Journal of Development Economics 123 (2016) 86–106

Contents lists available at ScienceDirect

Journal of Development Economics

journal homepage: www.elsevier.com/locate/jdeveco

Do land revenue windfalls create a political resource curse? Evidence from China ☆

Ting Chen, J.K.-S. Kung *

Division of Social Science, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong

ARTICLE INFO

Article history:
Received 20 July 2015
Received in revised form
13 August 2016
Accepted 23 August 2016
Available online 24 August 2016

Keywords:
Political resource curse
Land revenue windfalls
Promotion
Signaling
Corruption
China

ABSTRACT

By analyzing a panel on the political turnovers of 4390 county leaders in China during 1999–2008, we find that the revenue windfalls accrued to these officials from land sales have undermined the effectiveness of the promotion system for government officials. Instead of rewarding efforts made to boost GDP growth, promotion is positively correlated with signaling efforts, and with corruption. The robust positive relationship between land revenue windfalls and political turnover, or specifically promotion, suggests that those who are politically connected to their superiors and those beyond the prime age for promotion are the primary beneficiaries. The case for corruption is substantiated by the evidence inferred from anti-corruption crackdowns, which reveals that the additional effect of land revenue on political turnover and size of bureaucracy (a proxy for corruption) decreases significantly in crackdowns but that land revenue has no effect on city construction expenditure (a proxy for signaling).

1. Introduction

A consensus is slowly emerging that revenue windfalls—be they the result of natural resource abundance or government transfers—do not always benefit society (Ades and Di Tella, 1999; Brollo et al., 2014; Caselli and Michaels, 2013; Mehlum et al., 2006; Robinson, et al., 2006; Ross, 1999, 2012; Svensson, 2000; Vicente, 2010).[1] In particular, the one channel that has been identified recently pertains to the political process. Based on a political agency model with career concerns and endogenous entry of political candidates, Brollo et al. (2014) find that a larger budget, in their case government transfers in Brazil, is associated with both more corruption and a pool of individuals of a lower quality entering politics.

As with natural resource abundance or government transfers elsewhere, we show that the windfall revenues that sub-provincial—specifically county—governments in China obtain from selling land for nonfarm development purposes and over which they have monopoly rights are also a political resource curse. We consider land revenue windfall in China a "curse" because it has been significantly undermining the alleged effectiveness of a mechanism of rewarding the subnational officials' effort (or ability that is otherwise unobserved) in boosting GDP growth for as long as three decades,[2] and produces the kinds of effects that Brollo et al. (2014) alluded to, even where voting is a closed option to the selection of political elites.

Touted as an "institutional foundation" of China's sustained economic growth, the country's meritocratic political selection system—one which provides high-powered promotion incentives to China's subnational leaders—is predominantly viewed as the

☆We thank two anonymous reviewers of this journal, the editor Gerard Padró i Miquel, Daron Acemoglu, Yuen Yuen Ang, Chong-en Bai, Ying Bai, Loren Brandt, Meina Cai, Avner Greif, Yue Hou, Ruixue Jia, Philip Keefer, Pierre Landry, Hongbin Li, Nancy Qian, Zheng Michael Song, Victor Shih, Susan Shirk, David Stromsberg, Dan Treisman, Chenggang Xu, Noam Yuchtman, Li-an Zhou, Fabricio Zilibotti, and participants of seminars held at the Chinese University of Hong Kong, University of California, San Diego, Fudan University, Harvard University, University of Michigan (Ann Arbor), Hong Kong University of Science and Technology, Stanford University, Xiamen University, University of Washington (Seattle), Montreal (Center for Interuniversity Research and Analysis of Organizations) and St. Petersburg (Regional Heterogeneity and Incentives for Government) for helpful comments and suggestions. The remaining errors are ours.

* Corresponding author.
E-mail addresses: ctxad@ust.hk (T. Chen), sojk@ust.hk (J.-S. Kung).

[1] Many authors pose what essentially is the same rhetorical question in regard to the welfare effects of natural resource abundance and/or revenue windfalls. For instance, Brollo et al. (2014: 1759) ask: "Suppose new oil is discovered in a country, or more funds are transferred to a locality from a higher level of government. Are these windfalls of resources unambiguously beneficial to society?".

[2] Since reforming its economic system in the late 1970s, China has sustained a near double-digit growth rate for well over three decades.

http://dx.doi.org/10.1016/j.jdeveco.2016.08.005
0304-3878/

reason behind the miraculous success of its economic reform. Specifically, under a decentralized competitive setting—presumably necessitated by the sheer scale of the national economy, those who are able to grow their local economies the fastest will be rewarded with promotion to higher levels within the Communist hierarchy (also known as "jurisdictional yardstick competition", Maskin et al., 2000; Xu, 2011). Empirical evidence has indeed shown a strong association between GDP growth and promotion (Chen et al., 2005; Edin, 2003; Jia et al., 2014; Landry, 2008; Li and Zhou, 2005; Persson and Zhuravskaya, 2015; Yao and Zhang, 2015; Whiting, 2000).[3]

While this institutional arrangement has likely remained intact at the provincial level (thanks to the absence of land revenue windfalls), the same cannot be said for the lower levels. Since 1998, sub-provincial officials (consisting of, in the decreasing order of hierarchy the prefecture and the county) have been assigned exclusive statutory rights to sell land, resulting in some of them reaping huge windfalls of such revenue (known in Chinese as land conveyance fee or *tudi churangjin*). Classified as "extra-budgetary revenue", it is a category that does not obligate them to share it with upper-level authorities.[4] For instance, while accounting for less than 10% of the county's extra-budgetary revenue before 1998, this land revenue grew to constitute nearly 80% of the county coffers in 2008 (Fig. 1 Panel A).[5] This resulted both in an extraordinary rise in extra-budgetary revenue as well as in its share of total revenue (Fig. 1 Panel B), to the extent that China's local officials have been criticized for having become overly dependent upon land sales in fueling investment growth (*The Wall Street Journal*, March 1st, 2013). In addition, there is also convincing evidence linking land revenue with corruption.

By constructing a unique data set that matches the biographical data of county party secretaries with the fiscal and socioeconomic data of 1753 counties in 24 Chinese provinces over a 10-year period (1999–2008), we seek to analyze the effect of this revenue windfall on the political selection of China's local (county) leaders and corruption. In the case of selection, we find that, while GDP growth continues to have a significant and positive effect on political turnover—specifically promotion, so does land revenue. But most importantly we find that land revenue *reduces* the significance of GDP growth in determining promotion. Furthermore, land revenue is found to have an additionally significant effect for those connected to their superiors in terms of sharing the same birthplace or having previously worked in the prefectural government, as well as those who have already passed the prime age of promotion—due presumably to their lack of competitiveness. To the extent that GDP growth is a good proxy for the unobserved ability of the county leaders, these lines of evidence lend credence to the claim that land revenue has an adverse effect in the selection of county leaders.

There are two possible channels through which land revenue may have "substituted" GDP growth to some extent in determining the promotion of county officials. The first plausible channel is *signaling*. By analyzing the patterns of county budget expenditures for the 1999–2007 period, we find that county officials have directed the land revenue windfalls disproportionately to projects that serve to signal their "achievements"—notably ostentatious public projects, e.g. city construction projects, known in Chinese as "image" or "political achievement" projects, and to have strategically timed them in such manners as to prevent their signaling efforts from going to waste.[6]

A second, possible channel is outright *corruption*. By using an inferential or "forensic economics" approach, and by assuming that some county leaders may use land revenue directly to bribe their way to promotion, or collude with prefectural officials in selling land, we find supportive evidence that, in the event of a crackdown on the corruption of higher-level (prefectural and provincial) officials in the same province in which the county officials serve, the additional effect of land revenue decreases significantly in the year in which such crackdown occurs. While having the same positive and significant effect on the size of bureaucracy—a proxy for corruption, such crackdowns do not have similar effects on city construction expenditure—a proxy for signaling. In addition, we find strong evidence that expenditures involving cash and other allowances paid to government staff (administrative expenditure) and the beefing up of the government bureaucracy are much greater than the other expenditure categories such as social welfare spending and research subsidies provided to private enterprises—a finding that reinforces the evidence of a rent-seeking or simply corrupt local government.

To rule out the possibility that our estimations may be biased by the endogenous land revenue variable, we instrument land revenue with an interaction term that takes into account the amount of land in a county *unsuitable* for commercial and real estate development (as determined by terrain), on the one hand, and the exogenous (and time-varying) demand shock, on the other. We proxy for this demand shock using trends in the national interest rate, under the assumption that land revenue is essentially a product of the demand for, and supply of, land. To ensure that our instrument is robust, we replace the national interest rate with the provincial capital cities' house prices as our second instrument. Regardless of the instrument used, the result remains significant, relieving us of the concerns of both omitted variable bias and reverse causality. Additionally, we find that the two components of our instrument are insignificantly correlated with a county official's connections and/or factional ties, and that their significance has not increased over time (especially after 2002) in response to the growing land revenues. Together, these findings alleviate the concern that well-connected officials might be able to duly influence the locational choice of their appointment.

By analyzing the effect of land revenue windfalls on the economic-cum-political behavior of China's county officials, our paper contributes to the emerging literature on the political resource curse, as well as to the literature pertaining to the political selection of China's subnational leaders and its link to economic growth. Specifically, we find that, while the Chinese bureaucrats are immune to the reelection pressure that their counterparts in

[3] A slight exception is Jia et al. (2014), who find that promotion at the provincial level is simultaneously contingent upon performance and connections. In the case of Persson and Zhuravskaya (2015), they find that the career concerns of native provincial party secretaries are significantly weaker than those who were transferred from other provinces.

[4] The allocation of rights by the central government to regional authorities over this "extra-budgetary" revenue is not something new. In order to invigorate the local leaders' incentives to spur economic growth, the central government had since 1984 already devolved to regional governments the rights over the profits and taxes of the enterprises under their jurisdictions (Blanchard and Shleifer, 2000; Montinola et al., 1995; Oi, 1992, 1999; Qian and Xu, 1993; Qian and Weingast, 1997).

[5] The privatization of the previously state-owned housing units that began in the 1990s and soon after the promotion of land auctioning practices since 2002, are believed to have inadvertently spurred the growth in land revenues. But the effect of land revenue on local coffers, while dramatic for the county, is much smaller for the province; for example, in 2008 land revenue accounted for only 9.2% of the extra-budgetary revenue at the province level but a hefty 79% at the county level. The county is important because it is the level where resources required for mobilizing development reside.

[6] The tendencies for public officials to engage in unproductive signaling behavior is by no means limited to only authoritarian regimes. For instance, empirical studies have consistently found that reelection incentives for politicians under democracy have frequently led to signaling efforts in the respects of war making (Hess and Orphanides, 1995), public goods provision (Caselli and Michaels, 2013; De Janvry et al., 2012) and more generally economic performance (Besley et al., 2010).

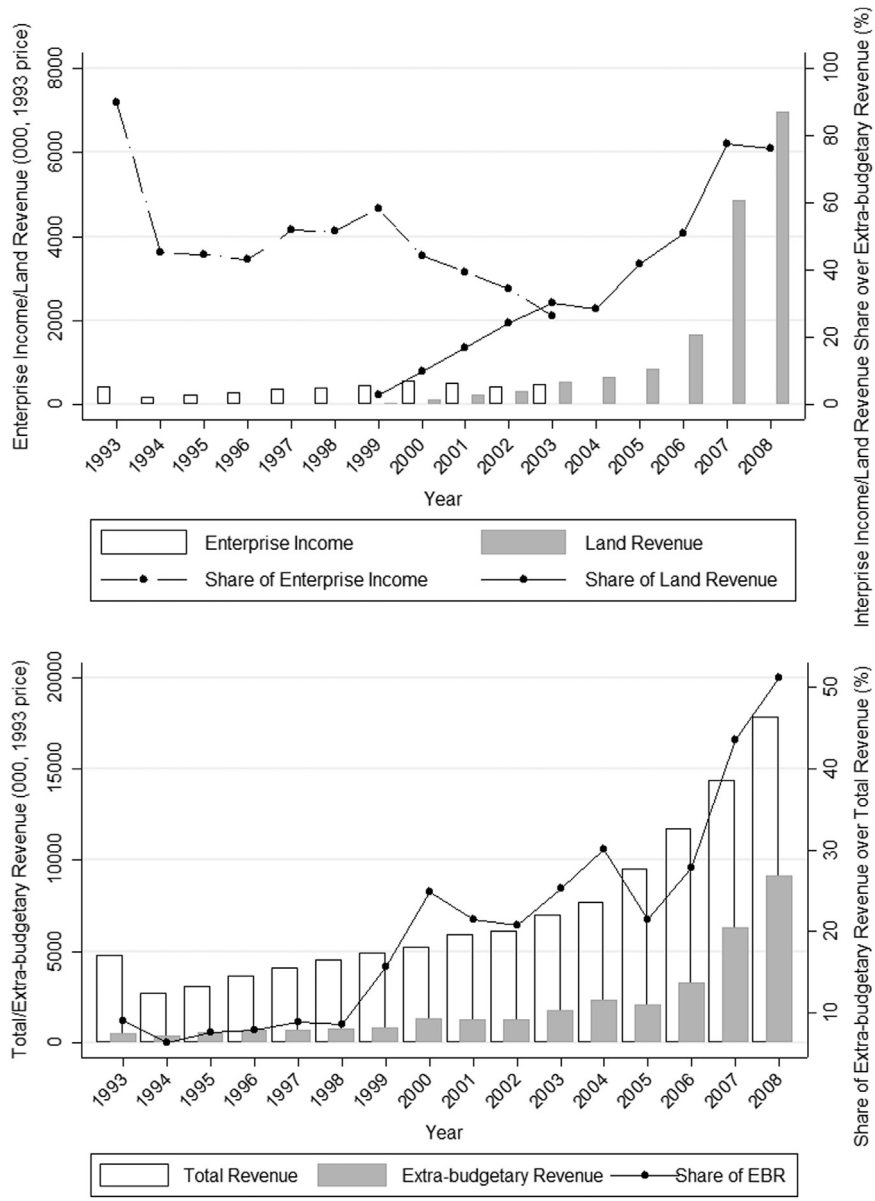


Fig. 1. County *Revenues* Structure, 1993–2008.

