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Rethinking China's Underurbanization: An Evaluation of Its County-to-City Upgrading Policy

Shenggen Fan
Lixing Li
Xiaobo Zhang

Development Strategy and Governance Division

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AUTHORS

Shenggen Fan, International Food Policy Research Institute
Division Director, Development Strategy and Governance Division
Email: s.fan@cgiar.org

Lixing Li, Peking University
China Center for Economic Research (CCER)
Email: lilixing@ccer.pku.edu.cn

Xiaobo Zhang, International Food Policy Research Institute
Senior Research Fellow, Development Strategy and Governance Division
Email: x.zhang@cgiar.org

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Contents

List of Tables

List of Figures

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ABSTRACT

It has been argued in the literature that China is underurbanized in large part because of restrictions on migration. While the presence of migration barriers can help explain why existing cities fail to achieve their optimal size, it cannot explain the lack of cities. Although migration has become much easier over time, the number of cities in China has been rather stagnant. In this paper, we argue that lack of appropriate mechanisms for creating new cities is another reason for underurbanization. Under China's hierarchical governance structure, the only way to create new cities is through the centralized policy of upgrading existing counties or prefectures into cities. However, in practice the implementation of the county-to-city upgrading policy was more complicated than expected. Based on a county-level panel dataset, this paper shows that jurisdictions that were upgraded to cities prior to 1998 do not perform better relative to their counterparts that remain to be counties in terms of both economic growth and providing public services. The policy was retracted in 1997, freezing the number of county-level cities since then. This, in turn, contributes to the observed underurbanization.

Keywords: urbanization, city creation, governance structure, political centralization, China

1. INTRODUCTION

It has been argued in the literature that China is underurbanized, judged both by international comparison and by the efficiency standard.[1] One popular explanation is that China has various explicit and implicit restrictions on migration, which have delayed urban agglomeration (Au and Henderson 2006a, 2006b). However, migration has become much easier over time. In fact, many cities, especially small and medium ones, have loosened the household registration (*hukou*) system since the early 1990s (Rawski 2003). The increasing ease of migration should have helped the urbanization process. This suggests that there must be some other factors explaining China's under urbanization.

In this paper, we propose an alternative explanation for China's underurbanization—the lack of a viable way of setting up new cities. In a democratic governance structure, cities will emerge and evolve in response to the pressure of population growth and industrial agglomeration.[2] China, however, has a hierarchical governance structure, under which neither the citizens nor the local governments have the discretionary power to create new cities. It is up to the central government that retains the ultimate power to decide which jurisdictions can achieve urban administrative status, which comes with more land quotas for city development. However, in practice, such a centralized process of awarding city status has proved to be more complicated than thought.

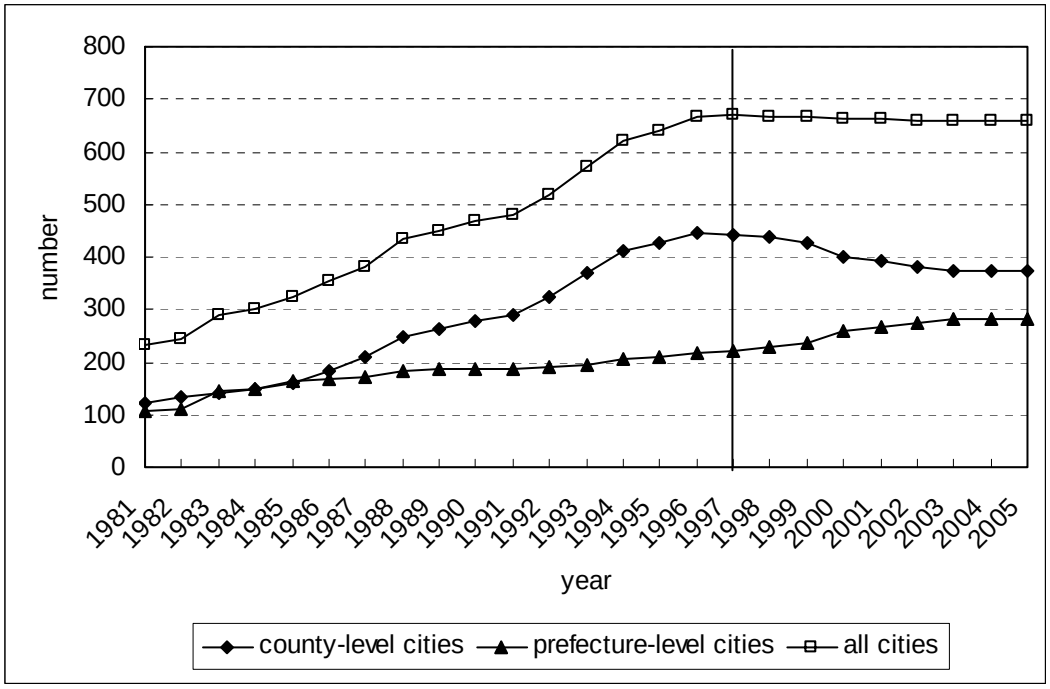
From 1983 to 1997, the central government granted city status to more than 400 counties and prefectures. Although the central government set some minimum requirements to regulate upgrading, these official requirements were not enforced in the practice of county-to-city upgrading (Li 2007). Instead, the most important determinant of city status—and the associated political and fiscal benefits—was local economic growth rate. Thus, upgrading mainly served as an incentive mechanism for local officials to develop the local economy. However, because the upgrading process was irreversible, once a city title had been awarded, the role of upgrading as an incentive instrument would no longer be applicable. As a result, the effect of the centralized city upgrading policy on urbanization and growth is likely to be questionable. To the best of our knowledge, no study has empirically examined this issue in the literature.

Based on county-level data compiled from the local public finance statistical yearbooks and China 1990 and 2000 population censuses, we compare the performance of upgraded cities with their counterparts that remained counties using difference-in-differences (DID) method. To correct for the potential bias caused by anticipation effect and mean reversion in the DID estimation, we match cities with counties using propensity-scores of getting city status. We find that economic growth rates of newly established cities dropped from a high level to a normal level after upgrading. In addition, these new cities did not perform any better than the non-upgraded counties in terms of educational achievement, public health outcomes and living conditions. Although the ratio of population with an urban household registration status increased more quickly in cities, industrial employment and overall employment rate did not. The ratio of immigrants in total population was not significantly higher in cities, either. In summary, the centralized system of city creation did not achieve the goal of promoting urbanization. In large because of these problems, the policy of "county-to-city upgrading" was called off in 1997. Since then, new cities only appear at the prefecture level and the total number of cities has remained rather constant (Figure 1). The ineffectiveness of the upgrading policy before 1997 and the lack of new cities after that could largely contribute to the observed relatively low level of urbanization in China.

