higher order spatial models are defined likewise. In both first order and high order spatial models, we employ a two-stage least square (2SLS) estimation in which the neighboring values of control and predetermined variables are used as instruments for the endogenous spatial lag term. Also, as in the dynamic panel data literature, each city's own control and predetermined variables are used to instrument the lagged values after the elimination of individual effects. See Lee and Yu (2010) for estimation details.

Spatial Weights Matrices

One of the key issues in the above spatial model is the spatial weights matrix, $W_n = [w_{ij}]_{i,j=1}^{n}$. This is an $n \times n$ matrix that defines the relative "distance" between city i and city j. Cities with positive weights are called "neighbors" . Neighbors that are presumably more inter-dependent with city i are given more weights. In our estimation we restrict W_n to be row-normalized with zeros on the diagonal. This normalization ensures that all the weights are between 0 and 1 and weighting operations can be interpreted as an average of the neighboring values. The coefficient λ in the first-order model (or λ_1 and λ_2 in the second order model) measures the strength of spatial effect. Thus it is the key parameter in our study.

Table 1 here

We consider two types of neighbors: geographical and economic. The former is based on geographical proximity, denoted by G^{within} and G^{across}. The latter is based on proximity in the ranking of per capita GDP, denoted by E^{within} and E^{across}. Here the superscript "within" means the weights matrix treats only cities within the same provinces as neighbors (with positive weights); while "across" means it treats cities in different provinces as neighbors and assigns zero weights to cities in the same province. This treatment is suitable for the study of tournament competition in which only the performances of neighbors within the tournament (cities within a province) are compared.

Specifically, given city i, G^{within} treats as its neighbors all the cities that are in the same province; while E^{within} takes those same-province cities as neighbors whose within-province rankings of GDP per capita are either one place above or below city i. G^{across} takes as neighbors cities that are not in the same province but share a common border with city i. Regarding E^{across}, for a given city, we choose its neighbors from other provinces whose nationwide ranking of GDP per capita are either one place above or below. These spatial weights matrices are summarized in the upper rows of Table 1. They are used in our baseline analysis.

The bottom rows of Table 1 list weights matrices that are used in extended analysis and robustness checks. We use letters with tildes to denote these matrices. $\widetilde{G}^{across}$ is similar to G^{across}, but it is more stringent in selecting neighbors, as it excludes cross-province geographically proximate cities if they are separated by mountains. This is designed to prevent mountains from affecting our estimation of spatial effects. Historically large mountains have severely impeded trade and other economic interactions. $\widetilde{G}_1^{within}$ and $\widetilde{G}_2^{within}$ are designed to refer to rivals within a province. With $\widetilde{G}_1^{within}$, a city has only one neighbor – the city within the same province and geographically most proximate to it. Similarly, with $\widetilde{G}_2^{within}$ a city has two neighbors that are within the same province and geographically most proximate.

3.2 Data

The data are compiled from several sources. The data on city public finances are mainly from *Fiscal Statistics of Cities and Counties in China* for the period 2000-2005. The yearbook is published by China Financial and Economic Publishing House, a state-owned press under the supervision of the Ministry of Finance of the People's Republic of China. It collects detailed information on city-level fiscal statistics, such as fiscal revenues and expenditures, fiscal accounting balances, transfer payments, and the fiscally-supported population. City-level total investment data come from the *China City Statistical Yearbook*.[7] Other city-level economic characteristics, such as proportion of manufacturing industry and GDP per capita, come from *China Statistical Yearbook for Regional Economy*. These two yearbooks are published annually by China Statistical Press, a state-owned press under the supervision of the National Bureau of Statistics of China. Table 2 reports summary statistics of the variables that we use in the regression. More detailed descriptions of these variables are available in the Appendix.

We also use information on the city leaders' age and career mobility and collected from Baidu Baike,[8] which is a large data source for the curriculum vitaes of Chinese government officials.

Table 2 here

4 Empirical Results

In this section we show a strong spatial correlation of total investment among cities within the same provinces. Then we present three clear patterns in the spatial correlation: a border effect, GDP ranking effect and age-of-leader effect.

4.1 Spatial Effect of Total Investment

Table 3 reports the basic results using a first order spatial model. For now we focus on within province spatial correlation. The main coefficient of interest is λ, the spatial effect coefficient. Using either a within-province economic matrix (E^{within}) or geographical matrix (G^{within}), the estimated λ is statistically significant. The point estimates of λ are 0.251 and 0.185 respectively. Both are significant at the 1% level. Thus total investment exhibits a strong and positive spatial correlation, as predicted by the simple optimization model of local officials. Of course the correlation could also be driven by a spillover effect or regional tax competition. In the subsection that follows, some salient features of spatial correlation are documented: each is consistent with the theory of tournament competition, but more or less inconsistent with the alternative theories.