Western democracies face because they are essentially under a closed political system, they remain vulnerable to the selection problem because of their accountability to those who determine their promotion, and to corruption engendered in the process. While we are certainly not the first to study the political resource curse in a single-country setting (Brollo et al., 2014 and Caselli and Michaels, 2013, for example, both focus on Brazil), to our knowledge this is the first attempt to richly document and explain a political resource curse as it exists under an authoritarian regime.

The remainder of this paper proceeds as follows. We provide in the next section a review of the background literature on revenue and promotion incentives before we introduce, in Section 3, a theoretical framework to guide our empirical analysis. In Section 4 we describe our data sources and define our variables, followed by reporting both the baseline and instrumented results of our empirical analysis in Section 5. Section 6 explores the two channels (namely signaling and corruption) through which land revenue may affect China's "yardstick competition" and their respective associated effects of adverse selection and corruption. It also extends our analysis of the selection outcome and checks the robustness of the corruption evidence. Section 7 provides the conclusion.

2. Background

This section provides a brief description of the political selection system in China and of the phenomenal growth of land revenue after 1998. It also explains why we employ the Chinese county as the unit of analysis.

2.1. Promotion based upon economic performance

Political selection in China is best characterized by what is popularly known as a "tournament" or more specifically "jurisdictional yardstick competition" (hereafter yardstick competition)—a system whereby public officials of the same level (e.g. the province) are made to compete with each other under broadly similar economic conditions for promotion to the next level up—for instance from county to prefecture, or from prefecture to province,

and so forth (Li and Zhou, 2005; Maskin et al., 2000; Xu, 2011).[7] Defined as whether a change in hierarchical rank has occurred regardless of whether the provincial leader has taken up a position in the central government, promotion has played a uniquely important role in the Chinese context because, by providing career incentives to public officials put in charge of boosting economic growth, it allows economic activities in a large economy to be efficiently decentralized, while keeping the political system highly centralized.

While "yardstick competition" provides sufficiently strong career incentives in guiding the economic-cum-political behavior of China's local officials, competition is so fierce, however, that only a handful of officials ever get promoted. For instance, of the 17,531 county-year observations in our panel of county officials, only 1,216, a meager 6.94%, have ever been promoted—a magnitude even lower than the province's 8.93% and the prefecture's 10.84%.[8] Moreover, given that promotion rarely occurs beyond the first term of office—nearly 86% (1,042/1216) of those in our sample got promoted within the first five years, efforts devoted to achieving promotion need to be timed optimally. Among those who failed to be promoted after the first term—the overwhelming majority, 90.53% (13,459/17,531) either stayed in the same position or transferred to a different locale of the same level and served in the same capacity. Those approaching retirement age—set at 55 for the county, 60 for the prefecture, and 65 for the province—would be assigned to an "advisory" position to while away their time before eventually retiring. The ferocity of competition implies that the Chinese officials may deploy unsupervised revenue windfalls at their disposal in ways that would enhance their promotion prospects. In particular, given that promotion is typically evaluated by one's immediate supervisors (i.e., county by prefecture, prefecture by province), "yardstick competition" easily gives rise to rent-seeking behavior or even outright corruption, as we shall show.

2.2. Land conveyance fee—an unexpected source of revenue windfall

As mentioned earlier, the central government had since the early 1980s encouraged local governments to develop the nonfarm economies—specifically the "township-and-village enterprises"—under their jurisdiction. The local governments were not required to share the revenue so generated—the so-called "extra-budgetary revenue"—with the upper level of administration (e.g., Oi, 1999). While this policy had been immensely successful, the earnest decentralization of these profits and taxes had hollowed out the central coffers. To arrest this trend, in 1994 and 2002 the state recentralized a substantial proportion of a wide array of local taxes (Kung et al., 2013). Just when the local governments were set to lose one of their most important income sources, a new lifeline emerged. In anticipation of China's rapid urbanization which would see a dramatic rise in the demand for land, the Chinese government (proactively) introduced a new policy to boost land supply—to allow arable land to be converted into non-arable (industrial or commercial) usages should the need arise.[9] But because the Chinese government did not wish to see the ownership of the land converted for urbanization purpose falling into the hands of private individuals, a statutory bill was passed at the 15th National Congress of the Communist Party of China in 1998 clearly stipulating that all non-arable land would be owned by the state (specifically the local state, e.g. the county). Therefore, what the private individuals obtain from their purchase is merely a limited tenure (of 70 years) of land use rights. As a result of this new law, county governments are assigned *de jure* ownership over land in their geographical jurisdictions (Lin and Ho, 2005; Kung et al., 2013), including land both in the county proper as well as land originally reserved for agriculture. County governments immediately saw an opportunity to benefit from this statutory right. They would draw up an annual land development plan detailing the amount of land (and their corresponding locations) that they wish to sell, including the amount of arable land they wish to convert for non-arable usages. Subject to the approval of the prefectural authorities, the county governments are allowed to keep all the proceeds from the sale of land under their jurisdiction (the Land Management Law, 1998).

The central government certainly did not intend for this new policy to compensate the local governments for losing the bulk of their extra-budgetary revenue, nor did they anticipate that the local authorities would take to converting arable land for development with such zeal as to evict the farmers in some cases. Indeed, some would even, creatively, waste the proceeds on practically useless construction projects for personal gains. The local governments eagerly tapped this new source of "extra-budgetary" financing (Han and Kung, 2015), which then flooded the local coffers. The county government is a good case in point.[10] While land revenue was negligible initially, it grew phenomenally over time; by 2008 it accounted for a whopping 79% of the entire extra-budgetary revenue and approximately 38% of the total revenue—dwarfing the enterprise income (Fig. 1 Panel A). Reaching 91.46 million *yuan* in 2008, this unregulated revenue was 1,221 times its size in 1998 (in 1993 constant dollar terms). The discretionary nature of this revenue makes it all the more attractive for the local governments, who could expend them in a myriad of ways and for multiple purposes.

2.3. The county as the unit of analysis

We choose the county to be our unit of analysis for the following reasons.[11] First, the county is better suited than the province for testing the hypothesized strengths of land revenue because it accounted for nearly 79% of the extra-budgetary revenue on average whereas the average province accounted for only 9.2% in 2008. While land revenues for the prefectural governments are also substantial (50.24%), it is not as ideal a level of administration for testing the "yardstick competition" thesis (Xu, 2011), because sizeable state-owned enterprises had been, for historical reasons, established and concentrated at the prefectural level. The industrial market structures at this level thus tend to be far more concentrated than those at the county level. Moreover, unlike the province and the prefecture, the county is the only level of

[7] These preconditions include: a) the devolution of property rights by the central state to various levels of regional governments to directly set up and manage enterprises of various ownership types appropriate to their levels and compete with each other on a regional basis, and b) a diversified, non-monopolistic economic structure with the effect of encouraging competition among rival producers of the same goods. China allegedly fulfilled these conditions at the reform outset, which, arguably, are conducive to marketization (Qian and Xu, 1993; Xu, 2011).

[8] If we count only those who have ended their office as county party secretaries in 2008—the end year of our analysis, the promotion rate becomes substantially higher—33.56% (1,216/3,623). The promotion rate for the province using this calculation is also higher—54.2%.

[9] When land is used for farming it is owned collectively by the villagers. But once the usage becomes non-agricultural, ownership changes hand from the villagers to the (local) state and the latter becomes the sole residual claimant of land revenue, subject to compensation paid to the villagers for having relinquished the land.

[10] While the township and village authorities may have as strong an incentive to convert farmland for non-arable usages, the county government is the lowest level of administration authorized to make decisions on land conversion.

[11] To reiterate, subnational governments in China consists of four levels—province, prefecture, county, and township.

administration at which the "tournament" hypothesis has not been empirically tested.[12]

Second, as mentioned earlier promotion is also most intense at the county level—6.94% versus the province's 8.93% and the prefecture's 10.84%. This tends to make the county officials eager for promotion go after land revenues with a vengeance.[13] Third, the county in China is a sufficiently sizeable spatial unit.[14] Together, these considerations suggest that county officials should have the strongest incentives to deploy land revenues for furthering their own gains.

Ideally, we would want to test the effect of land revenue windfall on both the county party secretaries and the county magistrates, given that the county is managed by both. However, given that the county party secretaries are in reality the de facto "first-in-command" officials (*Yibashou*) in charge of running the local economies (Lieberthal, 2003; Joseph, 2010), and in light of the prohibitively large amount of data work involved, we choose to study only the county party secretaries.[15]

3. Theoretical framework and hypothesis

Premised on the findings in the literature of the "political resource curse" (e.g., Brollo et al., 2014), we hypothesize that land revenue windfall in the Chinese context may similarly be deployed by county officials to enhance their promotion prospects, which implies that the effect of land revenue on political turnover or specifically promotion is positive.[16]

The hypothesized effect of land revenue may be realized through two possible channels. The first is *signaling*. To enhance their chances of promotion, the county officials would purposively demonstrate their "achievements"—essentially by investing in ostentatious public projects ranging from large public squares or plazas to grand government buildings (Cai, 2004; Guo, 2009; Pei, 2008; Smith, 2009; Yew, 2011, 2012). Known popularly as "image projects" (*xingxianggongcheng*), or "political achievement projects" (*zhengjigongcheng*), county officials would time these "investments" optimally to maximize their chances of promotion, which is granted to only a select few.

Despite being a waste of resources, the supervising authorities may consider these projects a useful measure of the officials' performance as they are at least "visible" and "quantifiable".[17] Moreover, in the event that some prefectural leaders are similarly career-minded, they themselves would take credit from such projects and use them for impressing their supervisors at the provincial level (Guo, 2009). The county leaders have a penchant for "image projects" because these projects can usually be completed within a few years, thereby enabling their achievements to be timely revealed—a feature that concurs particularly strongly with their short tenure of about four years on average. In addition, we expect this career incentive effect to be strongest when county officials are due for promotion, which typically occurs near the end of their first five-year term.

A second possible channel is *corruption*. To be sure bribery can occur in many ways. It can be outright overt, where county officials take the initiative to directly bribe their superiors. Or they may collude with prefectural officials already in the process of selling land. Likewise, with "kickbacks" easily arranged by manipulating bids, large-scale construction projects are also rife with opportunities for corruption, so much so that county officials can benefit directly from "image projects" and signal their achievements with them.

In what follows we test our hypothesis regarding the positive effect of land revenue on political turnover, or specifically promotion, and verify the two possible channels through which this hypothesized effect is realized using a uniquely constructed data set.

4. Data and variables

4.1. Data

To find out whether land revenue has the anticipated effect of weakening GDP growth in the selection of China's county officials, and, more specifically, whether it has led to adverse selection and corruption effects, we construct a panel data set that consists of variables on the outcomes of political turnover—our dependent variable, land revenue and per capita GDP growth rate—our key independent variables, and a number of control variables, including, *inter alia*, tax revenue, level of per capita GDP and population, inflation rate measured at the prefectural level, and a number of individual characteristics, including three proxies measuring factional ties and connections. We construct the variable *political turnover* by first obtaining the names of county party secretaries from the *Provincial Yearbook* (*Sheng Nianjian*), followed by searching for their personal biographies—including a number of individual characteristics ranging from age, sex, and place of birth to education, work history, and so forth—using the Chinese internet search engine *Baidu Encyclopedia* (*Baidu Baike*) (see Fig. A1 in the Appendix for an example of a county party secretary's vita).[18] To construct the land revenue and other fiscal revenue variables, we turned to a publication entitled *Fiscal Statistical Compendium for All Prefectures and Counties* (*Quanguo Dishixian Caizheng Tongji Ziliao*), from which data is available for the period 1999–2006, and the website of the Land Transaction Monitoring System (http://www.landchina.com/), for 2007–2008 data.[19] Similarly, it contains detailed information on expenditures, which thus allow us to test how county party secretaries may have used land revenue to further their promotion prospects. Finally, we resorted to the *Provincial Statistical Yearbooks* (*Sheng Tongji Nianjian*) for the earlier period of 1999–2001 and the *Statistical Yearbook of Regional Economies* (*Quyu Jingji Tongji Nianjian*) for the later period of 2002–2008, for computing the county-level per capita GDP growth rates and other control variables (e.g., population). Table A1 in the Appendix provides further details on the various

[12] Chen et al. (2005), Jia et al. (2014) and Li and Zhou (2005) provide evidence of the tournament at the provincial level, whereas Landry (2008) and Yao and Zhang (2015), and Edin (2003) and Whiting (2000), examine the determinants of promotion at respectively the prefectural and township levels.

[13] Given that the cost of requisitioning land (due to its urban nature) is sharply higher for the prefectural governments (Lin and Ho, 2005; Yew, 2011), the "revenue incentive" may also be less strong for the prefectural leaders.

[14] For instance, the largest county in China, Ruoqiang County in Xinjiang Province, is twice the size of a small European country such as Iceland (208,226 compared to 103,001 square kilometers).