[1] Chan (1994) and Zhang and Zhao (1998) describe in detail China's urban population and urbanization level. Zhou and Ma (2003) compare China's urbanization level with other countries. Sridhar and Wan (2007) find that China's urbanization rate is 10 percentage points lower than its industrialization level. The presence of a large number of dependents not being to unite with the migrant workers in cities indicates that urbanization lags behind industrialization in a real sense (Lu et al. 2007). For international comparisons on urbanization level, see World Bank (2008).

[2] For example, in the United States, a new city could be created by adopting a home rule charter. In Brazil, new municipalities are established through local voting.

Figure 1. Number of cities in China



There is an emerging body of literature on China's urbanization. For example, Anderson and Ge (2005) and Chen and Fu (2006) study the size distribution and growth pattern of Chinese cities. Au and Henderson (2006a, 2006b) and He and Zhou (2006) estimate the optimal size of cities. Deng et al. (2008) discuss the role of income growth in urban expansion. Zhang, Mount and Boisver (2004) analyze the relationship between urbanization and land use. However, the literature is largely silent on the institutional context of urbanization. By paying closer attention to institutional details, our paper offers a novel explanation to China's under urbanization.

The remainder of this paper is organized as follows. Section 2 introduces the background of granting city status in China. Section 3 describes the data and provides some descriptive analysis. Section 4 discusses the empirical strategy. Section 5 reports the results. Section 6 concludes.

2. COUNTY-TO-CITY UPGRADING IN CHINA

China has three main levels of local administrative entities: province, prefecture (*diqu*), and county. Cities can exist at any level.[3] For example, a province and a municipality directly under the central government (*zhixiashi*) are both at the provincial level; a prefecture and a prefecture-level city are both at the prefecture level; a county and a county-level city are both at the county level. *Upgrading* thus refers to the reclassification from a county/prefecture into a city at the same level. (This paper focuses on the county-to-city upgrading.) After upgrading, an entire county is labeled a city.[4] From 1983 to 1997, nearly 15 percent of China's more than 2,000 counties obtained city status in this way.

There are two ways to achieve urbanization. One is to increase the size of existing cities, while the other is to form and develop new cities. In many developing countries such as Mexico and India, big cities are troubled by "urban problems" such as slums. For fear of instability caused by unemployment in big cities, China chose the latter strategy of urbanization, restricting the size of big cities and promoting small cities and towns.[5] Under this guidance, upgrading was adopted as the major policy of creating urban units in China.

The policy objective of raising the number of small cities through upgrading is to speed up local economic growth, shifting surplus labor from rural areas to cities and reducing the rural-urban income gap (Kamal-Chaoui et al. 2009). By giving local governments more administrative authority and fiscal autonomy, the upgrading policy also intends to grant them more leverage for providing better public services.[6]

The official rule to regulate county-to-city upgrading first appeared in 1983, when the demand for city status increased in coastal provinces. This increase in demand was associated with rapid economic growth after economic reforms. Under some rough requirements proposed by the Ministry of Personnel and the Ministry of Civil Affairs, nearly 100 counties received city status between 1983 and 1986. As the number of cities continued to increase, the central government raised the minimum requirements for city status in 1986 and 1993, respectively. Table 1 summarizes the main minimum requirements on industrialization level, population engaged in nonagricultural activities, and fiscal strength that were announced in 1993. It is apparent from the table that the standard varies by population density. The entry barriers for counties with lower population density were set lower than those more densely populated counties.

Although getting city status does not change a county's rank in the administrative hierarchy, its government gains much more political power, which is why we use the term *upgrading*. For example, the party secretaries of many county-level cities can enter the standing committee of the prefecture-level party committee and enjoy a deputy-prefecture political rank. The administrative authority is also expanded in areas such as finance, trade, and transportation (see Table 2). For instance, Hubei province, has experimented with placing the budget of county-level cities under the direct supervision of the provincial government, thus bypassing the prefecture level.[7]

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[3] For a detailed description of the Chinese city system, see Chung (1999).

[4] Similarly, during prefecture-to-city upgrading, the entire prefecture is labeled a city. From 1983 to 2001, more than 160 prefectures in China were upgraded to prefecture-level cities.

[5] From the 1980s to the end of the 20th century, China's national urbanization policy tends to restrict the size of big cities. For example, the Eighth Five Year Plan for 1991-1995 states that the government should "control big cities, moderate development to medium-sized cities, and encourage the growth of small cities."

[6] In the "Report on the Sixth Five-Year Plan" made in 1982, Premier Zhao Ziyang states that "Except for special cases, the administrative power of enterprises should be decentralized to cities, bypassing the central ministries and provinces. We should change cities, especially big cities, into open, multi-functional, modern economic centers and form an economic network that is based on big cities while including surrounding small cities and towns." (Available at http://www.people.com.cn/zgrdxw/zlk/rd/5jie/newfiles/e1170.html)

[7] This is called "line item under province", or *Shengji Jihua Danlie*.

Table 1. Minimum requirements for county-to-city upgrading

Population density (person/km^2)		>400	100–400	<100
Percentage of counties in this category		25%	45%	30%
Industrialization level	Industrial output value (*yuan*)	1.5 billion	1.2 billion	0.8 billion
	Share of industrial output value in gross value of industrial and agricultural output	80%	70%	60%
Population engaged in nonagricultural activities	Size of urban population (engaged in nonagricultural production	150k	120k	100k
	Share of urban population in total population	30%	25%	20%
Fiscal strength	Fiscal revenue (yuan)	60 million	50 million	40 million
	Per capita fiscal revenue (*yuan*)	100	80	60

Source: "The Report on Adjusting the Criteria for the Designation of New Cities." Ministry of Civil Affairs, 1993; available in English in Zhang and Zhao (1998).

Table 2. Benefits of being a city: an incomplete list

Category	Benefits	Source
Tax and fee	Cities enjoy a higher urban construction tax (7% compared with 5% for counties) and could collect the surcharges levied on the issuing of motorcycle registration. In Liaoning province, cities could get 1 to 2 million *yuan* additional subsidies each year after upgrading.	Chung and Lam (2004); Zhang and Zhao (1998)
Land transfer	Cities generally convert more land to nonfarm use and retain a larger share of revenue from land sale.	Zhang (2006); Ping (2006)
Favorable policy	After achieving the status of "line item under province" (*Shengji Jihua Danlie*), cities could report directly to the provincial administration to ask for investment projects.	Su (2000); Zhang and Zhao (1998)
Administrative power	Cities have more authority on foreign trade and exchange management; gains authority over police recruitment and vehicle administration; could establish the branch of custom and large state-owned banks; could approve projects with a higher cap of investment.	Chung and Lam (2004); Du (1993)
Government size	Cities could establish more branches of government and have a larger number of government employees.	Ren and Wang (1999)
Rank and salary	Sometimes the bureaucratic rank and salary of officials are raised after upgrading.	Ren and Wang (1999)
Reputation	Cities generally carry greater prestige and are more attractive to outside investors.	Gu (1997); Chung and Lam (2004); Wang, Ji, and Lin (1998)

Note: Given the volatility of Chinese policies, the benefits are continuously changing over time, and benefits listed are not necessarily effective during the same period.