Table 3 here

We briefly discuss regression coefficients for the control variables. The coefficient of the dynamic effect (the time lag), γ, informs us how total investment depends on the previous year's level. This

[7]The yearbook does not provide investment information until 2000.
[8]http://baike.baidu.com.

coefficient can be seen as a measure for policy inertia and stability. The point estimates are 0.109 and 0.349 respectively for geographical and economic neighbors, falling far below one, thereby suggesting that total investment has a relatively low degree of inertia. Account balance and fiscal revenue have positive effects on total investment. Both variables represent budget constraints of the local government which determine the capacity of local officials to boost total investment. The ratio of manufacturing industry in total GDP, denoted by "manufacture ratio" in Table 3, measures the degree of industrialization in the city. Theoretically a higher level of industrialization requires more investment. This is confirmed by the positive and significant coefficients under different specifications. GDP per capita has a negative impact on total investment, which seems counter-intuitive. Without other control variables, GDP per capita is positively correlated with total investment. However when other attributes, especially fiscal revenue and transfer payment, are controlled for, the the correlation between GDP per capita and total investment turns negative.[9] Finally, transfer payments from upper-level government have strong and statistically significant effects on total investment. Larger transfer payments can significantly relax local governments' budget constraints, so they can engage more in public investment or use fiscal funds to support more private investment. As mentioned earlier, controlling for transfer payments helps us address the concern that the observed spatial effect may be induced by certain policy shocks at the province level, such as universal increases in transfer payments from the provincial government, or investment in the province-wide infrastructure funded by the provincial government.

4.2 Patterns of Spatial Effect

We present three clear patterns of spatial correlation for city level total investment. Each is consistent with the theory of strategic behavior in political competition.

4.2.1 Border Effect

So far we have focused on within province spatial correlation, which is statistically significant and economically strong. Turning to cross-province cities, we find little spatial correlation in investment. The border effect is evident.

Results based on cross-province weights matrices (G^{across} and E^{across}) are reported in the right columns of Table 3. Technically, these weights matrices treat prefectural cities as neighbors that are geographically and/or economically proximate, but from different provinces. No spatial effect

[9]More details about these correlations are available upon request.

is found for geographical neighbors. When economic weights matrix (E^{across}) is used, the spatial effect is statistically significant, but much weaker than the effect among within-province neighbors ($\lambda = 0.104$ versus $\lambda = 0.185$).

To further test the border effect, we employ a second order spatial model with two weights matrices, one for within province neighbors and the other for across province neighbors. This is a more general specification which helps avoid potential omitted variable bias. We investigate the following combinations of weights matrices: (i) geographical neighbors within and across provinces (G^{within} and G^{across}); (ii) economic neighbors within and across provinces (E^{within} and E^{across}). By putting within- and cross-province neighbors together, we study whether the interactions of total investment are indeed confined within a province's borders.

Table 4 here

Table 4 reports the results. Based on either geographical or economic neighbors, spatial effects are strictly confined within a province. In the case of geographical neighbors, the coefficient for G^{within} is 0.258 with standard error 0.032, but the coefficient for G^{across} is -0.028 with standard error 0.023 which is insignificant. For economically-defined neighbors within and across provinces (E^{within} and E^{across}), we again find a strong within-province spatial effect, with the scales close to those from the first order regressions. However, we find little cross-province spatial effect (point estimate of 0.016, with standard error 0.022). Therefore, the second order spatial model shows a clear border effect – total investment exhibits strong positive spatial effect within a province, but no spatial effect across provinces.

The border effect is consistent with the design of political competition in China. Promotion of prefectural city officials is determined by leaders of their own province. If an official is successful relative to peers within the province in spurring economic growth, he/she will be identified as a competent leader who could join the province level leadership. A rational local official should then compete strategically with peers within the province, rather than in other provinces.

4.2.2 GDP Ranking Effect

Within a province, is spatial correlation stronger among cities with similar ranking of GDP per capita, or among cities that are geographically proximate? This question has strong implications for understanding political competition in China. To answer it, we use the within-province geographical weights matrices $\widetilde{G}_1^{within}$ and $\widetilde{G}_2^{within}$. Recall that a city has only one neighbor based on $\widetilde{G}_1^{within}$, and two neighbors based on $\widetilde{G}_2^{within}$.

Results from the first-order model are reported in the first two columns of Table 5. Using either $\widetilde{G}_1^{within}$ or $\widetilde{G}_2^{within}$, the coefficient of spatial effect is small, but statistically significant. Thus, although a spatial effect exists among geographically neighboring cities, it has only marginal importance. This conclusion is clearer when the second order model is used.