[15] While the county magistrate was the *de facto* leader of the local economy and society in the Qing dynasty (Qu, 1969; Zelin, 1992), his supremacy has been superseded since the founding of the People's Republic. From then on, the county party secretary has effectively replaced the county magistrate as the local leader.

[16] This also implies that land revenue will likely undermine the positive effect of GDP growth on promotion.

[17] In 2007, up to 20% of China's municipal governments had been criticized by the Ministry of Construction for having lavishly engaged in these wasteful "image projects" (Yew, 2012).

[18] By regulation (Regulation on the Public Announcement of Senior Officials Prior to Appointment, "*Lingdao Ganbu Renzhiqian Gongshi Zhidu*"), the Chinese government is obligated to make public the curriculum vitae of all government officials prior to their appointment.

[19] The Land Transaction Monitoring System (http://www.landchina.com/) is a data bank set up by the Ministry of Land and Resource. It keeps a record of each and every land transaction, from which information on both price and quantity can be obtained for aggregation to the county level.

data sources.

In constructing our data we first exclude those directly governed municipalities and provinces that are either superior in administrative status or lacking the pertinent information.[20] This leaves us with 1753 counties (out of a total of 2002 Chinese counties) covering 24 (out of 31) provinces from which to construct a panel data set over the ten-year period of 1999–2008.[21] We then proceed to match the biographical data of the county party secretaries with the fiscal and socioeconomic data of the counties, resulting in 17,521 county*year observations available for analysis, involving a total of 4390 county party secretaries.[22] We choose 1999 as the starting point of our analysis because the statutory law that enabled local governments to appropriate land revenue was passed in 1998 (at the 15th National Party Congress), and, perhaps because of that the data on land revenue are made publicly available only from 1999 onwards. We end our analysis in 2008 because that is the most recent year for which data on fiscal revenues are available.

4.2. Dependent variable

Political Turnover. Our dependent variable is political turnover of the county party secretaries on a yearly basis, which assumes one of the following outcomes: Promotion, Lateral Transfer, Staying in Office, Retirement, or Termination (for wrongdoings such as corruption or natural death). Following Li and Zhou (2005), political turnover is coded as an ordinal variable, with promotion taking on the value of 3, lateral transfer to positions of the same rank and/or staying in office 2, retirement 1 and termination zero. Additionally, and as an alternative measure, we also employ a dummy variable that assigns the value of 1 to promotion, and zero to all other outcomes. A detailed description and classification of these various outcome categories is provided in Table A2 in the Appendix. Fig. 2 shows the distribution of these outcomes for the 17,521 county-year observations. Of these, a mere 6.94% was promoted. An overwhelming percentage, 90.53%, either stayed in office or moved laterally to positions of equivalent rank (either as party secretary in another county or worked in the prefectural government at a comparable rank). Less than 3% (2.07%) retired directly from completing their term as county party secretaries, and a mere 0.47% had their office terminated due to corruption, resignation or natural death.

4.3. Independent variables

Land Revenue. Our key independent variable is total land revenue (logged).

Per Capita GDP Growth Rate. Following Li and Zhou (2005), we employ the per capita annual GDP growth rate during the 1999–2008 period to proxy for the criterion used for political selection.

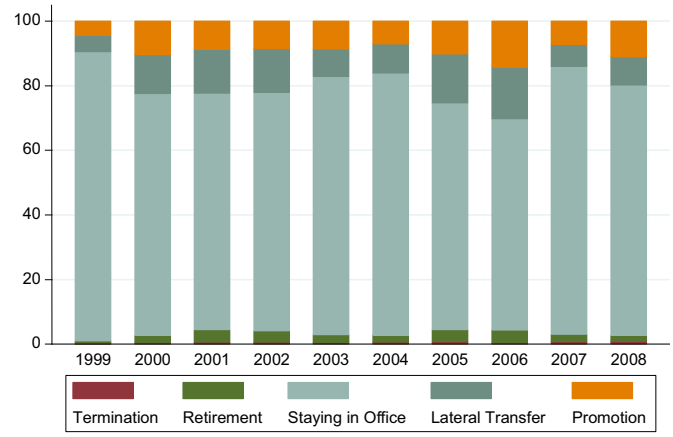


Fig. 2. Political turnover of county party secretaries, 1999–2008.

4.4. Control variables

To avoid the omission of those variables that may be correlated with turnover and land revenue, it is necessary to control for them in the regressions.

Tax revenue (logged). Foremost is tax revenue, which had more than tripled (328.87%) during 1998–2008—increased from a modest 142 billion yuan in 1998 to 609 billion *yuan* in 2008 (*Fiscal Statistical Compendium for All Prefectures and Counties*). Those who were able to increase this revenue source more than the average may stand a better chance of promotion (Lü and Landry, 2014).

Per capita GDP and population (both logged). In addition to county fixed effects, we also control for the size of a county's local economy measured in terms of both GDP per capita and population.

Prefectural level inflation rate. Assuming that the central government is concerned about inflation, then a higher level of inflation would likely dampen the local officials' promotion prospects. To prevent land revenue from picking up the impact of inflation on promotion we deflate land revenue using the GDP deflator at the prefectural level.

Individual characteristics of county party secretaries. Given that individual characteristics are likely correlated with promotion, we control for these observable characteristics. Foremost is *Age*, which, against the mandatory retirement age of 55 is most certainly a crucial determinant of the probability of promotion. Table 1 shows that the average age of the county party secretaries in our sample is 46, which is way below the official retirement age of 55. We also include the squared term of age to control for its concaving effect on political turnover (Panel A, Table 1).

Given the panel nature of the model (which pools together all the county party secretaries at different stages of their career), it is necessary to control for the varying duration of their tenure. While the probability of promotion likely increases with duration, evidence suggests that there is an optimal period beyond which promotion would be unlikely (Guo, 2009). To control for such possibilities we thus include a set of year-in-office dummies in our estimations. The average duration of tenure of the county party secretaries in our sample is just 4 years (Panel A, Table 1, see also Fig. A2 in the Appendix).

Another observable individual characteristic that may bear upon promotion is *years of schooling* (e.g., Shih et al., 2012). The majority of our county leaders (87.29%) have at least a college degree or 17 years of education on average (Panel A, Table 1).

Factional ties/workplace/birthplace connection. The proposition that promotion is premised upon GDP growth has not been unquestioned. Some claim that loyalty is in fact the more important consideration when deciding who to promote (Shih et al., 2012),

[20] This includes the four directly governed municipalities of Beijing, Tianjin, Shanghai, and Chongqing, and Hainan Province, where county party secretaries are under the direct supervision of either the municipal or provincial government and thus are of a higher status than their counterparts from the other provinces. The provinces of Tibet and Hebei are excluded from our sample due to the lack of data.

[21] Our sample also excludes the 840 districts (*qu*), because, unlike the county proper, the leaders of these county-level jurisdictions lack the independent authority to formulate and develop annual land use plans. Additionally, we also exclude the seven counties whose status was only recently upgraded from township within the timeframe of our sampling period (1998–2008).

[22] In cases where there are two county party secretaries serving in the same year—one outgoing and the other incoming, we follow Li and Zhou (2005) and Shih et al. (2012) and match the data of those whose term ends before (or, alternatively, starts from) the 1st of July of a given year.

Table 1
Summary statistics of independent variables (1999–2008).

Variables	Number of Observations	Mean	Std. dev.
Panel A. Variables employed in the regression analysis			
GDP Growth Rate	9764	0.124	0.154
Land Revenue (Log)	9764	4.277	3.268
Log of Per Capita GDP	9764	−1.552	0.698
Log of Tax Revenue	9764	9.184	1.152
Log of Population	9764	11.837	0.965
Prefectural Level Inflation Rate	9764	63.662	244.443
Individual-level variables			
Age	9764	45.795	3.944
Age^2	9764	2112.764	362.152
Years of Schooling	9764	17.128	1.871
CYL Party Secretary	9764	0.150	0.357
Workplace Connection	9764	0.413	0.492
Birthplace Connection	9764	0.186	0.389
Tenure Duration	9764	4.056	1.702
Panel B: variables employed in the IV regression analysis			
Unsuitable Index	9764	0.249	0.222
Log of Capital City House Price	9764	0.252	0.087
Panel C: expenditure variables employed in analysis of signaling			
Log of per capita city construction expenditure	8856	7.998	3.826
Log of per capita land development expenditure	8856	1.832	3.205
Log of per capita production expenditure	8856	2.205	3.601
Log of per capita education expenditure	7560	5.498	1.016
Log of per capita social security expenditure	8856	4.169	1.828
Log of per capita administration expenditure	9764	3.710	2.475
Number of government employees per 100,000 people	8825	0.080	0.052

whereas others argue that, once a set of shared characteristics (such as place of birth, whether attended the same school and/or worked in the same administration, etc.) between two successive levels of officials are controlled for, the relationship between GDP growth and promotion simply disappears (Opper and Brehm, 2007; Yao and Zhang, 2012).

We construct one measure each for workplace connection, birthplace connection and factional ties. Workplace connection is proxied by a dummy variable indicating whether a county official has previously worked in a prefectural government (PGE). Since the appointment system in China requires that it is the one-level-up prefecture government's authority to decide county officials appointment (so called "One Level Down" policy; justified on grounds of "gaining important local experience"), a county party secretary's experience in the prefecture government could affect the likelihood of promotion through their stronger (formal or informal) connection with the appointment authority—the prefecture governments. About 41.29% have such ties with a prefectural government (Panel A, Table 1).

Similar to workplace connection, birthplace connection is also a dummy variable indicating whether a county official was born in the same prefecture as his/her immediate supervisors—be it the party secretary or the mayor of the supervised prefecture. We choose this particular measure as evidence suggests that those provincial officials who share the same birthplace with the national leaders are more likely to be promoted (Shih et al., 2012; Opper and Brehm, 2007). In our sample, only 18.57% of the county officials came from the same prefecture as their immediate supervisors (Panel A, Table 1).

Finally, the proxy for factional ties is the so-called "*tuanpai*" (factional) experience. This variable is also a dummy variable, referring to whether a county official has served as party secretary in the Communist Youth League (CYL). In China, the CYL is a political organization upon which a certain "faction" known as *tuanpai* has been relying for grooming future leadership (Li, 2001, 2005; Bo, 2004). In this sense, CYL experience can be a good proxy measuring a county party secretary's factional ties. In our sample, a mere 14.97% of county officials have the credential of a CYL party secretary (Panel A, Table 1).

5. Empirical results

5.1. Relationship between land revenue, GDP growth and promotion

To test the hypothesis that the political selection of China's county leaders based upon "yardstick competition" may have been weakened by land revenue windfalls, we regress political turnover on GDP growth, then land revenue first, before we do so on their interaction term. In addition to the linear regression, the ordinal nature of our dependent variable means that the ordered logit model (controlling for both county and year dummies) must also be included as part of our baseline estimations. The equation underlying this regression exercise assumes the following form:

$$Turnover_{it}=\alpha_1 LandRev_{it}+\alpha_2 GDPGrowth_{it}+\alpha_3 LandRev_{it} * GDPGrowth_{it}+\beta_1 X_{it}+\beta_2 W_{jt}+\phi_i + T_t + \delta_j + \mu_{ijt} \quad (1)$$

where i indexes a county, t indexes a year and j indexes a party secretary. Denoting the annual land revenue (log) in county i at year t, our key explanatory variable $LandRev_{it}$ is employed to proxy for the effect of land revenue on the political selection of China's county leaders. Likewise, given the alleged importance of GDP growth for promotion, $GDPGrowth_{it}$, defined as the per capita annual growth rate of GDP in county i at year t, is similarly included in our estimations. Before testing our hypothesis, it is necessary to confirm, first and foremost, that both GDP growth and land revenue have an independently significant and positive effect on political turnover. We are thus also interested in α_1 and α_2, although α_3 remains our coefficient of key interest. X_{it} is a vector of county-level control variables, which include total tax revenue, level of per capita GDP and population size (all in natural logarithm), and inflation rate measured at the prefectural level. Including such characteristics as age, a set of year-in-office dummies, years of schooling, birthplace, measures of factional ties and connections, W_{jt} is a vector of individual characteristics of county party secretary j. T_t refers to the year fixed effects, while ϕ_i and δ_j are the county and party secretary fixed effects respectively. Finally, in all specifications standard errors are clustered at the prefectural level.

Table 2 reports the estimation results based on Eq. (1). Column (1) shows that higher GDP growth is positively correlated with promotion—a finding consistent with evidence at the province level (Li and Zhou, 2005). Interestingly, column (2) shows that land revenue is similarly positive as is GDP growth (at the 1% level in both the linear estimation (column (2)) and ordered logit estimation (column (6)). The finding that land revenue has an independently significant effect on promotion suggests that, in furthering their careers China's county leaders have succeeded in boosting GDP growth as well as their coffers. To rule out the possibility that promotion may be affected by the county officials' unobserved traits—most notably personal ability—we control for personal fixed effects in column (3). Doing so renders GDP growth insignificant, suggesting that it is indeed a good proxy for ability. But the same cannot be said for land revenue, which remains significant (and with similar magnitude), suggesting, conversely,

Table 2
Land revenue windfall and political turnover, baseline model.