Table 2 lists other benefits associated with city status, among which the most prominent is that cities are granted more quotas to convert land from agricultural to nonagricultural use. Local governments obtain a huge amount of revenues from such land conversion (Lichtenberg and Ding 2009).

These lucrative benefits enable the central government to use upgrading as an effective incentive instrument to reward localities with higher economic growth (Li 2007). However, because upgrading is irreversible and only provides a one-time incentive reward to localities for their past economic performance, the role of city status, once granted, will no longer be an incentive instrument. Thus, its long-term effects need to be examined.

3. DATA AND DESCRIPTIVE ANALYSIS

Many of our outcome variables are from the 1990 and 2000 population censuses. Assembled at the county level, these censuses provide rich information on education, health, migration, urbanization, and employment in different sectors. Merging the two censuses together provides us with a panel data set with observations from both years (henceforth, "census data set"). Information on economic conditions and government activities, such as gross domestic product (GDP), fiscal revenues, and expenditures are from the annual series *Public Finance Statistical Materials of Prefectures, Cities, and Counties 1993–2004* (henceforth, "public finance data set"). Because this latter report only starts in 1993, we have dropped cities that were upgraded before 1994, because we lack data from their pre-upgrading period.[8] We have kept all counties in the sample as the control group. Jurisdictions that were counties before 1994 but were upgraded to cities from 1994 to 1997 form the treatment group (upgrading policy stopped in 1997).

We first checked whether the requirements outlined in Table 1 have been strictly met in practice. As shown in Table 3, among the 99 cases of upgrading that took place in 1994–1997, only 6 meet all three requirements, 39 meet two, 30 meet only one, and 24 meet none. On the other hand, 36 counties did meet all three requirements but were not upgraded. This clearly demonstrates that the official requirements were not strictly enforced in practice.[9]

Table 3. Number of county-year observations by upgrading status and number of requirements satisfied (1994–1997)

Number of requirements satisfied	Total	0	1	2	3
Non-upgrading cases	6,395	4,583	1,313	463	36
Upgrading cases	99	24	30	39	6

Given the large regional variation in development, it is important to know whether the degree of enforcement varies by region. To determine this, we divided the counties into three geographical regions (coastal, central, and western) and compared the degree of enforcement, as shown in Table 4. Two major findings emerge. First, the coastal region has more than twice as many upgrading cases as the western region, even though the coastal region has three-fifths as many counties. This suggests that the upgrading quota has not been distributed in proportion to the total number of counties in each region. Instead, economic growth might have played a key role in deciding which counties to upgrade. Second, whereas nonenforcement seems to be ubiquitous, it is more severe in the western region, suggesting that the chance of receiving a city status for counties in underdeveloped provinces may have exceeded what their economic performance deserved.[10] This is consistent with the fact that counties with lower population density—in particular in the western regions—were given lower upgrading requirements, suggesting that the central government took regional disparity into consideration when making upgrading decisions.

Table 4. Number of upgrading cases that satisfied each requirement by region

Region	Total cases	Industrial level		Urban population		Fiscal strength	
		Yes	No	Yes	No	Yes	No
Coastal	49	31	18	34	15	8	41
Central	30	15	15	14	16	5	25
Western	20	5	15	11	9	3	17

[8] To estimate the propensity scores of getting an upgrade in year t, data in year t – 1 were used.

[9] For a formal test on the nonenforcement of upgrading requirements, see Li (2007).

[10] Li (2007) provides more evidence that the upgrading policy may be biased in favor of western provinces.

Most outcome variables from the public finance data set are available for 1994 to 2004. Table 5 lists the mean values for the treatment and control groups in 1994 and 2004. In total, 99 cities (labeled as "treatment group") were upgraded from 1994 to 1997. 1,537 counties are also included in the table as "control group". Growth rate is not listed in this table because we did not have a continuous measure from 1994 to 2004. GDP data are not available before 1997, and gross value of industrial and agricultural output (GVIAO) is not available after 2000. Table 5 reveals several interesting observations. First, the number of public employees increases much more quickly in cities relative to counties. Second, the increase in the share of productive expenditure (basic construction expenditure plus expenditure supporting agricultural production) in total public expenditure seems to be slower in cities. Third, in 2004, cities had much more extrabudgetary revenues and land revenue than counties.[11]

Table 5. Mean value of variables from public finance dataset

	Treatment group: City		**Control group: County**	
	N=99		**N=1537**	
	1994	**2004**	**1994**	**2004**
Fiscal revenue (10,000 RMB)	6,355	15,720	2,358	5,683
Public employee	13,112	17,263	9,010	1,1847
Public employee per 100 people	2.2	2.8	2.8	3.5
Fiscal revenue per public employee (10,000 RMB/person)	0.49	0.98	0.25	0.49
Industrial and business tax (10,000 RMB)	6,522	9,337	2,294	3,470
Industrial and business tax rate	5.11%	4.63%	7.83%	7.18%
Agricultural tax rate	3.20%	3.30%	2.80%	3.10%
Share of agricultural tax in total revenue	27.3%	18.5%	37.2%	26.5%
Productive expenditure per capita (RMB)	22.7	76.8	188.4	126.8
Share of productive expenditure in total expenditure	8.36%	9.07%	7.97%	10.96%
Extra-budgetary revenues (10,000 RMB)		3,373		1,049
Revenue from land (10,000 RMB)		1,465		542

Note: All the output and revenue measures have been adjusted to 1993 constant prices using the annual GDP deflator.

Table 6 lists the 1990 and 2000 mean values of variables from the census data set. We restricted the sample to those counties that appear in the empirical tests. There are a total of 95 cities and 1,001 counties.[12] It is apparent from the simple means that the percent of population with urban household registration, the number of immigrants and the size of employment in the manufacturing and service sectors grew faster in cities than counties. In contrast, public service outcomes, such as education and crude death rate, differ little between cities and counties from 1990 to 2000.

Because of the irreversible nature of city status, its role as an incentive instrument is abdicated once it is granted.[13] The weakening of this incentive after upgrading could result in slowing growth. The graph in Figure 2 compares the average growth rate of cities with that of counties. Because GVIAO was not available for after 2000, we have used the growth rate of GDP to show the trend from 2000 to 2004. It is easy to see that the growth rate of cities that were recently upgraded dropped sharply after 1997 and became normal relative to counties in following years.

[11] Extrabudgetary revenues consist of all resources managed by administrative branches of the government outside the normal budgetary process, such as various fees, charges, and revenues from land leasing. They are controlled by the local government and are not subject to treasury management or budgetary oversight (Wong and Bird 2008).