The second order model puts economic weights matrix (E^{within}) together with $\widetilde{G}_1^{within}$ or $\widetilde{G}_2^{within}$. As long as the geographical neighbors are not identical to the economic neighbors for all the cities within a province, we can separate the two types of spatial effects. For the 330 cities in the sample, when using $\widetilde{G}_1^{within}$, there exist only 60 cities (out of 330) that are connected with both geographical and economical neighbors. When using $\widetilde{G}_2^{within}$, we have 147 cities, which is still less than half of the sample. This validates our separation of geographical and economic neighbors.

Table 5 here

Results are reported in the last two columns of Table 5. When geographical weights matrix $\widetilde{G}_1^{within}$ is combined with economic weights matrix E^{within}, the coefficient of geographical spatial effect is 0.038 (with standard error 0.020), but the coefficient of economic spatial effect is 0.150 (with standard error 0.025). The spatial effect is about 4 times stronger among economic neighbors than among geographical neighbors.

Now consider the broader definition of geographical neighbors. Based on the combination of $\widetilde{G}_2^{within}$ and E^{within}, the coefficient of geographical spatial effect is larger and becomes more significant, which is likely due to more overlapping between the two types of neighbors. The coefficient for economic spatial effect is still significantly larger.

In summary, within a province, spatial correlation mainly exists among cities with similar GDP ranking, rather than among geographically neighboring cities. The leveling of the playing field helps increase the intensity of competition among rivals, and thereby induces more effort from all contestants in the tournament. This evidence lends further support for our hypothesis of tournament competition in which the evaluation of regional officials is based on their relative performance in promoting GDP growth.

4.2.3 Age-of-Leader Effect

We conjecture that the significance of spatial correlation depends on the age of local leaders. This is motivated by two age-related traits in China's hierarchical political system. First, officials are faced with a finite horizon. They are subject to mandatory retirement and the retirement age varies depending on the hierarchical ranks of the officials. For city leaders, the retirement age is 60. At the city level, party chiefs normally take office in their forties or fifties. Therefore the horizon of their careers as a local leader is limited. Figure 1 reports the distribution of the ages of city-level political leaders (party chiefs and mayors) during the period 2000-2005, with each bar representing the average number of leaders that falls in a particular age. The distribution is quite symmetric, with both mean and median ages being around 50 for party chiefs and 49 for mayors. Detailed summary statistics for each year during 2000-2005 are provided in Table 6.

Figure 1 and Table 6 here

The second trait is that the rate of promotion/termination is highly correlated with age. Here we define termination as either retirement or semi-retirement. It is a common practice in China that leaders are placed in some semi-retirement honorary positions before their formal retirement.[10] While these positions provide privileges, such as government cars, secretaries, and social status, they do not convey power. Therefore a move into one of these honorary positions will generally be considered as the termination of a political career for a local leader because it is virtually impossible for him/her to be reassigned to a power position. Given our definition of termination, Figure 2 shows the percentage of city-level party chiefs being promoted and terminated by age during the period 1997-2005. Clearly, when an official is over 53, the chance of getting promoted plummets and the chance of getting terminated increases sharply.

These age-related traits should affect the competition patterns of local officials who are forward-looking. Intuitively, an official in his/her last term before termination or retirement should have little incentive to compete with peers. On the other hand, an official who is old and facing the final chance of getting promoted may compete aggressively, because he/she is least concerned about the negative effect of excessive investment in the long run.

Figure 2 here

[10] A good example is the leading positions in the local People's Congress or Political and Consultative Conference, an advisory body for the government.

We empirically study these conjectures, taking an approach similar to Bordignon et al. (2003) that investigates the term limit effect on spatial competition in the Italian municipality tax setting. Specifically, the original regression equation (5) is modified into the following fourth order spatial model (in matrix form)

$$\begin{aligned} Y_{nt} &= \gamma Y_{n,t-1} + \lambda_1 Z_n W_n Z_n Y_{nt} + \lambda_2 Z_n W_n (I_n - Z_n) Y_{nt} + \lambda_3 (I_n - Z_n) W_n Z_n Y_{nt} \\ &\quad + \lambda_4 (I_n - Z_n) W_n (I_n - Z_n) Y_{nt} + X_{nt}\beta + \eta_n + \alpha_t l_n + \epsilon_{nt} \end{aligned} \tag{7}$$

where I_n is the identity matrix and Z_n is a diagonal matrix with $Z_n(i,i) = 1$ if the official is older than a cutoff age. Essentially, based on the cutoff age, the original weights matrix W_n is decomposed into four components, where $Z_n W_n Z_n$ measures how old officials respond to their old neighbors, $Z_n W_n (I_n - Z_n)$ measures how old officials respond to their young neighbors, and $(I_n - Z_n) W_n Z_n$ and $(I_n - Z_n) W_n (I_n - Z_n)$ are defined similarly.[11] By comparing the size of the coefficients related to the two weights matrices that we are interested in, λ_1 and λ_2 respectively, we gain understanding regarding whether and how old officials have different spatial responsiveness to their young and old neighbors.