	Linear probability model				Ordered logit			Linear model	
	Political Turnover (Termination = 0; Retirement = 1; Same Level = 2; Promotion = 3)							Promotion (= 1; all others = 0)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
GDP Growth Rate	0.082***	0.078***	0.048	0.084**	0.087***	0.805***	0.899***	0.050**	0.053**
	(0.028)	(0.028)	(0.030)	(0.042)	(0.029)	(0.275)	(0.278)	(0.023)	(0.023)
Land Revenue (Log)		0.010***	0.011***		0.009***	0.085***	0.084***	0.003**	0.003**
		(0.002)	(0.002)		(0.002)	(0.018)	(0.018)	(0.001)	(0.001)
GDP GR*Land Revenue					−0.055***		−0.454***		−0.019**
					(0.014)		(0.114)		(0.008)
Land Price (Log)				0.015***					
				(0.003)					
Area of Land Sale (Log)				−0.007					
				(0.004)					
Prefectural Inflation Rate	−0.000	−0.000	−0.000	−0.000**	−0.000	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age	0.164***	0.162***	0.438***	0.188***	0.159***	1.671***	1.655***	0.054***	0.053***
	(0.032)	(0.032)	(0.055)	(0.040)	(0.032)	(0.360)	(0.363)	(0.018)	(0.018)
Age^2	−0.002***	−0.002***	−0.005***	−0.002***	−0.002***	−0.019***	−0.019***	−0.001***	−0.001***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.004)	(0.004)	(0.000)	(0.000)
Years of schooling	0.011***	0.011***		0.014***	0.011***	0.103***	0.102***	0.006**	0.006**
	(0.003)	(0.003)		(0.005)	(0.003)	(0.032)	(0.032)	(0.003)	(0.003)
CYL party secretary	0.074***	0.074***		0.077***	0.074***	0.667***	0.669***	0.059***	0.059***
	(0.017)	(0.017)		(0.026)	(0.016)	(0.162)	(0.163)	(0.013)	(0.013)
Workplace connection	0.085***	0.083***		0.069***	0.082***	0.822***	0.805***	0.069***	0.068***
	(0.013)	(0.013)		(0.020)	(0.013)	(0.123)	(0.123)	(0.009)	(0.009)
Birthplace connection	0.099***	0.097***		0.107***	0.096***	0.935***	0.925***	0.086***	0.086***
	(0.018)	(0.018)		(0.028)	(0.018)	(0.164)	(0.164)	(0.015)	(0.015)
Control variables [a]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County- and Year-FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Personal fixed effects	No	No	Yes	No	No	No	No	No	No
Number of Obs.	9717	9717	8951	5179	9717	9764	9764	9717	9717
Adj. R-squared	0.048	0.051	0.064	0.050	0.055			0.085	0.085

[a] Controls include per capita GDP (log), population (log), and total tax revenue (log), a set of year-in-office dummies and tenure duration. Standard errors are clustered at the prefecture level and reported in parentheses.
* $p < 0.10$,
** $p < 0.05$,
*** $p < 0.01$. Constant terms are not reported.

that the effect of land revenue is unlikely correlated with ability (more on this below). In addition, given that land revenue is a function of both quantity and price with the former being more endogenous than the latter, we decompose land revenue into these two dimensions to determine which one matters more for promotion. The pertinent data are collected from the Land Transaction Monitoring System.

Column (4), which reports the results, shows that the effect of land revenue derives exclusively from price instead of quantity. This finding makes perfect sense, in light of the quantity restrictions (specifically quotas) the central government has placed upon the local authorities (since 2003) to prevent them from overzealously converting the arable land into commercial, nonfarm purposes.

In terms of magnitude, the marginal effects of GDP growth and land revenue are 0.058 and 0.006 in the case of promotion when evaluated at their respective means (calculations are based on the results in column (6) of Table 2). Putting these numbers in context, it implies that a one standard deviation increase in GDP growth (0.154) will increase the probability of promotion by 0.009 or 0.9% (0.058*0.154).[23] Given the average promotion rate of 6.94%, the seemingly modest magnitude of 0.9% is actually translated into 12.97% (0.9/6.94) of the actual average probability of promotion—not at all trivial. The corresponding magnitude for land revenue is somewhat larger: the 1.96% change in the probability of promotion resulting from a one standard deviation increase in land revenue (0.006*3.268) amounts to 28.24% (1.96/6.94) of the actual average probability of promotion.

Based on the evidence that both GDP growth rates and land revenue have an independently positive and significant effect on promotion, we examine how land revenue may affect GDP growth and in turn promotion by interacting GDP growth with land revenue. The result, reported in columns (5) and (7), shows that the pertinent interaction term is significantly negative across both linear and ordered logit regressions, suggesting that land revenue has unwittingly replaced (to some extent) GDP growth in the selection of county officials for promotion. Specifically, the larger the land revenue the smaller the effect of GDP growth on promotion, *ceteris paribus*. In other words, land revenue has a distortionary effect on the political selection of county officials based on the economic growth "tournament".

To ensure that our results are indeed driven by the differences between promotion and other turnover outcomes and not by, for example, the difference between staying in office and termination, we recode the various ordinal outcomes simply into a binary variable of promotion versus all other outcomes (with promotion being assigned the value of 1), and obtain similar results; that is, both GDP growth and land revenue have a significantly positive effect on promotion at the 5% level (column (8)), whereas their interaction term has a significantly negative effect (column (9)).

Insofar as the individual attributes are concerned both age and its squared term are significant. Our evidence suggests that one must be promoted before turning 44 (−(0.438/(−0.005*2)),

[23] The corresponding magnitude is 1.1% for the provincial officials during 1978-1995 according to Li and Zhou (2005).

column (3)), or never hope to be promoted because the chance declines precipitously thereafter. Like age, years of schooling is also positively correlated with turnover—a finding consistent with the evidence at both prefectural and provincial levels that political selection in post-reform China is indeed based on meritocracy (e.g., Landry, 2008; Li and Zhou, 2005). Last but not least, the three proxies for factional ties and connections, namely Communist Youth League, Prefectural Government Experience and Birthplace Connections, are also highly significant (at the 1% level). These results send mixed messages: at the sub-provincial level both performance and connections are partial determinants of promotion (more on this in Section 5).[24]

5.2. Evidence using instrumental variables

It is obvious that land revenue is endogenous to political turnover. For example, the ambitions of county party secretaries have been omitted, which is likely to affect both land revenue and promotion simultaneously. And, to the extent that promotion is decided and revealed, say, one year in advance, it may also affect the incentive to maximize land revenue during that final year of tenure, thereby raising concerns of reverse causality. This would be especially the case, for instance, if selling land beyond the sanctioned quota reduces one's chance of promotion. The same problem may also occur if a county party secretary who perceives a slim chance of promotion ends up selling more land. In both instances, reverse causality would bias the OLS estimates toward zero.

To deal with these concerns, we employ an instrumental variable approach to re-estimate our baseline regressions. Given that land revenue is the product of price and quantity, we instrument land revenue with both the supply of, and demand for, land. In the case of land supply, we construct an index that allows us to measure the percentage of land in each Chinese county *unsuitable* for urban development, based upon an architectural safety standard that considers land with a slope of 15 degrees or below to be safe for real estate construction.[25]

We first obtained the elevation data from the United States Geographic Service (USGS) Digital Elevation Model (DEM) at the 90-meter resolution, which typically are spaced at the 90 square-meter cell grids across the entire surface of the earth on a geographically projected map. Based on information on elevation for each grid in relation to its adjacent grids, we generate a slope for each grid on a projected map of China. We then match this slope map with the county maps of China to delineate their administrative boundaries. Using 15 degrees as the cutoff point, we assign the value of 1 to those grids with slope above 15 degrees, and 0 otherwise (Fig. A3 in the Appendix provides a visual example of a grid map and two sample counties with extremely high and extremely low unsuitability). Grids corresponding to the water bodies are also coded 1. Dividing the number of unsuitable grids by the total number of grids yields the percentage of land unsuitable for real estate development. For the whole of China, the county average of unsuitable land for development is 24.91%, with a standard deviation 22.20% (see Panel B of Table 1).

We then interact the geographic constraint on a county's land supply with the temporal variations in the national interest rate to construct our instrument. This identification strategy follows essentially that of Mian and Sufi (2011) and Chaney et al. (2012), who instrument regional real estate prices by interacting the elasticity of land supply with nationwide movements in the real interest rate. The underlying idea is that a reduction in the interest rate, for instance, will have a larger impact on land prices in counties where the supply of land is more constrained by topography than in counties facing a lesser constraint, with the corollary effect of raising the land revenue. To confirm this intuition, we regress the total amount of land sold by the county governments in the sample period on the unsuitability index and find a significantly negative relationship (see column (1) of Table A3 in the Appendix). To further confirm that the unsuitability of land for development is uncorrelated with economic development or the development of specific sectors, we regress the average growth rate of GDP, the additional value attributed to the industrial sector and that attributed to the service sector (the value-added), on the same index but fail to find any significant relationship. Together, these results provide solid evidence that the variation in typography does have an expected impact on price through the quantity of land supplied.[26] We obtain the data on national interest rate for the period 1999–2008 from the website of the People's Bank of China (http://www.pbc.gov.cn/). As we can see from Fig. A4 in the Appendix, the trend in the national interest rate over the entire sample period had changed.[27]

To ensure that this identification strategy is valid, we employ a second instrument using an alternative measure to proxy for demand shock. This alternative proxy is the house prices in China's provincial capital cities, available from the *Statistical Yearbook of Regional Economies* (*Quyu Jingji Tongji Nianjian*), 2000–2009. Compared to interest rates this particular proxy has the additional advantage of providing also variations across space as well as over time. The underlying assumption behind this particular strategy is that, being in the rural sector house prices in the Chinese counties are more likely influenced by those in the surrounding metropolises rather than the other way round. Our second instrument is thus an interaction of land supply constraint and house prices in the provincial capital cities. The first-stage of the 2SLS setup assumes the following specification (Eq. (2)):

$$LandRev_{it}=\gamma_1 Unsuitable_i * InterestRate_t+\gamma_2 Unsuitable_i * HousePrice_{pt}+\gamma_3 GDPGrowth_{it}+\xi_1 X_{it}+\xi_2 W_{jt}+\phi_i+T_t+\delta_j+\upsilon_{ijt} \quad (2)$$

where $Unsuitable_i$ denotes the percentage of a county's land unsuitable for housing construction, $InterestRate_t$ the variations in the interest rate, and $HousePrice_{pt}$ the house prices in China's provincial capital cities.

In the second stage, we regress political turnover on the predicted values of land revenue based on the following specification (Eq. (3)):

$$Turnover_{it}=\theta_1 \widehat{LandRev}_{it}+\theta_2 GDPGrowth_{it}+\theta_1 \widehat{LandRev_{it} * GDPGrowth}_{it}+\varphi_1 X_{it}+\varphi_2 W_{jt}+\phi_i+T_t+\delta_j+\sigma_{ijt} \quad (3)$$

Table 3 reports the instrumented results. In the first model (column (2)), we use the interaction of land supply constraint and national interests rate (IV_1) as instrument, and control for the alternative instrument of house prices in the provincial capital cities

[24] This echoes Jia et al. (2014), who find that promotion at the provincial level is simultaneously determined by both performance and connections.

[25] This approach is inspired by Saiz (2010), who exploits the variation in water bodies and steep-sloped terrain as the key determinants of housing supply in the major metropolises in the United States.

[26] As each administrative jurisdiction (the county included) is only sanctioned to sell a certain amount of land annually, it may well be this land quota rather than suitability that arguably determines a county's supply constraint. Unfortunately, data on land quota is available only for the more recent period of 2009–2011 and at the higher (prefecture) level, which prevents us from testing this alternative conjecture for the period 1999–2008. But we take the available data anyway and regress the unsuitability index on the land quota. The pertinent coefficient is highly and positively significant, giving us the confidence to use unsuitability as an integral part of our instrument.

[27] We use the six-month national interest rate for constructing our instrument. To check robustness we also tried using respectively the one-year and three-year interest rates and obtained similar results (hence not separately reported).

Table 3
Land revenue windfall and political turnover, instrumented evidence.

	Land revenue		Political turnover			Promotion	
	1st Stage (1)	2nd Stage (2)	2nd Stage (3)	2nd Stage (4)	2nd Stage (5)	2nd Stage (6)	2nd Stage (7)
Unsuitability*Interest rate (IV_1)	6.829***		−0.335				
	(0.538)		(0.281)				
Unsuitability*Capital city house prices (IV_2)	0.154***	0.008					
	(0.034)	(0.007)					
Land revenue (log)		0.025***	0.074*	0.025***	0.015**	0.016***	0.009*
		(0.006)	(0.041)	(0.006)	(0.006)	(0.005)	(0.005)
GDP growth rate	0.365**	0.074**	0.057*	0.074**	0.107***	0.045*	0.066**
	(0.174)	(0.029)	(0.034)	(0.029)	(0.036)	(0.023)	(0.028)
GDP GR*Land rev.					−0.170***		−0.106**
					(0.060)		(0.050)
Control variables[a]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County- and Year-FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	9934	9536	9536	9536	9536	9536	9536
Adj. R-squared	0.539	0.044	−0.098	0.043	0.039	0.078	0.071
P-value of over-identification Test				0.2952	0.2413	0.931	0.2913
Cragg-Donald Wald F-statistic		1492.047	13.706	751.092	66.973	751.092	66.973

[a] Control variables in the models include log of per capita GDP, log of tax revenue, log of population, prefectural level inflation rate, age, age squared, years of education, CYL party secretary, workplace connection, birth connection, a set of year-in-office dummies and tenure duration. Standard errors are clustered at the prefecture level and reported in parentheses;
* $p < 0.10$,
** $p < 0.05$,
*** $p < 0.01$. Constant terms are not reported.

Table 4
Land revenue and GDP growth, instrumented evidence.