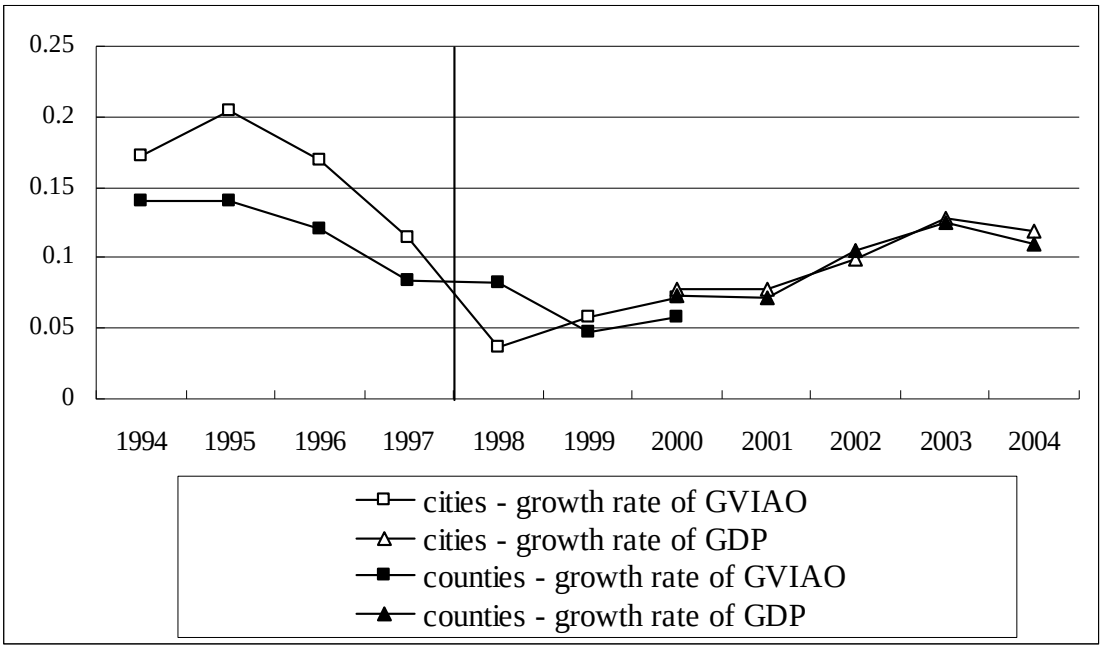
[12] These observations are a subset of those in Table 3. We dropped those observations that lack full information to estimate their propensity score of being upgraded to cities in 1994–1997.

[13] No city has been downgraded to a county so far.

Table 6. Mean value of variables from population census dataset

	Treatment group: City		Control group: County	
	N =95		N=1001	
	1990	2000	1990	2000
Population (1,000 people)				
Total	629	658	412	421
> 6 yr	555	615	360	393
> 15 yr	455	502	292	320
Educational achievement				
% illiterate (among > 15 yr)	19.7%	8.1%	24.9%	11.2%
% illiterate (male, among > 15 yr)	10.6%	3.9%	15.4%	6.5%
% illiterate (female, among > 15 yr)	29.2%	12.4%	35.0%	16.1%
% illiterate (among > 6 yr)	18.2%	8.7%	22.9%	11.6%
% primary (among > 6 yr)	44.8%	40.5%	44.4%	41.6%
% middle school (among > 6 yr)	28.2%	38.3%	24.9%	35.7%
% high school (among > 6 yr)	8.1%	10.5%	7.3%	9.3%
% above secondary(among > 6 yr)	0.7%	2.0%	0.6%	1.8%
Health condition				
# of children born alive per woman	2.15	1.42	2.25	1.49
# of surviving children per woman	2.02	1.40	2.07	1.45
Crude death rate (deaths per 1000)	6.16	6.18	6.47	6.27
Disabled population	16.6k	21.9k	11.6k	14.5k
Disability rate	3.7%	4.3%	4.0%	4.5%
Living condition				
Floor space per person (sq. meters)		24.4		22.4
Urbanization				
% with urban household registration	14.7%	19.8%	13.1%	16.1%
Immigration				
Total immigrants (1,000 people)	12.4	57.1	6.5	23.1
Immigrants from other province	4.7	18.4	2.3	4.7
Immigrants/total population	2.49%	9.24%	2.25%	6.89%
Total employment rate (among > 15 yr)	78.5%	79.8%	78.9%	82.4%
By occupation:				
Technician	3.5%	3.4%	3.5%	3.4%
Government agencies	1.1%	1.0%	1.0%	0.9%
Office workers	1.1%	1.7%	1.1%	1.4%
Sales and service	4.2%	6.1%	2.9%	4.5%
Agriculture	56.3%	46.5%	63.1%	55.9%
Production	12.3%	12.0%	7.3%	7.3%
Employment size by sector (1,000 people)				
Agriculture	275	237	197	183
Mining and quarrying	5.1	3.7	2.3	1.8
Manufacturing	39.7	50.9	13	15.5
Electric, gas, water supply	1.25	1.87	0.57	0.92
Construction	5.5	11.3	1.98	4.3
Geology and water	0.63	0.37	0.36	0.21
Transportation and storage	5.8	8.8	2.8	4.3
Commerce	12.7	21.3	6.2	10
Banking and insurance	0.95	1.48	0.57	0.78
Real estate	0.32	0.29	0.14	0.12
Social service	1.70	5.70	0.86	2.50
Health, sports	2.10	3.10	1.30	1.78
Education and culture	6.69	7.82	4.40	4.84
Research	0.18	0.18	0.09	0.10
Government	5.19	6.89	3.32	4.20

Figure 2. Comparison of growth rates: cities vs. counties



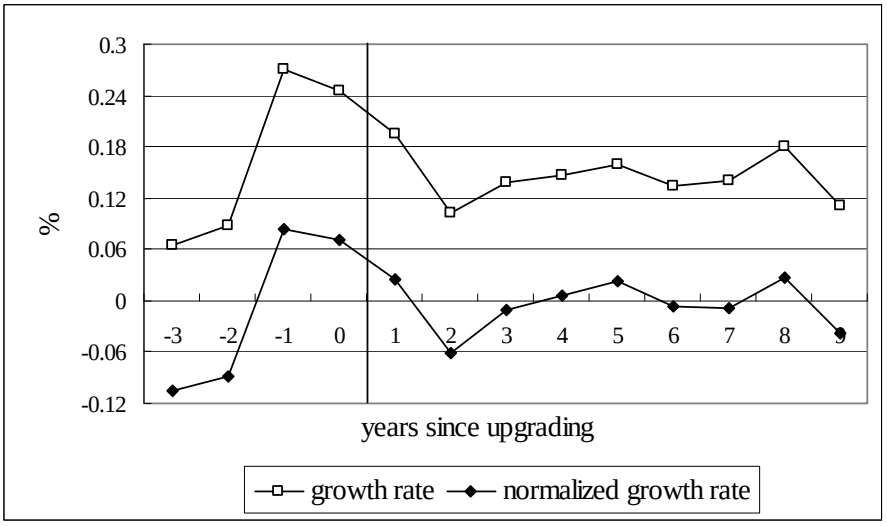
Note: This graph compares the average growth rate of the treatment group (jurisdictions that were upgraded from counties to cities during 1994–1997) and the control group (counties). GVIAO means the gross value of industrial and agricultural output, which measures the total economic activity when GDP data are not available.