We consider various cutoff ages, with results reported in Table 7. The upper block of the table shows results for party chiefs and the lower block for city mayors. The row labeled "Old vs. Young" shows the spatial correlation between old leaders (age greater than or equal to the cutoff) and young leaders (age less than the cutoff). "Old vs. Old" row shows spatial correlation among old leaders.

The pattern of "Old vs. Old" spatial correlation is clear. The correlation increases with cutoff age until it reach a peak at about age 53 for party chiefs and 54 for mayors. When the cutoff age is 56-57, the spatial correlation is basically zero. This pattern is highly consistent with the above two age-related traits. At age 53 or 54, many leaders are faced with their final chance of getting promoted, hence are motivated to compete aggressively with peers, especially with those of similar age. As the cutoff age increases, the "old" leaders become those in their last terms before termination or formal retirement, and they have little incentive to compete, because the probability of promotion is about zero anyway.

Comparing the above pattern with Figure 2, the picture becomes clearer. Starting from age 53-54, the percentage of officials getting promoted falls steadily, while the percentage of officials getting terminated rises monotonically. This is exactly the cutoff age at which the spatial effect starts to

[11] Bordignon et al. (2003) decompose W_n into $Z_n W_n$ and $(I_n - Z_n) W_n$, which measure how the old/young officials respond to their neighbors, regardless the nature of his/her neighbors.

diminish. At age 56, the probability of promotion falls below the probability of termination, and the spatial effect among old officials comes close to zero.

The pattern of "Old vs. Young" spatial correlation is less clear, partly because the definition of "young official" is too broad – anyone younger than the cutoff age is considered as a young official. For example, when the cutoff age is 55, any official younger than 55 is defined as a young official. Nevertheless, it is evident that, when the cutoff age is 55 or older, old officials become less and less responsive to the investment of young officials. Based on our theory, this is again due to the fact that the probability of promotion is extremely low when an official is older than 55.

Table 7 here

5 Spatial Effect and Strategic Interaction: Further Evidence

We have documented three salient patterns of spatial correlation regarding city level total investment, and each is well explained by the theory of strategic interaction among local officials engaging in tournament competition. This section provides further evidence that the documented spatial effect is driven by tournament competition. We rule out two alternative explanations: a spillover effect and tax competition.

5.1 Alternative Explanation: Spillover Effect

An obvious alternative interpretation for the spatial correlation across cities is an economic spillover effect. A city's increased investment is likely to make investment in neighboring cities more profitable in the short-run.[12] Thus, for instance, construction of a freeway which connects a series of cities will be captured by our empirical model as a spatial effect.

We argue that the pure economic spillover is unlikely to drive our observed spatial effect for several reasons. First, it is not likely that the strength of economic spillover depends on the age of local leaders. In particular, our results show that the spatial effect declines sharply when the age of a city leader hits 56. This discontinuity effect is only consistent with the age-based patterns of promotion and termination probabilities among city leaders, but not consistent with the economic spillover effect.

Second, economic spillover should be more likely to appear among geographically proximate cities since some key channels of spillover (e.g. the flow of goods and people) rely on the distance.

[12] Brun et al. (2002) find little evidence of spillover effect for the growth of one city on another in the long run.

This prediction seems to be at odds with the border effect of spatial correlation. In addition, the GDP ranking effect within the provinces is more consistent with the tournament competition hypothesis, rather than the hypothesis of the spillover effect.

People may still argue that the border effect of spatial correlation could be consistent with the spillover story. Spillover could be confined within a province simply because many province borders in China are comprised of mountains which may impede cross-province spillover.

To test this possibility and rule out the spillover story, we run spatial regression with re-defined cross-province geographical neighbors. Specifically, two cities from different provinces are neighbors if they are (i) geographically proximate, and (ii) not separated by mountains. The corresponding weights matrix is $\widetilde{G}^{across}$ in Table 1. Recall that G^{across} does not impose condition (ii), thus $\widetilde{G}^{across}$ is more stringent in selecting neighbors.[13]

If the spillover hypothesis holds, we should expect increased spatial correlation for cities across province borders by using $\widetilde{G}^{across}$. However, we find no evidence for that. The spatial effect is still confined within a province and does not go beyond provincial borders, as shown in Table 8. Both first order and second order models yield regression coefficients that are nearly the same as those in the baseline case where G^{across} is used.

Table 8 here

5.2 Alternative Explanation: Tax Competition

The spatial effect in total investment might also be driven by tax competition among city governments. Short-run investment boosts tax revenues as well as economic growth. There is a large literature stressing the role of fiscal incentives in shaping the behavior of Chinese local governments (Oi, 1992; Montinola et al., 1995; Qian and Weingast, 1997; Jin et al., 2005). However, based on all empirical results obtained so far, we argue that tax competition is not a key driver for the spatial effect observed from the data. First, tax competition is more likely to occur among geographically proximate regions since it is easier for firms and residents to relocate among these regions and thus tax competition should be more intensive for those regions. This conflicts with our empirical evidence, as we explained above in addressing the concern about the spillover effect. Second, the age-of-leader effect, especially the discontinuity effect around at 56, can hardly be explained by the tax competition hypothesis.