	GDP growth rate		
	(1)	(2)	(3)
Land revenue (log)	0.002		
	(0.001)		
Land revenue (log, lagged 1 year)		0.001	
		(0.002)	
Land revenue (log, lagged 2 years)			0.000
			(0.002)
Control variables[a]	Yes	Yes	Yes
County- and year-fixed effects	Yes	Yes	Yes
Number of observations	9536	9536	8713
Adj. R-squared	0.135	0.135	0.122

[a] Control variables in the models include, log of per capita GDP, log of tax revenue, log of population, prefectural level inflation rate, age, age squared, years of education, CYL party secretary, workplace connection, birth connection, a set of year-in-office dummies and tenure duration. Standard errors are clustered at the prefecture level and reported in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Constant terms are not reported.

(IV_2). In the second model (column (3)), we use IV_2 as our instrument and control for IV_1. In the third model (column (4)), we use both IVs and report the *p*-value for the over-identification test. In Table 3 we also report the Cragg-Donald F-Statistic on weak instruments, and cluster the standard errors at the prefectural level (in all specifications). Column (1), which reports the first-stage results, show that both IV_1 and IV_2 are significantly correlated with land revenue. Reporting the second-stage results, columns (2), (3) and (4) show that the predicted value of land revenue is significant in all these regressions. The point estimate of 2SLS is larger than that of the OLS, suggesting that the OLS estimate is likely biased downward due to reverse causality. In all three models, the GDP growth rate is also significant at the 5–10% level, validating once again the "yardstick competition" claim. Additionally, columns (2) and (3) show that neither instrument has a significant effect on political turnover; this satisfies the exclusion restrictions condition that both instruments are affecting political turnover only through the land revenue channel. In column (5), we include the interaction term between land revenue and GDP growth and instrument it with two additional IVs (IV_1*growth* and IV_2*growth*). As with the OLS result, the interaction term is significant and negative, which confirms our hypothesis that land revenue does in fact significantly weaken the impact of GDP growth on political selection. Finally, we replicate the 2SLS regressions using a binary coding scheme and find consistent results (columns (6) and (7)).

But could land revenue be merely capturing the delayed effect of GDP growth on promotion (instead of partially replacing it)? To check this, we regress GDP growth on land revenue and its lagged term (for both one and two years), but find no significant relationship between the two (Table 4).

5.3. Problem of endogenous appointment

While the instrumental variable approach helps to alleviate any endogeneity problems potentially caused by omitted variable bias and/or reverse causality, it is unable to resolve the problem stemming from the endogenous appointment of well-connected officials. To ensure that no officials could duly influence the decision of which county they are appointed to, we perform the following falsification tests. First, to the extent that well-connected officials could duly influence appointment with respect to locational choice, we would expect factional ties and/or workplace connection to be positively and significantly correlated with the unsuitability for land development. Second, we would also expect such correlations to increase over time—especially since 2002, after the various land auctioning practices came into being.[28] We thus regress a county's unsuitability index for land development and average land price of the year prior to a party secretary was assigned to that county to assume office, on the individual characteristics of the county party secretaries (comprising age and its squared term and years of schooling), including, most importantly,

[28] Considered by the Ministry of Land and Resources as more transparent and fairer than private negotiations, prefecture and county governments must conduct public auctions and open tenders if they wish to convey land use rights after August 2002 (practices known in Chinese as *zhao, pai, gua*).

Table 5
Effect of county party secretaries' characteristics (including factional ties, workplace and birthplace connections) on land unsuitability and land prices.

	Land unsuitability index					Log of average land price				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Age[a]	−0.007	0.004	−0.007	−0.007	−0.007	−0.118	−0.561	−0.119	−0.115	−0.119
	(0.009)	(0.014)	(0.009)	(0.009)	(0.009)	(0.158)	(0.661)	(0.158)	(0.158)	(0.156)
Age^2	0.000	−0.000	0.000	0.000	0.000	0.001	0.006	0.001	0.001	0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.007)	(0.002)	(0.002)	(0.002)
Education	−0.001	−0.000	−0.001	−0.001	−0.001	0.000	−0.023	0.000	0.000	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.028)	(0.084)	(0.028)	(0.028)	(0.028)
CYL party secretary	0.004	0.004	1.970	0.004	0.004	0.072	−0.009	−18.587	0.072	0.074
	(0.005)	(0.007)	(2.918)	(0.005)	(0.005)	(0.133)	(0.353)	(80.997)	(0.133)	(0.133)
CYL party secretary*Year			−0.001					0.009		
			(0.001)					(0.040)		
Prefectural government experience	−0.004	−0.005	−0.004	1.319	−0.004	0.092	0.133	0.092	−53.001	0.091
	(0.004)	(0.006)	(0.004)	(2.519)	(0.005)	(0.093)	(0.271)	(0.093)	(57.795)	(0.093)
Prefectural government experience*Year				−0.001					0.027	
				(0.001)					(0.029)	
Birthplace connection	−0.000	0.003	−0.000	−0.000	−1.673	0.134	0.283	0.134	0.135	−59.772
	(0.005)	(0.009)	(0.005)	(0.005)	(2.878)	(0.152)	(0.353)	(0.152)	(0.151)	(83.191)
Birthplace connection*Year					0.001					0.030
					(0.001)					(0.042)
Pref.- and year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	3849	2213	3849	3849	3849	3849	2213	3849	3849	3849
Adj. R-squared	0.751	0.737	0.751	0.751	0.751	0.452	0.366	0.452	0.452	0.452

[a] Refers to age when the county party secretaries took office. Standard errors are clustered at the prefecture level and reported in parentheses; ** $p < 0.05$, *** $p < 0.01$. Constant terms are not reported.
* $p < 0.10$.

our various measures of factional ties and connections. Reported in Table 5, the results clearly show that all variables are insignificantly correlated with both index and price (columns (1) and (6)).

But that is not sufficient to relieve us of the concern that appointment may be endogenous. For example, it might be the case that appointment was more or less random initially, but as land revenue became increasingly lucrative for the local coffers, the better connected were assigned to counties capable of generating proportionately more land revenues. In other words, appointment may become increasingly endogenous over time in response to the growing importance of land revenues. To show that this is indeed not the case, we repeat the same regression exercise but this time we regress both index and price on those county party secretaries who were appointed *after* 2002—when land revenues really began growing in earnest. Reported in columns (2) and (7) of Table 5, the results are strikingly similar to those of the full sample (columns (1) and (6)). To further confirm this, we interact each of the three connections-cum-ties variables with year of appointment. If appointment is indeed endogenous, the pertinent coefficients should be significant and positive. As showed in columns (3)-(5) and (8)-(10) of Table 5, their effects are all insignificantly correlated with either component of our instrument, effectively rejecting the possibility that those who have connections would be favorably assigned to counties more suitable for land development or with higher land prices.

An important reason why endogenous appointment is less likely to occur at the county level may be attributed to the existence of a "rotation" system at the provincial level to groom political leaders before appointing them to still higher positions in the central government or party (Zhang and Gao, 2008), and the lack of one below the province. Indeed, the vast majority of the county leaders, 76.6%, were promoted to positions within the same prefecture.

6. Why land revenue may help promotion?

In this section we explore the two possible channels through which land revenue could increase promotion prospects, first by investigating whether county officials do fund their signaling activities with the land revenue, then by looking for evidence to bear upon corruption. In so doing, we also attempt to verify whether land revenue may have led specifically to the promotion of county officials of a seemingly lower caliber.

6.1. Signaling

To test the channel of signaling we regress the six major categories of county government expenditure—all normalized by the county population, and size of bureaucracy,[29] on the size of land revenue, with full controls of the variables employed in the previous regressions, including county- and year-fixed effects.[30] The summary statistics of these expenditures are reported in Panel C in Table 1 and the regression results in Table 6 (Panel A for regression results and Panel B for IV results).[31] The results lend strong support to the signaling story. Of the six expenditure categories, City

[29] Measured by the number of government employees per 100,000 people, size of bureaucracy is not an expenditure category.

[30] To be sure these six categories do not make up the entirety of the county government's expenditure. We exclude the four expenditure categories apportioned to the provinces by the central government (foreign affairs, national defense, public security, and procuratorate), who then spread the expenditures among the lower levels of administration (prefectures and counties). We exclude these expenditure categories not only because the expenditures they entail are unrelated to the local economy, but also because data on these expenditures are available for only one year, viz. 2007. In that particular year, these four categories accounted for just 10% of the total (foreign affairs [0.39%], national defense [0.17%], public security [5.39%], and procuratorate [4.68%]). The same applies to the category "price subsidies", where the figure is available for only 1999.

[31] We adopt only the instrument based upon the interaction between the unsuitability index and national interest rate here because provincial capital's house prices may affect land development expenditures or other categories of expenditure through channels other than land revenue. For example, to the extent that house prices in nearby metropolitan areas are correlated with the local living standard, compensations paid to the evicted farmers for land expropriation—a major part of land development expenditure—are typically also correlated with the local living standard (Cai, 2012). In this sense, house prices in the provincial capital cities may affect local land development expenditure through the channel of local living standard.

Table 6
Effect of land revenue on government expenditures, 1999–2007.

	City construction expenditure	Land development expenditure	Education expenditure	Social security expenditure	Production expenditure	Administration expenditure	Bureaucracy size
Panel A	Fixed effects regression estimation						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP growth rate	−0.03	−0.167	0.052***	0.008	0.261	0.05	0.007**
	(0.140)	(0.130)	(0.015)	(0.098)	(0.202)	(0.080)	(0.003)
Land revenue (Log)	0.556***	0.534***	0.002	0.020**	−0.068***	0.029***	0.004***
	(0.021)	(0.018)	(0.001)	(0.009)	(0.016)	(0.006)	0.000
Number of observations	9155	9155	7761	9155	9155	10,121	9120
Adj. R-squared	0.807	0.758	0.981	0.786	0.744	0.9	0.566
Panel B	IV Regression Estimation						
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
GDP growth rate	−0.032	−0.170	0.052***	0.019	0.286	0.053	0.007**
	(0.141)	(0.131)	(0.015)	(0.098)	(0.200)	(0.080)	(0.003)
Land revenue (Log)	0.562***	0.545***	0.002	−0.024	−0.164***	0.022***	0.004***
	(0.030)	(0.028)	(0.003)	(0.019)	(0.032)	(0.007)	(0.001)
Number of observations	9155	9155	7761	9155	9155	10,121	9120
Adj. R-squared	0.807	0.758	0.981	0.783	0.741	0.9	0.565
Control variables[a]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County- and Year-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel C	IV Regression Estimation						
	(15)	(16)	(17)	(18)	(19)	(20)	(21)
GDP growth Rate	−0.039	−0.177	0.052***	0.018	0.285	0.047	0.007**
	(0.137)	(0.128)	(0.015)	(0.098)	(0.203)	(0.083)	(0.003)
Land revenue (Log)	0.285***	0.244***	−0.001	−0.034	−0.099	0.142***	0.010***
	(0.090)	(0.086)	(0.010)	(0.051)	(0.086)	(0.050)	(0.003)
Land revenue*Year in office	0.179***	0.199***	0.003	0.003	−0.051	−0.085***	−0.004**
	(0.058)	(0.054)	(0.006)	(0.033)	(0.063)	(0.031)	(0.002)
Land revenue*Year in office^2	−0.021**	−0.024***	0.000	0.000	0.007	0.012***	0.001**
	(0.009)	(0.008)	(0.001)	(0.005)	(0.010)	(0.004)	0.000
Number of observations	9155	9155	7761	9155	9155	10,121	9120
Adj. R-squared	0.807	0.757	0.981	0.783	0.74	0.898	0.552
Control variables[a]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County- and year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** $p < 0.01$. Constant terms are not reported.
** $p < 0.05$,
* $p < 0.10$,
[a] Control variables in the models include log of per capita GDP, log of tax revenue, log of population, prefectural level inflation rate, age, age squared, years of education, CYL party secretary, workplace connection, birth connection, a set of year-in-office dummies and tenure duration. Standard errors are clustered at the prefecture level and reported in parentheses;

Construction—consisting of extra-budgetary expenditures on ostentatiously large-scale projects such as grand plazas or parks—is most telling of the signaling story.[32] Another category that is suggestive of a signaling story pertains to that of Land Acquisition and Development. Representing compensation paid to farmers for having requisitioned their arable land, Land Acquisition and Development expenditures are essentially financed exclusively with the extra-budgetary revenue. As construction for urban development requires first of all the clearing of land, the significance of this expenditure suggests that the land revenue-maximizing officials are aggressive in converting farmland. In short, land revenue has a highly significant effect on both "signaling" variables (columns (1), (2), (8) and (9)).

To further verify the signaling story, we investigate if a *cyclical* pattern specific to these two categories of expenditures exists; that is, whether county officials invest at certain strategic points of their career (Cai, 2004; Guo, 2007, 2009; Pan, 2013). The timing of expenditure is crucial for promotion, because too early an investment may become neglected when the time for promotion comes; plus an exceedingly high benchmark would render subsequent effort unsustainable. Similarly, investing after one's first term would be too late, given the pattern that the majority of promotion occurs at the end of the first term (Guo, 2009). In short, one must choose the time to invest optimally to avoid having their signaling efforts go to waste. To confirm this, we add the interaction term between land revenue and year in office and its quadratic term to determine if there is any nonlinear effect on the two categories of expenditures having a strong content of signaling (Panel C, Table 6). In view of the findings that the curvilinear effects are found

[32] According to some observers, local leaders are highly unlikely to finance "image projects" with budgetary fiscal revenue, hence extra-budgetary revenue becomes virtually the only viable source of financing (Wu, 2010; Zhan, 2012). Moreover, although this expenditure item includes also budgetary spending on urban public infrastructure projects (such as the construction of highways and industrial parks) and we are unable to disentangle it from the total, the fact that it is still statistically significant suggests that "image projects" likely accounted for a nontrivial proportion of this expenditure category.