Figure 3 further depicts the growth rate trend for jurisdictions that experienced upgrading. The sample of this graph is larger than the treatment group defined earlier. This sample includes all the cities that were upgraded as early as 1985. Observations were regrouped according to the amount of since the year when upgrading occurred. Negative numbers on the horizontal axis represent years before upgrading (during which the cities were still counties), while positive numbers indicate years after city status was awarded. Both the raw average and the normalized average growth rate (the national average growth rate has been subtracted from each raw growth rate) are presented and they show the same pattern. It is apparent that in the years just before and during upgrading, the average growth rate of these jurisdictions was high; after upgrading, this rate started to drop; and two years after upgrading, it fell below the national average. After that, the average growth rate returned to the national average and stayed around there. In sum, after receiving city status and the accompanied benefits, cities did not sustain a higher growth rate than did counties.

Figure 3 also shows that counties that eventually got an upgrade were not born with higher growth rates. Instead, higher growth rates are closely associated with the opportunity of getting an upgrade, suggesting that incentives play an important role in the fluctuation of growth rates before and after upgrading.

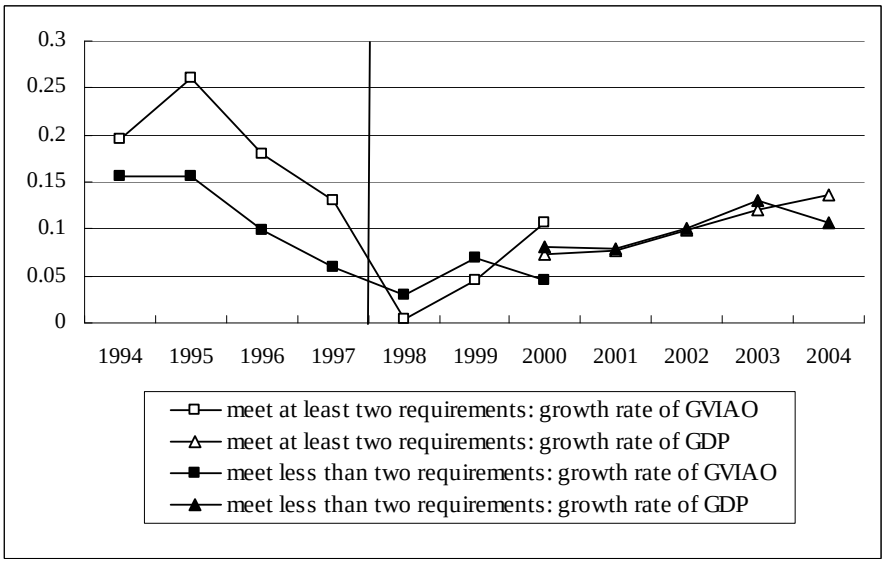
Figure 4 compares the average growth rate of cities that met at least two requirements with those that did not at the time of upgrading. This comparison helps to explore the heterogeneity in the process of upgrading and to examine the impact of initial conditions on performance. It is not surprising that during the policy-affected period, meeting more requirements was positively correlated with higher growth. However, after 1997, these two groups did not show much difference in terms of economic growth. Having an initial higher industrialization level and more urban population did not guarantee higher growth later on.

Figure 3. Growth rates of upgraded cities before and after upgrading



Note: The horizontal axis represents the number of years since upgrading took place. 0 means the year of upgrading, –1 means the year immediately before the upgrading year, and 1 means the year immediately after. To get the normalized growth rate, we subtract the national average growth rate in the corresponding year from each raw growth rate and then calculate the average

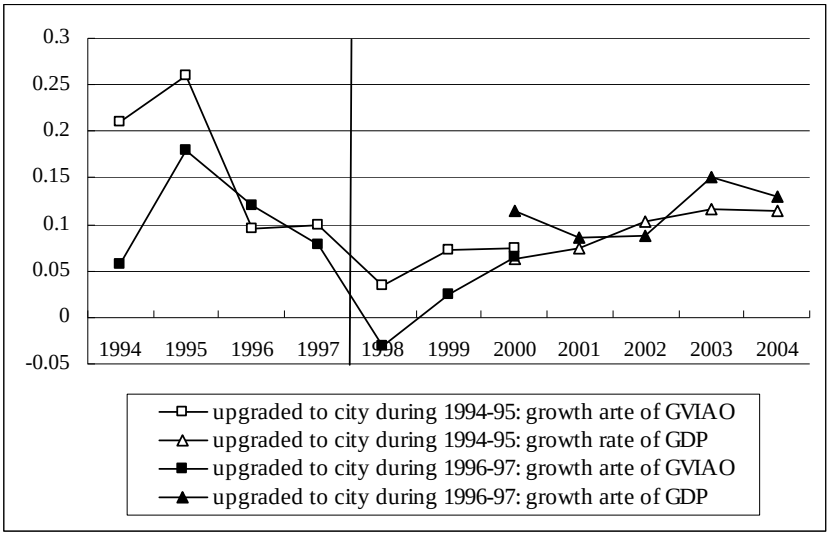
Figure 4. Growth rates of upgraded cities by number of requirements



Note: This graph divides the jurisdictions that were upgraded to cities in 1994–1997 into two groups, according to whether they met at least two minimum requirements of city status (see Table 1) at the time of upgrading. GVIAO means the gross value of industrial and agricultural output, which measures the total economic activity when GDP data are not available.

The implementation of the upgrading policy may have varied over time. For example, local lobbying may have become stronger, making it harder to enforce the requirements of upgrading. Thus, in addition to those that did not meet requirements, counties with less growth potential may also have been upgraded. Figure 5 compares the average growth rate of cities that were upgraded in 1994–1995 with those upgraded in 1996–1997. This comparison helps us determine whether the timing of upgrading matters to later economic performance. No significant difference is observed in the figure. Instead, the growth rate of both groups decreased after upgrading. In sum, all these figures display a common trend indicating that a region's economic performance becomes lackluster after upgrading.