[13] By this definition, each city has 2.11 neighbors on average from other provinces. Before removing neighbors with mountain barriers, the number of neighbors is 2.18 on average from other provinces.

5.3 Spatial Effect of Education Expenditure

Tournament competition depends critically on the link between a competitor's action and his/her career advancement. In the simple model laid out in Section 2, when the official's utility $u(.)$ is not an increasing function, officials do not react strategically to the action of peers. Therefore an alternative way to test the tournament competition theory is to find an economic variable that does not increase the odds of promotion. Our theory predicts zero spatial correlation for such a variable.

We choose education expenditure to test this hypothesis. The reasons are twofold. First, education expenditure helps little in boosting short-run economic growth, although it promotes long-run growth. Given that a local official holds his/her position for 3-5 years on average, education expenditure should not be correlated with promotion odds. Second, local governments have a great deal of freedom to increase education expenditures. In China, local governments have contributed to over 95 percent of total government expenditures on education.

Table 9 here

Table 9 reports the results. Overall the spatial effect is small both economically and statistically. Results in the left columns are based on the first order spatial model. For geographical neighbors, education expenditure does not have any spatial correlation, within the province or across the provinces. For economic neighbors, the spatial effect is statistically significant, but economically negligible. For example, the within province spatial effect is 0.034, but its counterpart is 0.185 when we study total investment. Turning to the more general second order spatial model, the spatial effect of education expenditure is even smaller, both economically and statistically, as shown in the right columns of Table 9. Overall, as a falsification test, these results are supportive of the tournament competition theory.

6 Conclusion

We have presented strong evidence that local officials in China engage in tournament competition and strategically boost total investment. The foundation of competition is the unique combination of political centralization and economic regional decentralization in China.

After analyzing a simple model of local government officials' optimization behavior, we employ spatial econometrics models to carry out the empirical analysis. We document significant spatial correlation of total investment among cities within the same province, which is consistent with the tournament competition theory. Three patterns are prominent. First, competition is strictly confined within a province. Second, cities with similar ranking in GDP per capita engage in the most intense competition. Third, the intensity of competition depends on the age of leaders. City leaders tend to compete more aggressively when they face their final chance of promotion due to age, but tend not to compete when they are near the termination age.

Additional evidence is provided to show that the documented spatial effect is driven by tournament competition, rather than by economic spillover and regional tax competition. Furthermore, no spatial effect is found for regional education expenditures, which is also consistent with the theory of tournament competition.

From this multi-faceted empirical evidence, we argue that tournament competition is prevalent among officials of rival cities in China, and officials behave strategically in the competition. This competition is rooted in the performance-based promotion scheme in China, and it profoundly shapes the Chinese economy. In pursuit of sustained economic growth, scholars and policy makers in China have been advocating the changes to the current promotion scheme to include alternative criteria such as environmental protection. Results in this paper imply that local officials may respond to this with dramatic changes in their behavior. In particular, they are likely to reduce investment efforts. It will be worthwhile to study the potential impact of shifts in the promotion scheme on the Chinese economy. We leave this work for the future.

Appendix: Variable Descriptions

We offer descriptions of variables from *Fiscal Statistics of Cities and Counties in China* below.

Total Investment is defined as the sum of residential and non-residential investment made by various types of enterprises and the government. *Education Expenditure* is defined as expenditures by a local government on various public schools and other education-related agencies. It includes (i) salary, subsidy, bonus, insurance and additional benefits of teachers and other related personnel; (ii) expense on utility, stationery, equipment, furniture and other durables; and (iii) education-related construction and renovation. *Fiscal Accounting Balance* is the accumulated fiscal balance, i.e., the total fiscal surplus of the previous years. *Fiscal Supported Population* measures the population whose compensation is paid out of the government budget, including people working in administrations, public schools, state-owned-enterprises, collective-owned-enterprises and other government units. It also includes compensation of honorary-retired and retired staff. *Manufacture Ratio* is defined as the ratio of secondary industry value added divided by the city GDP. *Fiscal Revenue* is the total fiscal revenue of a city, including the budgetary revenue and extra-budgetary revenue. *Transfer Payment* encompasses total transfer payments from the higher-level government.