Table 7
Effects of land revenue on political turnover and expenditures during crackdown on corruption, 1999–2008.

Panel A	2SLS Estimation							
	Political turnover				Promotion			
	Province (1)	Prefecture (2)	Province (3)	Prefecture (4)	Province (5)	Prefecture (6)	Province (7)	Prefecture (8)
Land revenue (log)	0.034***	0.037***	0.023***	0.029***	0.025***	0.027***	0.015***	0.019***
	(0.009)	(0.009)	(0.006)	(0.006)	(0.008)	(0.008)	(0.005)	(0.006)
Corruption crackdown (CC)	0.083*	0.118**			0.102**	0.110**		
	(0.048)	(0.051)			(0.044)	(0.047)		
Land revenue*CC	−0.020*	−0.026**			−0.022**	−0.024**		
	(0.011)	(0.012)			(0.010)	(0.011)		
Number of corruption crackdown (#CC)			0.014**	0.004			0.009*	0.009
			(0.006)	(0.008)			(0.005)	(0.006)
Land revenue*#CC			−0.011**	−0.018***			−0.006	−0.013***
			(0.004)	(0.006)			(0.004)	(0.005)
$\beta^{LandRevenue}+\beta^{LandRevenue*CorruptionCrackdown}$	0.013**	0.011	0.012*	0.011**	0.003	0.003	0.009	0.006
	(0.007)	(0.007)	(0.007)	(0.005)	(0.006)	(0.006)	(0.006)	(0.004)
Control Variables[a]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County- and Year-Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	9536	9536	9536	9536	9536	9536	9536	9536
Adj. R-squared	0.034	0.032	0.031	0.026	0.068	0.067	0.075	0.067
P-value of Over-identification Test	0.736	0.278	0.499	0.537	0.214	125.963	158.447	183.247
Cragg-Donald Wald F-Statistic	155.001	163.869	109.896	193.600	142.800	0.508	0.918	0.283

Panel B	City construction expenditure				Bureaucracy size			
	Province (9)	Prefecture (10)	Province (11)	Prefecture (12)	Province (13)	Prefecture (14)	Province (15)	Prefecture (16)
Land revenue (log)	0.550***	0.541***	0.562***	0.560***	0.005***	0.005***	0.004***	0.004***
	(0.038)	(0.044)	(0.029)	(0.031)	(0.001)	(0.001)	(0.001)	(0.001)
Corruption crackdown (CC)	−0.173	−0.187			0.017***	0.013**		
	(0.266)	(0.271)			(0.006)	(0.006)		
Land revenue*CC	0.043	0.055			−0.004***	−0.003*		
	(0.058)	(0.058)			(0.001)	(0.001)		
Number of corruption crackdown (#CC)			−0.003	0.002			0.001	0.001**
			(0.038)	(0.034)			(0.001)	(0.001)
Land revenue*#CC			0.003	0.017			−0.000	−0.001***
			(0.028)	(0.024)			(0.001)	(0.000)
Control variables[a]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County- and year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	9155	9155	9155	9155	9120	9120	9120	9120
Adj. R-squared	0.807	0.807	0.807	0.807	0.559	0.560	0.563	0.565
Cragg-Donald Wald F-Statistic	337.266	389.360	108.467	521.059	332.826	385.763	107.730	514.141

[a] Control variables in the models include log of per capita GDP, log of tax revenue, log of population, prefectural level inflation rate, age, age squared, years of education, CYL party secretary, workplace connection, birth connection, a set of year-in-office dummies and tenure duration. Standard errors are clustered at the prefecture level and reported in parentheses.
* $p < 0.10$,
** $p < 0.05$,
*** $p < 0.01$. Constant terms are not reported.

only for Land Development and City Construction but not the other expenditures, the results are indeed strongly consistent with a signaling story. Based on the pertinent coefficients, the maximum for both types of expenditures is 4 $(-0.179/(2*(-0.021))=4.261$ and $-0.199/(2*(-0.024))=4.146)$, which is strikingly consistent with the finding that the best time for one to signal one's ability is near the completion of one's first term (of five years) as a county party secretary (Guo, 2009). This result lends strong credence to the thesis that investments in city construction are more likely driven by officials' desire for promotion than by their need for public support.

In addition, perhaps due to their limited tenure, county officials in China also do not care about the long term and accordingly do not have the fiscal incentives to invest and tax at the long-run revenue-maximizing rate—i.e. they are not "stationary bandits" in the sense of Mancur Olson (1993). Consequently, the increase in land revenue has not been translated into greater social welfare spending—be it Education or Social Security; the pertinent coefficients are both insignificant for the IV estimations (columns (10)–(11), Table 6). Production Expenditure, which consists primarily of subsidies made to the private industrial sector for research and development, is even worse; the negative (and significant) coefficient suggests that spending in this regard has in fact decreased, at a 1% level of significance for both the OLS and IV estimations (columns (5) and (12), Table 6). On the whole, evidence suggests that land revenue has not been deployed in a manner conducive to either economic growth or social welfare enhancement.

6.2. Corruption

In light of land revenue's significant and positive correlation with both Administrative Expenditure and Size of Bureaucracy,[33]

[33] Administrative Expenditure is made up of public sector payroll and a variety of in-kind benefits and subsidies provided to government staff, including bonuses

Table 8
Heterogeneous effects of land revenue on political turnover, 1999–2008.

	IV Estimation on political turnover		
	(1)	(2)	(3)
Land revenue (log)	−0.000	0.017**	0.025***
	(0.007)	(0.006)	(0.006)
CYL party secretary	0.051	0.076***	0.074***
	(0.053)	(0.017)	(0.017)
CYL party secretary*Land Revenue	0.005		
	(0.011)		
Workplace connection	−0.021	0.082***	0.081***
	(0.052)	(0.013)	(0.013)
Workplace connection *Land revenue	0.023*		
	(0.012)		
Birthplace connection	−0.192**	0.091***	0.094***
	(0.084)	(0.019)	(0.019)
Birthplace connection*Land revenue	0.069***		
	(0.020)		
Above age (≥ 44)		−0.307**	
		(0.127)	
Above age*Land revenue		0.051**	
		(0.025)	
Years of schooling	0.010***	0.010***	0.011***
	(0.004)	(0.003)	(0.004)
Years of schooling*Land revenue			−0.002
			(0.003)
Control variables[a]	Yes	Yes	Yes
County- and year-fixed effects	Yes	Yes	Yes
Number of observations	9536	9536	9536
Adj. R-squared	0.008	0.037	0.043
P-value of over-identification Test	0.619	0.414	0.208
Cragg-Donald Wald F-Statistic	57.295	128.629	141.470

[a] Control variables in the models include log of per capita GDP, log of tax revenue, log of population, prefectural level inflation rate, age, age squared, a set of year-in-office dummies and tenure duration. Standard errors are clustered at the prefecture level and reported in parentheses;
* $p < 0.10$,
** $p < 0.05$,
*** $p < 0.01$. Constant terms are not reported.

chances are high that land revenue may directly give rise to rent-seeking behavior if not downright corruption (columns (6)–(7) and (13)–(14), Table 6).[34] To the extent that a larger bureaucracy is also considered an "achievement", it may be regarded as having an adverse selection effect on political selection.

A more direct source of corruption in this context pertains to the use of land revenue by county officials in bribing their superiors in exchange for promotion. Given the insurmountable difficulties associated with identifying outright corrupt behavior of this kind, however, we perform a robustness check by adopting the so-called "forensic economics" approach in identifying the *discontinuous* changes in incentives underlying the hidden behavior of corruption (Zitzewitz, 2012). For example, Di Tella and Schargrodsky (2003) find that in Buenos Aires, prices paid by hospitals to private suppliers fell by 15% during a crackdown on corruption. To the extent that the crackdown is random, they conclude that the pertinent magnitude (of 15%) is a good measure of corruption in government procurements. Following this approach, we hypothesize that the effect of land revenue on the political turnover of the county party secretaries would be significantly reduced in the event (year) of a crackdown on the corruption of their superiors, i.e., the prefectural and provincial officials of the same province.

An important reason why a crackdown on the county officials' superiors may deter them from committing bribery is that it reminds them that they can and do get caught. Available anecdotal evidence does suggest that the crackdown of corruption at higher levels can easily affect county officials as well. For the 101 county party secretaries in our sample who were dismissed for corruption or misconduct, 72 (71%) were apprehended in a crackdown. Similarly, 7 county officials were convicted of bribing a prefectural party secretary for promotion on close heels of the latter's apprehension for corruption.[35]

To see if corruption crackdown indeed deters bribery in our sample, we collect data on the crackdown of corruption involving high ranking officials—specifically those at the prefectural level and above. The pertinent data are collected from *Procuratorial Daily* (*Jiancha Ribao*), the mouthpiece of the Department of Procuratorate.[36] Based on reports in the *Procuratorial Daily*, we construct two sets of variables for measuring the crackdown on corruption as it occurs in a province in a given year. The first is a dummy variable, which would be assigned the value of 1 if a provincial official (provincial governor or its equivalent) has been apprehended for corruption, and zero otherwise. We do the same for the prefectural officials. The second variable enumerates all corruption cases involving the provincial officials, followed by the prefectural officials (prefectural mayor or its equivalent). A total of 86 provincial officials and as many as 438 prefectural officials had been apprehended for corruption during 1998–2008. We then use this information to test the hypothesized corruption channel by regressing political turnover or a dummy variable indicating promotion on the interaction between the instrumented land revenue and the crackdown dummy, controlling for both land revenue and the main effect of the crackdown. Moreover, to verify that the crackdown has only affected corruption but not signaling, we perform a "falsification test" by separately regressing the expenditure on City Construction (the proxy for signaling) and Size of Bureaucracy (the proxy for corruption) on the foregoing interaction term. If this "forensic" approach works, the interaction between land revenue and crackdown should not have a significant effect on City Construction Expenditure but it should have a significant effect on the Size of Bureaucracy.

The regression results are reported in Table 7. Columns (1), (2), (5), (6), (9), (10), (13) and (14) report the results using the dummy variable, whereas columns (3), (4), (7), (8), (11), (12), (15) and (16) show the results based on the actual magnitude. While land revenue continues to have a positive and significant effect on political turnover, the interaction term between land revenue and corruption crackdown is significantly negative (columns (1)–(4)). The results are the same where the binary promotion variable is the dependent variable (columns (5)–(8)). This supports the underlying assumption concerning the deterring effect of corruption crackdown on bribing one's way to promotion using land revenue. In particular, given the near identical size of the two variables, viz. land revenue and the interaction term between land revenue and corruption crackdown, it is safe to conclude that the effect of land revenue on promotion was significantly reduced in the year when, and in the province/prefecture where, a crackdown on corruption occurred.

To find out whether land revenue has any remaining effect on political turnover in the event of corruption crackdown, we examine whether the sum of the coefficients of land revenue and its interaction term with corruption crackdown is significant. We find that they are significantly positive at the 5–10% level in virtually all

(*footnote continued*)
and a variety of allowances and official entertainment expenses. Lü (2000a, 2000b) refers to this phenomenon in the Chinese context as "organizational corruption".

[34] Typically, corruption is positively associated with the size of bureaucracy (Krueger, 1974; Mauro, 1995, 1998; Tollison, 1982).

[35] http://news.ifeng.com/a/20150707/44119335_0.shtml?f=hao123.

[36] Published by the People's Procuratorate of China, the *Procuratorial Daily* contains a column that periodically reports major corruption cases discovered by the central government's inspection team (*Zhongyang Xunshizu*).

specifications. This provides convincing evidence that unlike corruption, signaling activities significantly account for the remaining effect of land revenue in the event of corruption crackdown. Moreover, while the interaction term of land revenue and corruption crackdown does not have a significant effect on City Construction expenditure (columns (9) through (12)), it does have a significant and negative effect on the Size of Bureaucracy (columns (13), (14) and (16)). Taken together, these results support the hypothesis that crackdown on corruption deters only the illegal, dishonest behavior of officials but their signaling efforts, which are not illegal, remain unchecked.[37]

6.3. Adverse selection: who benefits the most from land revenue?

To ascertain whether land revenue has any adverse selection effect on the promotion of county officials, we regress political turnover outcome on a number of individual characteristics, including, most importantly, factional ties and connections, as we are especially concerned with the potential effect of political connections on promotion.

The pertinent results are reported in Table 8. To gauge the additional effect of land revenue on factional ties and connections, we include the interaction term between each of the three types of ties-cum-connections, viz. Communist Youth League (CYL), Birthplace Connection (BC), and Prefectural Government Experience (PGE) in column (1), in addition to controlling for their main effects. We find that land revenue has an additional significant effect on both BC and PGE, but not CYL, suggesting that land revenue benefits those who are connected to their superiors through either the workplace or the birthplace.

We repeat the same exercise in columns (2) and (3), this time on age and years of schooling. To meaningfully gauge the effect of land revenue on age, we construct a dummy variable that divides the county party secretaries into two groups—one below the age of 44 and the other above—based on the finding that promotion rarely occurs beyond the age of 44 (calculated based on the pertinent coefficients in column (3) of Table 2 ($-(0.438/(-0.005*2))=44$). Reported in column (2), the result clearly shows that, while those above the age of 44 are indeed less likely to be promoted, they could use land revenue—directly via signaling or indirectly through outright bribery—to reverse this comparative disadvantage; the interaction term between "above age" and land revenue is positive and significant at the 5% level.