Figure 5. Growth rates of upgraded cities with different upgrading years



4. EMPIRICAL STRATEGIES

Difference-in-Differences Model

Assuming that cities and counties have a parallel time trend for outcome *Y*, then a straightforward way to estimate the effect of city status on *Y* is a difference-in-differences model:

$$Y_{it} = \beta_0 + \beta_1 Upgrade_i + \beta_2 Post_{it} + \beta_3 Upgrade * Post_{it} + \varepsilon_{it} \quad (1)$$

where $Upgrade_i$ is a dummy for upgrading that equals 1 if the county is upgraded to a city and otherwise equals 0; $Post_{it}$ is a dummy for the post-upgrading period that equals 1 for the years after the county is upgraded and otherwise equals 0; and the interaction term, $Upgrade*Post_{it}$, equals 1 for upgraded cities in their post-upgrading years. Because each upgrading case happens in different years, $Post_{it}$ varies across cities and is not defined for counties. Thus, equation (1) must be modified before we can actually estimate it. We use a full set of year dummies to substitute $Post_{it}$. This, however, will not affect the definition of $Upgrade*Post_{it}$. So the actual empirical model is

$$Y_{it} = \beta_0 + \beta_1 Upgrade_i + \sum_{j=1994}^{2004} \beta_{2j} year_j + \beta_3 Upgrade * Post_{it} + \varepsilon_{it} \quad (2)$$

In equation (2), β_3 measures the average effect of city status on outcome Y_{it} after controlling for pre-upgrading differences. This model could be applied to evaluate outcomes from both the public finance data set and the census data set, as long as that information is available in both pre- and post-upgrading periods. For the public finance data set, we have annual data from 1994 to 2004; so, we can decompose the average effect of city status into dynamic effects of post-upgrading years. To do this, we replace the $Upgrade*Post_{it}$ dummy with ten dummies: $Upgrade*Post0_{it}$, $Upgrade*Post1_{it}$, … , $Upgrade*Post9_{it}$. Among them, $Upgrade*Post0_{it}$ equals 1 for the year cities were upgraded, $Upgrade*Post1_{it}$ equals 1 for cities in the first year after upgrading, and so forth. The model is

$$Y_{it} = \beta_0 + \beta_1 * Upgrade_i + \sum_{j=1994}^{2004} \beta_{2j} year_j + \sum_{k=0}^{9} \beta_{3k} Upgrade * Postk_{it} + \varepsilon_{it} \quad (3)$$

Where β_{30} measures the average effect of city status for the year of upgrading, β_{31} measures the average effect of city status for the first year after upgrading, and so on. Equation (3) allows us to detect the time pattern of the effect, such as immediate versus gradual and temporary versus permanent.

The identification assumption for the DID method is that, in the absence of upgrading, the treatment and control group are otherwise identical or at least have a parallel time trend in their outcomes over time. The most likely problem is that counties that anticipated being in the competition for city status may make some strategic preparations several years before submitting an application. Such preparations include (but are not restricted to) accumulating resources to achieve higher growth rates (or simply inflating the official figures of growth rates) in the years prior to application and expanding the number of urban household registration quota so as to inflate the size of urban population. If this is true, their performance will naturally return to the "normal" level after getting city status, which we call an "anticipation effect". Another possible problem is mean reversion. Some counties may happen to grow faster than normal for a few years before the application for upgrading purely by luck. In this case, growth rates eventually will move back towards the mean or average. Both the anticipation effect and mean reversion could bias our estimates toward finding a negative effect.

In order to deal with these problems, we use propensity score matching methods to better compare upgraded cities with similar counties (Rosenbaum and Rubin 1983; Dehejia and Wahba 1999, 2002). We include various socio-economic indicators in the construction of propensity scores to control for the pre-upgrading differences between counties and cities. Assuming that the selection of upgrading is on observables, matching could partly correct for the bias in a straightforward DID estimation.

Propensity Score Matching

We use a logit model to estimate the propensity score of upgrading during 1994–1997

$$\Pr(Upgrade_{it}=1)=\frac{\exp(\alpha_0+\alpha_1 G_{it}+\alpha_2 Z_{it})}{1+\exp(\alpha_0+\alpha_1 G_{it}+\alpha_2 Z_{it})} \tag{4}$$

Where $Upgrade_{it}$ is a dummy indicating whether upgrading happens for county i in year t, G represents growth rate, and Z is a vector that includes variables appearing in the upgrading requirements, such as urban population, industrial output, and fiscal revenue.[14] The growth rate is included mainly to mute the estimation bias due to potential anticipation and mean reversion effect. We then use matching to combine counties and cities with different observed characteristics but the same propensity scores. The matching estimator is

$$\hat{\Phi}_{Matching}=\frac{1}{n}\sum_{i\in county\to city}\left\{Y_i-\sum_{j\in county}W(i,j)Y_j\right\} \tag{5}$$

Where i represents those counties that were upgraded to cities from 1994 to 1997, j represents those that remain counties, and n is the number of upgrading cases. The match for each upgrading case i is constructed as a weighted average over the outcome of the control group j—counties. The weight, $W(i, j)$, depends on the distance between the propensity scores for i and j. In this paper, we constructed the weights using a kernel function that is standard in the literature (Smith and Todd 2005). Compared with linear regression, matching does not need to impose a linear functional form on the model.

We conduct difference-in-differences propensity score matching (Heckman et al. 1998; Heckman, Ichimura, and Todd 1998) if the outcome variable is available in both pre- and post-upgrading period (e.g., 1990 and 2000 in the census data). The estimator is defined as

$$\hat{\Phi}_{DID-Matching}=\frac{1}{n}\sum_{i\in county\to city}\left\{(Y_{i,2000}-Y_{i,1990})-\sum_{j\in county}W(i,j)(Y_{j,2000}-Y_{j,1990})\right\} \tag{6}$$

The difference between this DID matching estimator and the usual matching estimator is that this one allows for systematic differences between upgrading and non-upgrading outcomes after conditioning on observables. According to Smith and Todd (2005), the DID matching estimator generally performs better than cross-sectional matching estimators.

[14] Here we use the growth rate in year t-1. We have also used alternative definitions of growth rate, such as average growth rates over three to five year period prior to the time of application. The results are similar. Due to page limit, they are not reported here but available upon request.

5. RESULTS

Difference-in-Differences Estimation

Table 7 shows the DID estimation results based on equation (2). The outcome variables are from the public finance data set, including growth rate, fiscal revenue, number of public employees, fiscal revenue per public employee, share of productive expenditure in total expenditure, and share of agricultural tax in total revenue.[15] Table 8 further decomposes the average effect into effects in different post-upgrading years based on equation (3).

Table 7. Difference-in-differences estimation results

	GVIAO growth rate	Growth rate of industrial output	Growth rate of agricultural output	Fiscal revenue	Public employee	Fiscal revenue per public employee	Productive expenditure share	Agricultural tax share
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Upgrade	0.025	0.047	–0.026	6,023***	3,600***	0.406***	1.487**	–0.068***
	(0.027)	(0.037)	(0.030)	(909)	(615)	(0.077)	(0.734)	(0.014)
Upgrade *Post	–0.027	–0.042	0.046	761*	1896***	–0.073	–2.862***	–0.047***
	(0.030)	(0.040)	(0.034)	(390)	(457)	(0.058)	(0.777)	(0.016)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.015	0.03	0.015	0.14	0.06	0.11	0.07	0.17
N	11,183	10,634	10,873	20,215	20,195	20,190	11,412	19,985

Note: Standard errors clustered at the prefecture level are in parentheses. Significance levels of 10%, 5%, and 1% are represented by *, **, and ***, respectively.