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Table 1: A List of Spatial Weights Matrices

Within Province		Across Province	
Symbol	Definition of neighbors	Symbol	Definition of neighbors
E^{within}	two regions with similar GDP per capita	E^{across}	two regions from different provinces with similar GDP per capita
G^{within}	regions in the same province	G^{across}	proximate regions outside province
$\widetilde{G}_1^{within}$	one most proximate region	$\widetilde{G}^{across}$	proximate regions outside province (no mountain)
$\widetilde{G}_2^{within}$	two most proximate regions		

Table 2: Summary Statistics

Variable	Measure	Obs.	Mean	Std. Dev.	Min	Max
Total Investment	Billion	330	13.751	19.882	0.184	187.014
Education Expenditure	Billion	330	0.588	0.511	0.006	5.098
Account Balance	Billion	330	0.301	0.705	-0.514	14.000
Fiscal Revenue	Billion	330	1.941	3.290	0.014	41.000
Fiscal Supported Population	100000	330	1.081	0.638	0.037	3.400
Manufacture Ratio	decimal	330	0.428	0.128	0.091	0.897
GDP per capita	10000	330	1.104	1.412	0.115	27.213
Transfer Payment	Billion	330	1.062	1.116	-0.216	13.000

Table 3: Spatial Correlation of Investment (First Order Model)

	G^{within}	E^{within}	G^{across}	E^{across}
Spatial Effect	0.251	0.185	-0.010	0.104
	(0.040)	(0.031)	(0.026)	(0.035)
Dynamic Effect	0.109	0.349	0.258	-0.544
	(0.115)	(0.138)	(0.144)	(0.300)
Account Balance	10.333	10.573	9.056	14.035
	(4.130)	(3.992)	(4.353)	(6.015)
Fiscal Revenue	54.013	40.194	49.815	91.340
	(6.013)	(7.053)	(7.919)	(16.005)
Fiscal Population	14.239	15.188	35.076	51.121
	(22.234)	(20.821)	(23.174)	(31.430)
Manufacture Ratio	70.501	121.303	144.704	158.007
	(39.062)	(35.291)	(39.238)	(52.722)
GDP per capita	-132.329	-138.153	-132.634	-242.304
	(32.557)	(33.799)	(35.676)	(56.824)
Transfer Payment	39.436	36.551	41.443	64.614
	(5.598)	(5.805)	(6.380)	(10.826)

This table reports results from the first order spatial model. Each column corresponds to one spatial weights matrix. The numbers in parenthesis are standard errors. Time and city fixed effects are controlled for.

Table 4: Spatial Correlation of Investment: Border Effect

	G^{within} and G^{across}	E^{within} and E^{across}
Spatial Effect (within)	0.258	0.203
	(0.032)	(0.028)
Spatial Effect (across)	-0.028	0.016
	(0.023)	(0.022)
Dynamic Effect	0.331	0.360
	(0.082)	(0.111)
Account Balance	8.636	10.590
	(3.831)	(3.900)
Fiscal Revenue	42.054	38.965
	(4.453)	(5.751)
Fiscal Population	10.078	13.188
	(20.780)	(20.666)
Manufacture Ratio	66.422	118.926
	(36.260)	(35.034)
GDP per capita	-107.41	-140.82
	(29.570)	(32.135)
Transfer Payment	33.922	36.325
	(5.014)	(5.457)

This table reports results from the second order spatial model where both within province and cross province weights matrices are included in the same regression equation. The numbers in parenthesis are standard errors. Time and city fixed effects are controlled for.

Table 5: Spatial Correlation of Investment: GDP Ranking Effect

	$\widetilde{G}_1^{within}$	$\widetilde{G}_2^{within}$	$\widetilde{G}_1^{within}$ and E^{within}	$\widetilde{G}_2^{within}$ and E^{within}
Spatial Effect (Geo)	0.034	0.131	0.038	0.111
	(0.023)	(0.031)	(0.020)	(0.024)
Spatial Effect (Econ)	—	—	0.150	0.159
	—	—	(0.025)	(0.025)
Dynamic Effect	0.759	0.385	0.612	0.366
	(0.131)	(0.150)	(0.094)	(0.096)
Account Balance	5.303	7.243	8.057	9.354
	(3.933)	(3.953)	(3.706)	(3.721)
Fiscal Revenue	22.334	40.345	26.159	37.676
	(6.897)	(7.697)	(4.786)	(4.896)
Fiscal Population	21.750	22.558	10.143	9.179
	(21.036)	(21.062)	(19.848)	(19.944)
Manufacture Ratio	125.84	105.01	110.44	92.665
	(35.954)	(36.312)	(33.948)	(34.297)
GDP per capita	-72.648	-122.68	-103.97	-138.85
	(32.722)	(34.370)	(29.770)	(30.212)
Transfer Payment	27.043	34.925	29.054	33.947
	(5.723)	(5.899)	(4.963)	(4.986)

This table reports results from second order spatial model. Both economic neighbors (based on ranking of GDP per capita) and geographical neighbors refer to cities within the same province. The table shows that spatial effect for economic neighbors is much stronger than that for geographical neighbors. The numbers in parenthesis are standard errors. Time and city fixed effects are controlled for.