Regardless of why the CCP rarely promotes a county official after they turned 44, if we take this threshold as (exogenously) given anyway, we may consider those who failed to obtain a promotion before they turned 44 as a sign of incompetence; after all, more than 85% of those who obtained a promotion in our sample did so within their first term of service as county party secretaries (1042/1216). In other words, we may consider land revenue as having an adverse selection effect on political selection, to the extent that it affords those who had previously failed in the "tournament" a second chance for promotion. Land revenue, however, has no additional significant effect on years of schooling (column (3)).

[37] As noted earlier, anecdotal evidence suggests that both county officials and their superiors are apprehended in the event of corruption crackdown. Consequently, it is difficult to argue that county officials, expecting only their superiors to be arrested during crackdown, would spend land revenue on city development for personal gains even during the years of crackdown. We thank the editor for this insight.

7. Conclusion

The idea that abundance of natural resources—inherently a blessing—eventually turns into a "curse" has now been extended to abundance of other kinds of resources. We have seen, for example, from the work of Brollo et al. (2014) how fiscal transfers in Brazil have distorted the politicians' incentives; the results are more corruption in the government and deterioration in the quality of the competing candidates—a political resource curse any way we look at it. Following this literature, we asked whether similar curses may occur in authoritarian regimes where public officials rather than politicians are appointed and promoted instead of being voted into office. Stated differently, could the lack of democracy be a saving grace for the authoritarian regimes? A policy that assigns the rights over land revenues to the sub-provincial governments allows us to test the political resource curse hypothesis in an entirely different political setting.

Based on the premise that public officials in China are appointed and evaluated for promotion by their immediate superiors, and that promotion has long relied on the so-called "yardstick competition" (with GDP growth being a proxy for ability), land revenue windfalls and GDP growth are found to exhibit similarly positive relationships with promotion. But more importantly, we found that land revenue has the additional significant effect of reducing the importance of GDP growth in promotion, thereby distorting China's political selection of its sub-provincial officials. The effects of this revenue windfall are decidedly negative, as it results in the same kinds of adverse selection and corruption problems that Brollo et al. (2014) have independently found in democracies. In our empirical study of the political resource curse in an authoritarian regime, the first of its kind, we have found evidence of land revenues being deployed for the purpose of unproductive signaling—specifically increased spending on flamboyant public projects, or directly bribing one's way up, with negative impacts on political selection as well as corruption.

Appendix A

See appendix Table A1 and A3.

A. Data sources.

B. Definitions of, and criteria employed in, coding political turnover.

There are altogether four political turnover outcomes: Promotion, Lateral Transfer, Retirement, and Termination. Table A2 below provides the Criteria Employed in Coding Political Turnover.

1. *Promotion*

   Typically, county party secretaries would be promoted to the position of vice party secretary or mayor at the prefecture level. In addition, following the Chinese Communist Party's own internal ranking system, appointment to head one of the several "strategically important" departments (prominent examples include the Department of Organization (*Zuzhi Bu*) and Public Security Bureau) is considered equivalent in rank to either vice party secretary or mayor at the prefecture level and thus promotion. For details see "Provisional Terms and Regulations Governing the Top Leadership (Party and Government Officials)" (*Guojia Gongwuyuan Zhanxing Tiaoli*), State Council, and "Regulations on the Selection and Appointment of Top Party Secretaries and Government Officials" (*Dangzheng Lingdao Ganbu Xuanba Renyong Gongzuo Tiaoli*), Department of Organization. See also Li (2001).

2. *Lateral transfer or staying in office*

   Lateral transfer refers to appointments to positions at

Table A1
Data sources.

Variables	Coverage	Source
Individual characteristics of county party secretaries	24 provinces (1999–2010), 17,521 person-year observations covering 1753 counties involving 3923 individuals	*Provincial Yearbook and Baidu Encyclopedia*
Age		
Year of education		
Local origin		
Communist youth league Party secretary		
Prefectural government experience		
Birthplace connection		
County-level fiscal revenues and expenditures		
Land revenue (log)	31 provinces and prefectures (1999–2008)	*Prefectural and County Financial Statistics (Dishixian Caizheng Tongji Ziliao) (1999–2007); Land Transaction Monitoring System* (http://www.landchina.com/) *and Provincial Fiscal Yearbook (2008)*
Tax revenue (log)		
Per capita production expendiures (log)		
Per capita education expenditures (log)	31 provinces and prefectures (1999–2007)	*Prefectural and County Financial Statistics (Dishixian Caizheng Tongji Ziliao) (1999–2007)*
Per capita social security expenditures (log)		
Per capita city construction expenditure (log)		
Per capita land development expenditure (log)		
Per capita administration expenditures (log)		
Number of government employees per 100,000 people		
County-level socioeconomic characteristics		
GDP growth rate	31 provinces and prefectures (1999–2008)	*Statistical Yearbook of Regional Economies (Quyu Jingji Tongji Nianjian) (2002–2009), county and prefecture level data and Provincial Statistical Yearbook (Sheng Tongji Nianjian) (1999–2001)*
Per capita GDP (log)		
Population (log) inflation rate (prefectural Level)		
GIS data and land related data		
Slope map	31 provinces and prefectures	*SGS Digital Elevation Model (DEM) at 90 square-meter-cell grid resolution*
County administrative boundary maps	31 provinces and prefectures	*China County Population Census Data with GIS Maps (1953, 1964, 1982, 1990, 2000) from the China Data Center*
Interest rate capital city house price	10 years (1999–2008) 31 provinces and prefectures (1999–2008)	*The website of the People's Bank of China* (http://www.pbc.gov.cn/) *Statistical Yearbook of Regional Economies (Quyu Jingji Tongji Nianjian) (2000–2009), prefectural level data*
Corruption case	10 years (1999–2008) 524 cases	*Procuratorial Daily* (*Jiancha Ribao*)

Table A2
Criteria employed in coding political turnover [a].

A county party secretary is "promoted" if he/she attains one of the following positions upon the end of term:	
Dijishi Shiwei Fushuji	Deputy Secretary of Prefectural Party Committee
Dijishi Shiwei Zuzhibu Buzhang	Minister of Party Committee Organization Department
Dijishi Shiwei Xuanchuanbu Buzhang	Minister of Party Committee Propaganda Department
Dijishi Jiwei Shuji	Secretary of the Discipline Inspection Commission
Dijishi Fu Shizhang	Vice Mayor
Dijishi Shizhengfu Mishuzhang	Secretary General
Dijishi Gonganju Juzhang	Chief of Public Security Bureau
Dijishi Zhongji Renminfayuan Yuanzhang	Chief Justice of Intermediate People's Court
Dijishi Zhongji Renminjianchayuan Yuanzhang	Chief Procurator of Intermediate People's Procuratorate
A county party secretary is "transferred laterally" if he/she ends up with one of the following positions upon the end of term:	
Xianwei Shuji	County Party Secretary
Xianjishi Shiwei Shuji	County City Party Secretary
Quwei Shuji	District Party Secretary

Table A2 (*continued*)

A county party secretary is "promoted" if he/she attains one of the following positions upon the end of term:	
Dijishi Shiwei Tongzhanbu Fubuzhang	Minister of Party Committee United Front Department
Dijishi Shiwei Zuzhibu Fubuzhang	Vice Minister of Party Committee Organization Department
Dijishi Shiwei Xuanchuanbu Fubuzhang	Vice Minister of Party Committee Propaganda Department
Dijishi Jiwei Fushuji	Vice Secretary of the Discipline Inspection Commission
Shizhengfu Shizhang Zhuli	Assistant Mayor
Shizhengfu Xunshiyuan	Prefectural Government Counselor
Dijishi Zhengfu Fumishuzhang	Vice Secretary-General
Dijishi Gonganju Fujuzhang	Deputy Chief of Public Security Bureau
Dijishi Zhongji Renminfayuan Fuyuanzhang	Deputy Chief Justice of Intermediate People's Court
Dijishi Zhongji Renminjianchayuan Fuyuanzhang	Deputy Chief Procurator of Intermediate People's Procuratorate
Juzhang	Department Head of Prefectural Functional Bureau (e.g. Head of Education Bureau)
A county party secretary is "retired" if he/she ends up with one of the following positions upon the end of term:	
Dijishi Shirenda Changweihui Fu/Zhuren	Chairman and Vice-Chairman of the Standing Committee of the People's Congress
Dijishi Zhengxie Fu/Zhuxi	Chairman and Vice-Chairman of the People's Political Consultative Conference
Dijishi Shizhonggonghui Zhuxi	Chairman of Prefectural Trade Union
Dijishi Fulian Zhuxi	Chairman of Prefectural Women's Federation

[a] The coding of Political Turnover is based on the administrative rank of the positions to which the county party secretary was subsequently appointed.

Table A3
Effect of typography on land sales and various economic growth indicators.

	Total area of land sold (1)	Average GDP growth rate (2)	Average industrial growth rate (3)	Average service sector growth rate (4)
Unsuitability index	−6.414***	−0.001	0.025	0.025
	(0.505)	(0.007)	(0.018)	(0.027)
Number of observations	1247	1247	1743	1743
Adj. R-squared	0.080	−0.001	0.001	0.000

Robust standard errors in parentheses;
*$p < 0.10$,
**$p < 0.05$,
*** $p < 0.01$. Constant terms are not reported.

essentially the same rank. For example, this could conceivably occur when a county chief is transferred from one county to another either in the same capacity as county party secretary or as head of what the Chinese regards as a "non-strategic" department at the prefectural level (examples of such departments include the Department of Education or Workplace Safety). We consider such transfers as "lateral" because both the ranking and compensation that come with the new appointment are the same as those associated with the previous one and so they are clearly not promotions.

Staying in office refers to the situation where a county party secretary stays in the same position for one more year. Given the ranking will not change if the party secretary stays in office, it is equivalent to a lateral transfer.

3. *Retirement*
   Upon retirement one may be appointed to take up an advisory position in the Chinese People's Political Consultation Committee (*Zhongguo Renmin Zhengzhi Xieshang Huiyi*) or the People's Congress.
4. *Termination*

Termination happened when county party secretary unusually leaves office due to the incidence of natural death, severe illness, or imprisonment due to wrongdoing.

C. *Other supporting tables and figures*

See Appendix Figs. A1–A4

Note: This example serves to illustrate how the county party secretaries' dataset is constructed based upon their curriculum vitae in *Baidu Encyclopedia*. The curriculum vitae in turn are obtained from the pertinent Chinese government websites.

Fig. A1. A County party secretary's vita in *Baidu Encyclopedia*.

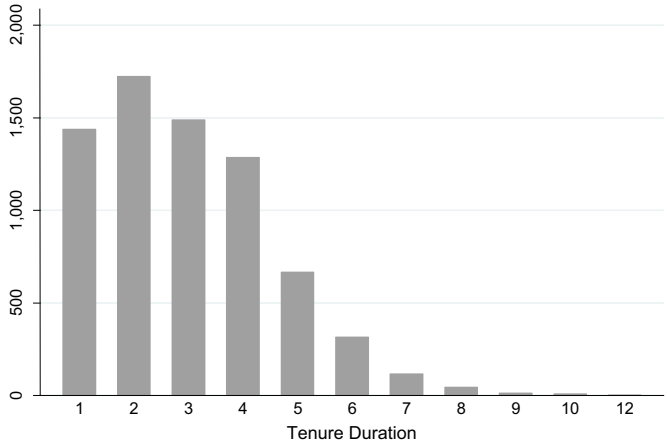
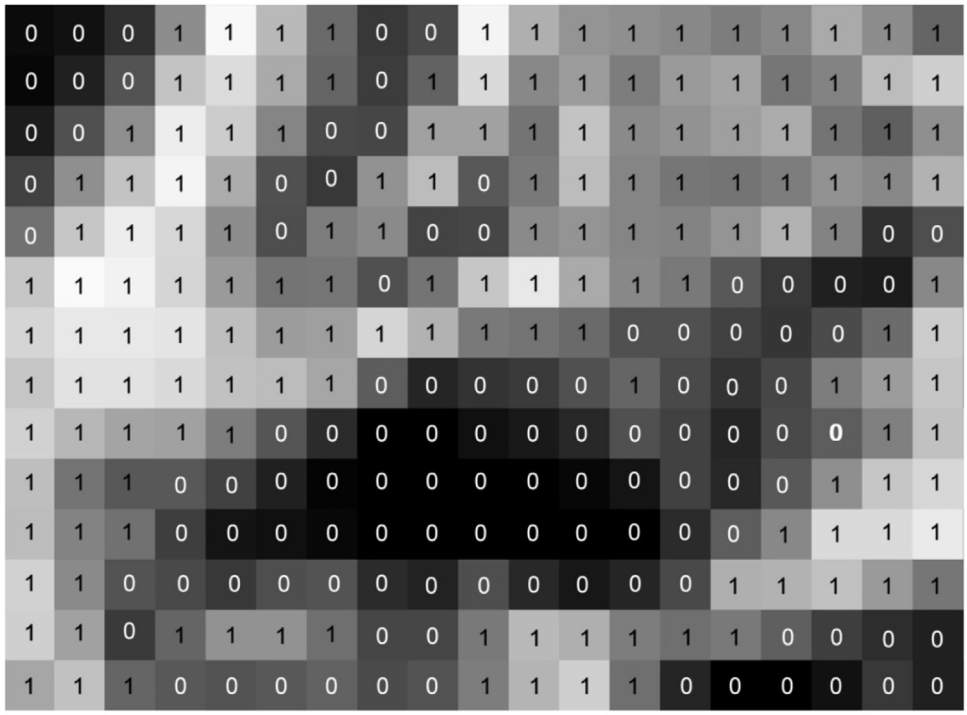
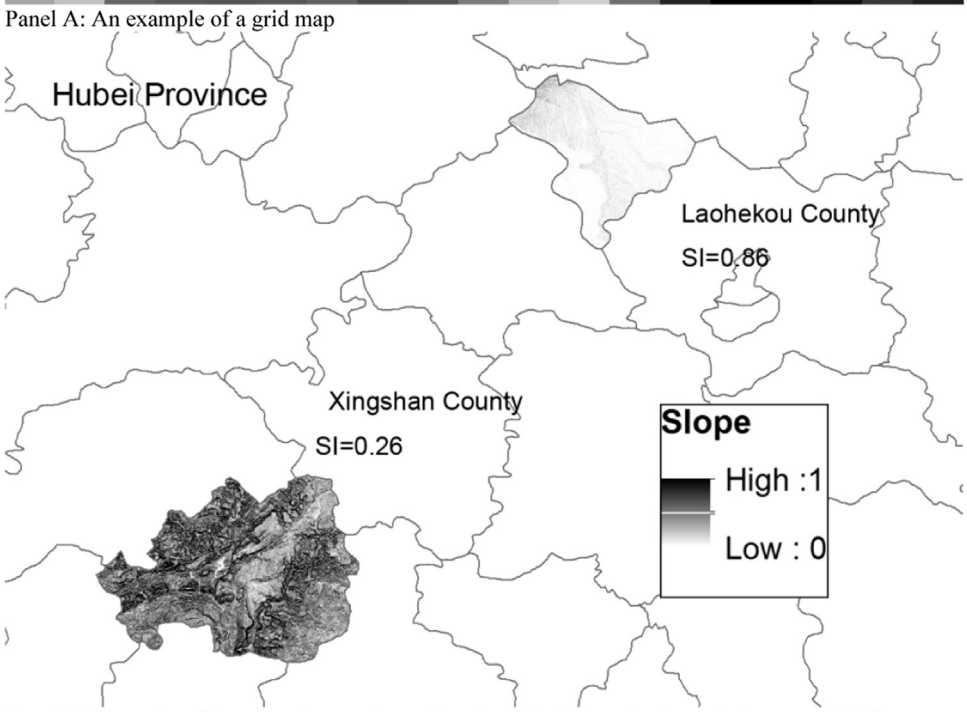