Columns (1) through (3) show the results for the growth rate of gross value of industrial and agricultural output (GVIAO), industrial output, and agricultural output, respectively. Because these output values are not available for after 2000, we can only decompose the post-upgrading effect into the sixth year after upgrading. The results on the growth rate of total and industrial output are consistent with those shown in Figures 2 and 3—that is, growth rate decreased after a county was awarded city status. However, it is a little bit surprising that the growth rate of agricultural output increased after a county became a city. Whereas the overall effect is positive but not statistically significant, the decomposed effects are positive and statistically significant in the first and third year after upgrading. Theory suggests that the growth of a city is driven by agglomerative economies and spillovers in nonagricultural sectors. Our results, however, show that the formation of cities in China does not follow the usual urban growth practice. In China, city formation does not significantly affect the growth of industrial sectors. Instead, it shows an impact on the agricultural sector, which could be due to the uniqueness of China's institutional arrangements.

Column (4) of Table 7 shows that the average effect of city status on fiscal revenue is positive, with a magnitude of about 15 percent of the average value. The decomposed effects shown in column (4) of Table 8 display an interesting dynamic pattern over time—the pattern is negative in the first three years after upgrading and then becomes positive starting in the fourth year.

As Luo and Zhang (2009) explained, under China's centralized governance structure, the size of local government is largely in proportion to local population, unless there is a change in status from

[15] It is possible that fiscal revenue and public employee follow log normal distributions, so that their log values are better dependent variables. We conducted robustness checks using their log values as dependent variables, and the findings are very similar. Because these variables are more meaningful in their levels, we have only reported estimates using their levels as dependent variables.

county to city. Column (5) of Tables 7 and 8 confirms the effect of such a change: There is an immediate increase in the number of total public employees immediately after upgrading that continues to grow in the post-upgrading period. The average increase is as large as 20 percent relative to counties.

Table 8. Difference-in-differences estimation results after decomposition

	GVIAO growth rate	Growth rate of industrial output	Growth rate of agricultural output	Fiscal revenue	Public employee	Fiscal revenue per public employee	Productive expenditure share	Agricultural tax share
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Upgrade	0.025	0.047	–0.026	6,023***	3,600***	0.406***	1.487**	-0.068***
	(0.027)	(0.037)	(0.030)	(908)	(615)	(0.077)	(0.739)	(0.014)
Upgrade *Post0	0.0023	–0.0039	0.043	–1,688***	944***	–0.173***	–1.643***	–0.049***
	(0.034)	(0.045)	(0.048)	(515)	(313)	(0.067)	(0.596)	(0.015)
Upgrade *Post1	–0.012	–0.045	0.091*	–1,381***	805**	–0.160**	–2.663***	–0.072***
	(0.036)	(0.047)	(0.046)	(488)	(404)	(0.067)	(0.684)	(0.016)
Upgrade *Post2	–0.12**	–0.103	–0.051	–1,352**	1,537***	–0.178***	–2.228***	–0.069***
	(0.052)	(0.059)	(0.051)	(654)	(419)	(0.063)	(0.815)	(0.019)
Upgrade *Post3	–0.054	–0.036	0.107**	–385	1,968***	–0.151**	–2.358***	–0.061***
	(0.039)	(0.057)	(0.046)	(440)	(478)	(0.059)	(0.805)	(0.019)
Upgrade *Post4	0.012	–0.055	0.014	331	2,015***	–0.112**	–2.635***	–0.052***
	(0.044)	(0.047)	(0.038)	(432)	(470)	(0.048)	(0.860)	(0.017)
Upgrade *Post5	–0.019	–0.038	0.102*	688	1,977***	–0.073	–3.156***	–0.028*
	(0.054)	(0.051)	(0.055)	(831)	(492)	(0.064)	(0.937)	(0.017)
Upgrade *Post6				1,704*	1,924***	–0.027	–3.160***	–0.036**
				(941)	(525)	(0.061)	(0.918)	(0.015)
Upgrade *Post7				2,321**	2,164***	0.029	–3.461***	–0.028*
				(1055)	(587)	(0.069)	(1.006)	(0.017)
Upgrade *Post8				2,673**	1,954***	0.065	–3.163***	–0.044**
				(1115)	(614)	(0.080)	(1.029)	(0.020)
Upgrade *Post9				4,060***	3,422***	0.059	–3.950***	–0.046*
				(1503)	(928)	(0.078)	(1.075)	(0.027)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.016	0.04	0.016	0.15	0.06	0.11	0.07	0.17
N	11,183	10,634	10873	20,215	20,195	20,190	11,412	19,985

Note: Standard errors clustered at the prefecture level are in parentheses. Significance levels of 10%, 5%, and 1% are represented by *, **, and ***, respectively.

The increase in fiscal revenue and public employees is consistent with the fact that local governments gain more administrative independence and discretionary power through upgrading. Analogous to firm managers who maximize their control rights, local officials prefer a larger government. A city status provides local governments with more discretionary power to expand government size.

Fiscal revenue per public employee is used to measure the fiscal dependent burden (Zhang 2006). Lower fiscal revenue per public employee represents a weaker ability of the local government to support its employees, and thus a heavier fiscal dependent burden. With a huge increase in the size of public employees, it is interesting to know whether this burden becomes heavier after upgrading. Column (6) of Table 7 does not indicate any significant difference in revenue per public employee between cities and counties. But once decomposed into different years [Table 8, column (5)], it appears that the fiscal

dependent burden actually becomes more severe in the first seven years after upgrading, suggesting that the expansion of the number of public employees overshadows the increase in revenue, at least in the short term.

Column (7) of Tables 7 and 8 examines how the expenditure is distributed into productive investment in agriculture and basic construction. We label this part of expenditure "productive" and classify the remaining part as "administrative costs of the government." The negative estimate suggests that cities spent a smaller proportion on this part. Again, this may be largely due to the quick expansion of government size, which leads to an increase in administrative costs.

Finally, column (8) of both tables shows a negative effect of city status on the share of agricultural tax in total revenue. This suggests that the focus of local government has shifted away from agriculture. In sum, Tables 7 and 8 are consistent with the proposition that a city status enables local governments to generate more revenues and inflate their size but does not guarantee a sustained high growth rate.

Estimating Propensity Scores

The results for the logit estimation of the propensity score are found in Li (2007). Figure 6 shows the histograms of the estimated propensity scores for counties (upper panel) and cities (lower panel). Following Smith and Todd (2005), we matched on the odds ratio of propensity score, P/(1–P), rather than on the propensity score, P, itself, so that the estimates are robust to choice-based sampling. The histograms of the log odds ratio are shown in Figure 7. These two figures give a graphical assessment of the extent of common support. It seems that the propensity scores have large overlap for cities and counties. In fact, only two cities do not have support in the counties; they will be excluded in matching.