Table 6: Summary Statistics of Ages of Party Chiefs and Mayors

	Party Chiefs						Mayors					
	Obs	Mean	Median	SD	Min	Max	Obs	Mean	Median	SD	Min	Max
2000 -2005	1980	49.8	49.9	4.6	31.5	62.9	1980	48.1	48.2	4.8	30.2	63.5
2000	330	48.7	49.3	6.1	31.5	61.9	330	46.5	46.5	5.8	30.2	60.5
2001	330	49.2	48.9	4.9	32.5	62.9	330	47.2	47.3	5.2	31.2	61.5
2002	330	49.7	49.3	4.5	33.5	60.1	330	48.0	48.0	4.5	34.2	62.5
2003	330	49.9	49.5	3.9	39.6	58.4	330	48.4	48.5	4.3	37.3	63.5
2004	330	50.3	50.2	3.8	38.3	59.2	330	49.0	48.9	4.2	38.3	60.5
2005	330	50.8	50.6	3.7	41.1	59.4	330	49.4	49.2	4.3	38.3	61.5

This table shows summary statistics of the ages of officials in 330 prefectural level cities in China. Source: Author's collection.

Table 7: Spatial Correlation: Age-of-Leader Effect

Cutoff Age	51	52	53	54	55	56	57
				Party Chiefs			
Old vs. Old	0.272	0.282	0.290	0.266	0.228	0.156	0.098
	(0.031)	(0.032)	(0.040)	(0.046)	(0.051)	(0.059)	(0.115)
Old vs. Young	0.155	0.164	0.232	0.185	0.280	0.276	0.249
	(0.048)	(0.045)	(0.041)	(0.049)	(0.054)	(0.072)	(0.081)
				Mayors			
Old vs. Old	0.227	0.294	0.257	0.376	0.137	-0.012	0.030
	(0.040)	(0.044)	(0.051)	(0.061)	(0.091)	(0.132)	(0.234)
Old vs. Young	0.199	0.240	0.248	0.186	0.263	0.151	0.129
	(0.037)	(0.039)	(0.039)	(0.042)	(0.041)	(0.056)	(0.083)

This table reports the spatial effect of old officials competing with neighboring old or young officials, denoted “Old vs. Old” and “Old vs. Young” respectively. Old officials are those whose age is above the cutoff age. The numbers in parenthesis are standard errors. Time and city fixed effects are controlled for.

Table 8: Robustness Check: Border Effect of Investment

	$\widetilde{G}^{across}$	G^{within} and $\widetilde{G}^{across}$
Spatial Effect (within)	—	0.262
	—	(0.033)
Spatial Effect (across)	-0.010	-0.022
	(0.026)	(0.023)
Dynamic Effect	0.335	0.322
	(0.137)	(0.084)
Account Balance	8.492	8.699
	(4.261)	(3.840)
Fiscal Revenue	45.729	42.466
	(7.533)	(4.549)
Fiscal Population	33.466	9.500
	(22.692)	(20.809)
Manufacture Ratio	143.611	65.322
	(38.462)	(36.351)
GDP per capita	-123.549	-107.798
	(34.702)	(29.668)
Transfer Payment	39.434	34.013
	(6.173)	(5.037)

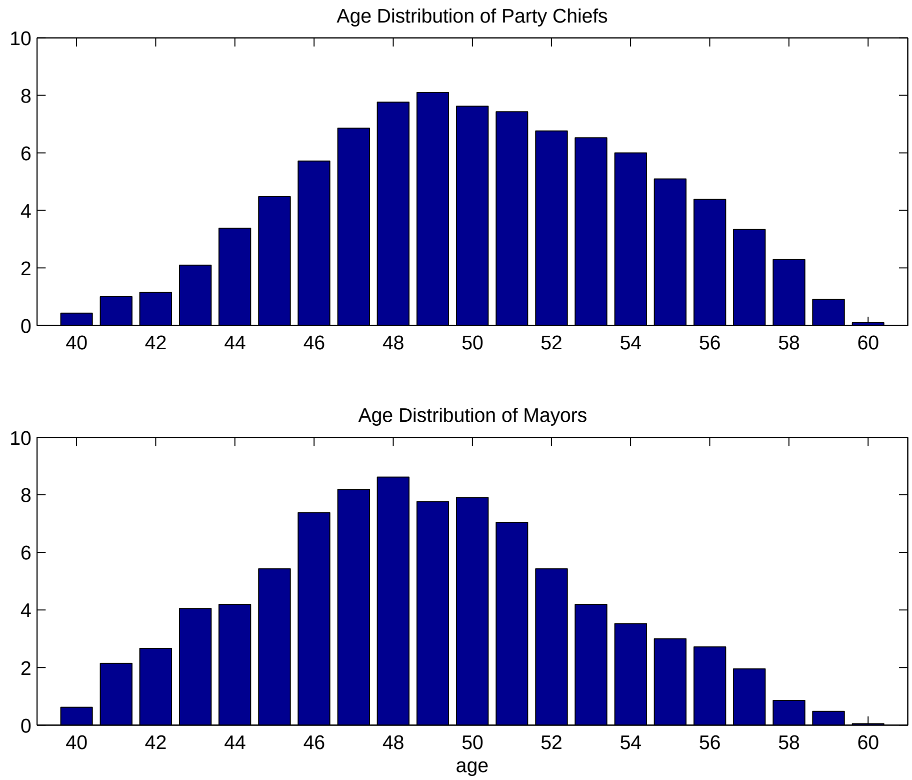
This table reports results based on geographical weights matrices, with cities separated by mountain not treated as neighbors. The numbers in parenthesis are standard errors. Time and city fixed effects are controlled for.