Fig. A2. Distribution of tenure duration of county party secretaries, 1999–2008.



Panel A: An example of a grid map



Panel B: Examples of two sample counties with extremely high and extremely low unsuitability

Fig. A3. Construction of the unsuitability index (of the instrumental variable).

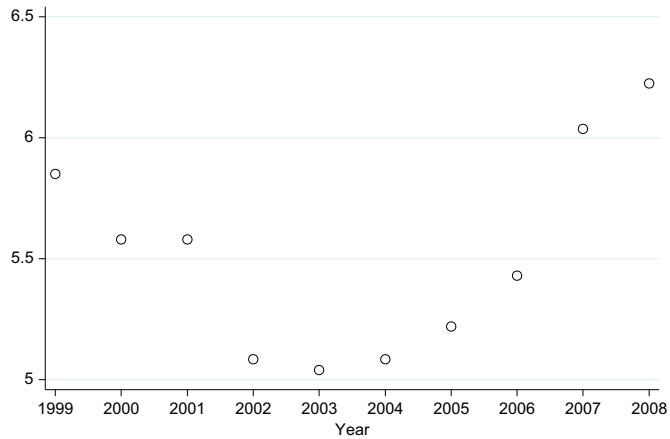


Fig. A4. National interest rate (%), 1999–2008.

Appendix B. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.jdeveco.2016.08.005.

References

Ades, Alberto, Di Tella, Rafael, 1999. Rents, competition, and corruption. Am. Econ. Rev. 89 (4), 982–993.
Besley, Timothy, Persson, Torsten, Sturm, Daniel M., 2010. Political competition, policy and growth: theory and evidence from the US. Rev. Econ. Stud. 77 (4), 1329–1352.
Blanchard, Olivier, Shleifer, Andrei, 2000. Federalism with and without political centralization: China versus Russia. No. w7616. National Bureau of Economic Research.
Bo, Zhiyue, 2004. The institutionalization of elite management in China. In: Naughton, B.J., Yang, D.L. (Eds.), Holding China Together: Diversity and National Integration in the Post-Deng Era. Cambridge University Press.
Brollo, Fernanda, Nannicini, Tommaso, Perotti, Roberto, Tabellini, Guido, 2014. The political resource curse. Am. Econ. Rev. 103 (5), 1759–1796.
Cai, Yongshun, 2004. Irresponsible state: local cadres and image-building in China. J. Communist Stud. Transit. Politics 20 (4), 20–41.
Cai, Meina, 2012. Land for welfare in China. Presented in American Political Science Association Annual Meeting (September 2012).
Caselli, Francesco, Michaels, Guy, 2013. Do oil windfalls improve living standards? Evidence from Brazil. Am. Econ. J. Appl. Econ. 5 (1), 208–238.
Chaney, Thomas, Sraer, David, Thesmar, David, 2012. The collateral channel: how real estate shocks affect corporate investment. Am. Econ. Rev. 102 (6), 2381–2409.
Chen, Ye, Li, Hongbin, Zhou, Li-An, 2005. Relative performance evaluation and the turnover of provincial leaders in China. Econ. Lett. 88 (3), 421–425.
De Janvry, Alain, Finan, Frederico, Sadoulet, Elisabeth, 2012. Local electoral incentives and decentralized program performance. Rev. Econ. Stat. 94 (3), 672–685.
Di Tella, Rafael, Schargrodsky, Ernesto, 2003. The role of wages and auditing during a crackdown on corruption in the city of Buenos Aires. J. Law Econ. 46 (1), 269–292.
Edin, Maria, 2003. State capacity and local agent control in China: CCP cadre management from a township perspective. China Q. 173 (1), 35–52.
Guo, Gang, 2007. Retrospective economic accountability under authoritarianism evidence from China. Political Res. Q. 60 (3), 378–390.
Guo, Gang, 2009. China's local political budget cycles. Am. J. Political Sci. 53 (3), 621–632.
Han, Li, Kung, James Kai-sing, 2015. Fiscal incentives and policy choices of local governments: evidence from China. J. Dev. Econ. 116, 89–104.
Hess, Gregory D., Orphanides, Athanasios, 1995. War politics: an economic, rational-voter framework. Econ. Rev. 85 (4), 828–846.
Jia, Ruixue, Kudamatsu, Masayuki, Seim, David, 2014. Complementary roles of connections and performance in political selection in China. J. Eur. Econ. Assoc.
Joseph, William A., 2010. Politics in China: An Introduction. Oxford University Press.
Krueger, Anne O., 1974. The political economy of the rent-seeking society. Am. Econ. Rev. 64 (3), 291–303.
Kung, James Kai-sing, Chenggang, Xu, Feizhou, Zhou, 2013. From industrialization to urbanization: The social consequences of changing fiscal incentives on local governments' behavior. In: Kennedy, David, Stiglitz, Joseph E. (Eds.), Law and Economic Development with Chinese Characteristics: I(nstitutions for the)21st Century. Oxford University Press.
Landry, Pierre F., 2008. Decentralized authoritarianism in China. Cambridge University Press, New York.
Li, Cheng, 2001. China's Leaders: The New Generation. Rowman & Littlefield Pub Incorporated.
Li, Cheng, 2005. Hu's policy shift and the Tuanpai's coming-of-age. China Leadersh. Monit. 15 (6), 1–16.
Li, Hongbin, Zhou, Li-An, 2005. Political turnover and economic performance: the incentive role of personnel control in China. J. Public Econ. 89 (9), 1743–1762.
Lieberthal, Kenneth, 2003. Governing China: From Revolution Through Reform, 2nd ed. W. W. Norton Press, New York.
Lin, George C.S., Ho Samuel, P.S., 2005. The state, land system, and land development processes in contemporary China. Ann. Assoc. Am. Geogr. 95 (2), 411–436.
Lü, Xiaobo, 2000a. Booty socialism, bureau-preneurs, and the state in transition: organizational corruption in China. Comp. Politics 32 (3), 273–294.
Lü, Xiaobo, 2000b. Cadres and Corruption: The Organizational Involution of the Chinese Communist Party. Stanford University Press.
Lü, Xiaobo, Landry, Pierre F., 2014. Show me the money: interjurisdiction political competition and fiscal extraction in China. Am. Political Sci. Rev. 108 (3), 706–722.
Maskin, Eric, Qian, Yingyi, Xu, Chenggang, 2000. Incentives, information, and organizational form. Rev. Econ. Stud. 67 (2), 359–378.
Mauro, Paolo, 1995. Corruption and growth. Q. J. Economic. 110 (3), 681–712.
Mauro, Paolo, 1998. Corruption and the composition of government expenditure. J. Public Econ. 69 (2), 263–279.
Mehlum, Halvor, Moene, Karl, Torvik, Ragnar, 2006. Cursed by resources or institutions? World Econ. 29 (8), 1117–1131.
Mian, Atif, Sufi, Amir, 2011. House prices, home equity-based borrowing, and the US household leverage crisis. Am. Econ. Rev. 101 (5), 2132–2156.
Montinola, Gabriella, Qian, Yingyi, Weingast, Barry R., 1995. Federalism, Chinese style: the political basis for economic success in China. World Politics 48 (1), 50–81.
Oi, Jean Chun, 1992. Fiscal reform and the economic foundations of local state corporatism in China. World Politics 45 (1), 99–126.
Oi, Jean Chun, 1999. Rural China Takes Off: Institutional Foundations of Economic Reform. University of California Press.
Olson, Mancur, 1993. Dictatorship, democracy, and development. Am. Political Sci. Rev. 87 (3), 567–576.
Opper, Sonja, Brehm, Stefan, 2007. Networks versus performance: political leadership promotion in China (Working paper). Lund University, Department of Economics.
Pan, Jennifer, 2013. Measuring the goals and incentives of local Chinese officials (Working paper). Harvard University, Department of Government.
Persson, Petra, Zhuravskaya, Ekaterina, 2015. The limits of career concerns in federalism: evidence from China. J. Eur. Econ. Assoc. http://dx.doi.org/10.1111/jeea.12142.
Pei, Minxin, 2008. China's Trapped Transition: The Limits of Developmental Autocracy. Harvard University Press.
Qian, Yingyi, Xu, Chenggang, 1993. Why China's economic reforms differ: the M-form hierarchy and entry/expansion of the non-state sector. Econ. Transit. 1 (2), 135–170.
Qian, Yingyi, Barry, R. Weingast, 1997. Federalism as a commitment to preserving market incentives. J. Econ. Perspect. 11 (4), 83–92.
Qu, Tongzu, 1962. Local Government in China Under the Ch'ing 9. Stanford University Press.
Robinson, James A., Torvik, Ragnar, Verdier, Thierry, 2006. Political foundations of the resource curse. J. Dev. Econ. 79 (2), 447–468.
Ross, Michael L., 1999. The political economy of the resource curse. World politics 51 (2), 297–322.
Ross, Michael, 2012. The Oil Curse: How Petroleum Wealth Shapes the Development of Nations. Princeton University Press.
Saiz, Albert, 2010. The geographic determinants of housing supply. Q. J. Econ. 125 (3), 1253–1296.
Shih, Victor, Adolph, Christopher, Liu, Mingxing, 2012. Getting ahead in the communist party: explaining the advancement of central committee members in China. Am. Political Sci. Rev. 106 (1), 166–187.
Smith, Graeme, 2009. Political machinations in a rural county. China J. 62 (7), 29–59.
Svensson, Jakob, 2000. Foreign aid and rent-seeking. J. Int. Econ. 51 (2), 437–461.
Tollison, Robert D., 1982. Rent seeking: a survey. Kyklos 35 (4), 575–602.
Vicente, Pedro C., 2010. Does oil corrupt? Evidence from a natural experiment in West Africa. J. Dev. Econ. 92 (1), 28–38.
Whiting, Susan, 2004. The cadre evaluation system at the grass roots: the paradox of party rule. In: Naughton, B.J., Yang, D.L. (Eds.), Holding China Together: Diversity and National Integration in the Post-Deng Era. Cambridge University Press.
Wu, Weiping, 2010. Urban infrastructure financing and economic performance in China. Urban Geogr. 31 (5), 648–667.
Xu, Chenggang, 2011. The fundamental institutions of China's reforms and development. J. Econ. Lit. 49 (4), 1076–1151.
Yao, Yang, Zhang, Muyang, 2015. Subnational leaders and economic growth: evidence from Chinese cities. J. Econ. Growth 20 (4), 405–436.
Yew, Chiew Ping, 2011. Explaining land use change in a Guangdong county: the supply side of the story. China Q. 207 (1), 626–648.
Yew, Chiew Ping, 2012. Pseudo-urbanization? Competitive government behavior and urban sprawl in China. J. Contemp. China 21 (74), 281–298.

Zelin, Madeleine, 1992. The Magistrate's Tael: Rationalizing Fiscal Reform in Eighteenth Century Ch'ing China. University of California Press.
Zhan, Jing Vivian, 2012. Strategy for fiscal survival? Analysis of local extra-budgetary finance in China. J. Contemp. China 22 (80), 185–203.
Zhang, Jun, Gao, Yuan, 2008. Term limits and rotation of Chinese governors: do they matter to economic growth? J. Asia Pac. Econ. 13 (3), 274–297.
Zitzewitz, Eric, 2012. Forensic economics. J. Econ. Lit. 50 (3), 731–769.