Table 9: Spatial Correlation of Education Expenditure

	G^{within}	E^{within}	G^{across}	E^{across}	G^{within} and G^{across}	E^{within} and E^{across}
Spatial Effect (within)	0.002	0.034	—	—	0.017	0.032
	(0.024)	(0.017)	—	—	(0.023)	(0.017)
Spatial Effect (across)	—	—	0.007	0.031	0.010	0.021
	—	—	(0.016)	(0.016)	(0.016)	(0.016)
Dynamic Effect	0.963	1.019	1.029	0.985	0.962	1.007
	(0.038)	(0.04)	(0.039)	(0.041)	(0.035)	(0.038)
Account Balance	-0.037	-0.041	-0.042	-0.039	-0.037	-0.040
	(0.005)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
Fiscal Revenue	0.017	0.012	0.012	0.015	0.017	0.012
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Fiscal Population	0.088	0.074	0.076	0.084	0.085	0.076
	(0.027)	(0.028)	(0.028)	(0.027)	(0.027)	(0.027)
Manufacture Ratio	0.100	0.115	0.111	0.102	0.096	0.112
	(0.045)	(0.046)	(0.046)	(0.045)	(0.045)	(0.045)
GDP per capita	-0.013	-0.016	-0.010	-0.017	-0.009	-0.019
	(0.036)	(0.036)	(0.037)	(0.036)	(0.036)	(0.036)
Transfer Payment	0.026	0.020	0.019	0.025	0.025	0.022
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)

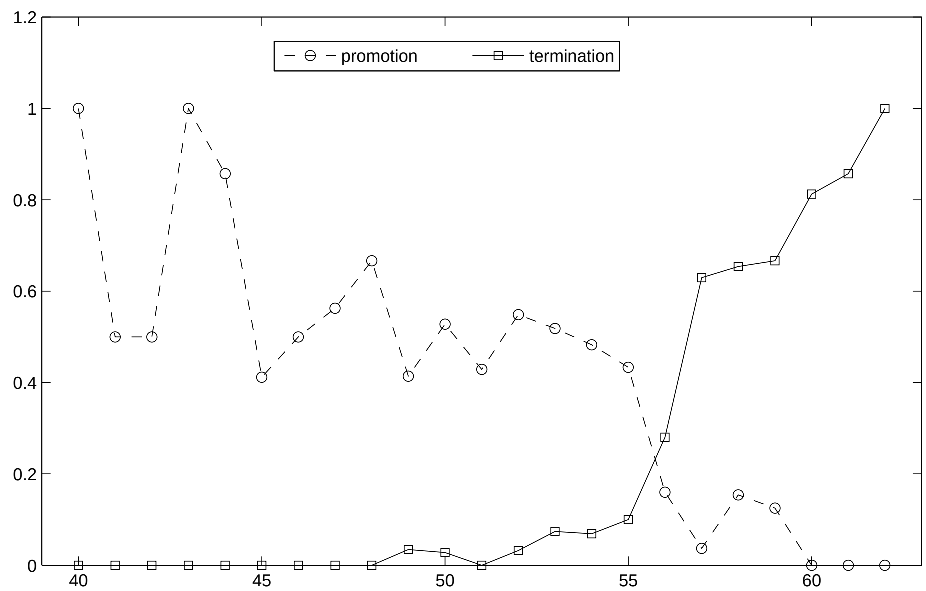
This table reports spatial effect of education expenditure based on various weights matrices. The numbers in parenthesis are standard errors. Time and city fixed effects are controlled for.

Figure 1: Age Distribution of City Leaders



The figure shows the age distribution of party chiefs and mayors of prefectural cities. Each bar represents the average numbers cross years.

Figure 2: Promotion and Termination Percentages



The figure plots the percentage of party chiefs being promoted or terminated by age.