Figure 6. Histogram of propensity score

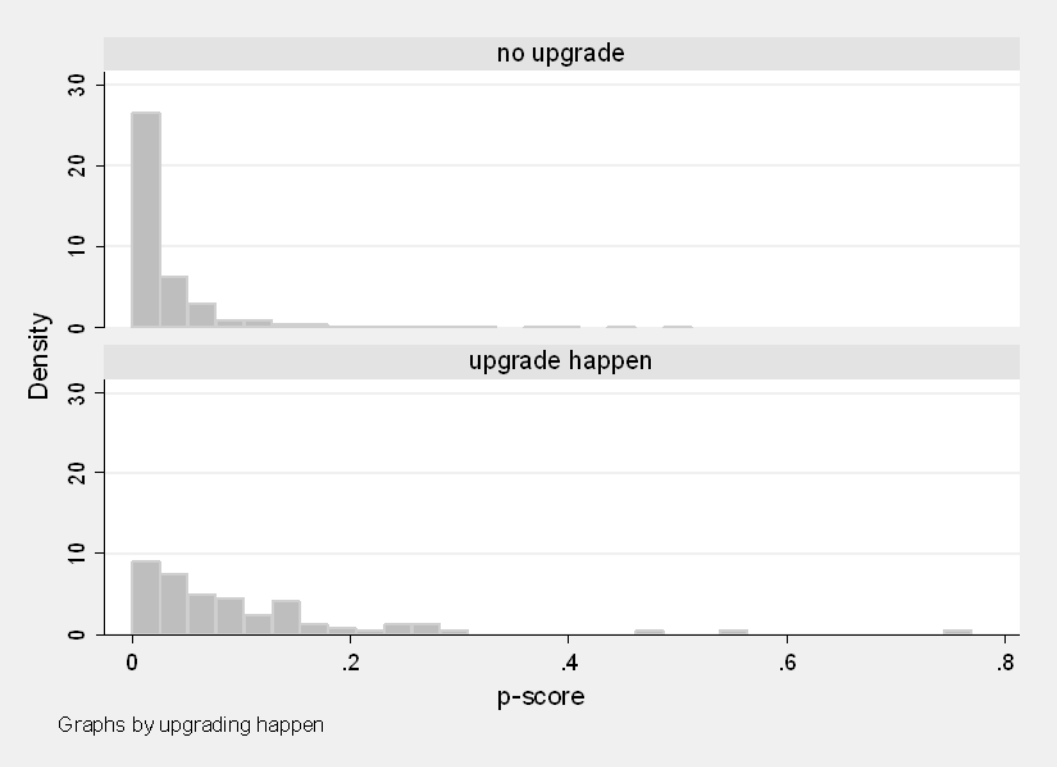
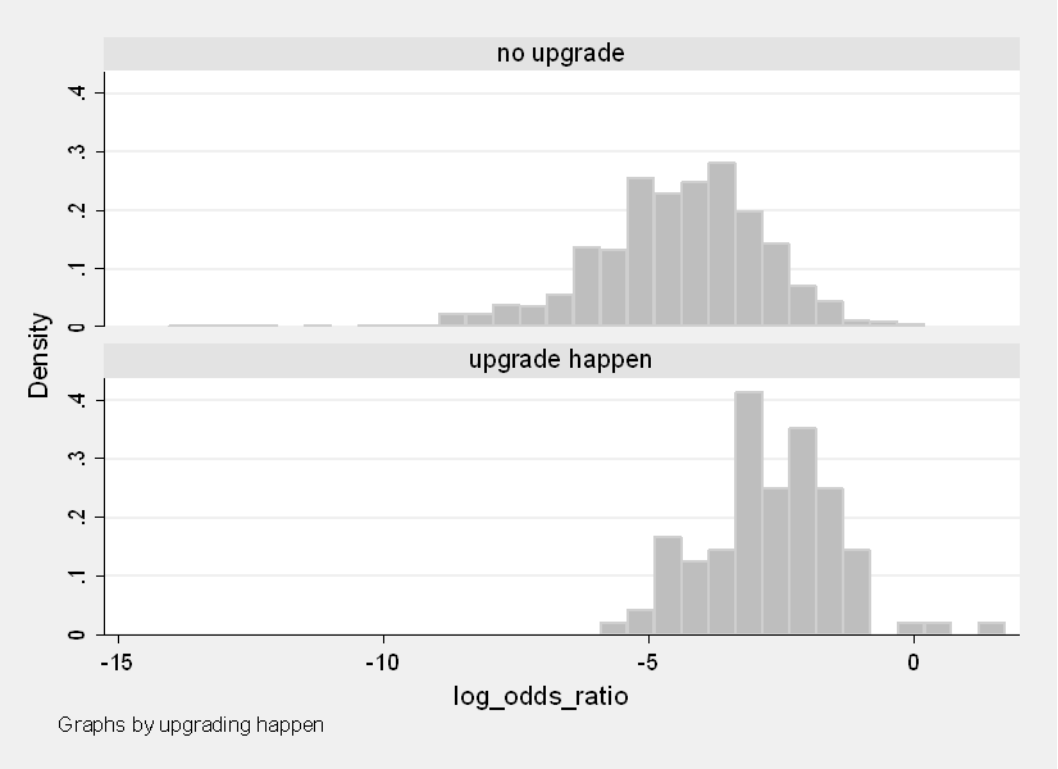


Figure 7. Histogram of log-odds ratio of propensity score



To check whether the conditioning variables used to construct the propensity score in equation (4) satisfy the conditional independence assumption, we performed a balancing test. The general idea was to test for differences in these variables between cities and counties after conditioning on the propensity score. This paper follows Smith and Todd (2005) to conduct a regression-based balancing test for each conditioning variable. For example, for growth rate *G*, we ran the following regression

$$G_{it} = \theta_0 + \theta_1 \hat{P}_{it} + \theta_2 \hat{P}_{it}^2 + \theta_3 \hat{P}_{it}^3 + \\ + \gamma_0 Upgrade_{it} + \gamma_1 Upgrade_{it} \hat{P}_{it} + \gamma_2 Upgrade_{it} \hat{P}_{it}^2 + \gamma_3 Upgrade_{it} \hat{P}_{it}^3 + e_{it} \quad (7)$$

where $\hat{P}$ is the estimated propensity score. We then tested H_0: $\gamma_0 = \gamma_1 = \gamma_2 = \gamma_3 = 0$. Failing to reject H_0 means that conditional on the polynomials of the propensity score, interactions of the treatment dummy with these polynomials have no additional impact on the conditioning variable. This suggests that the balancing condition is satisfied. The F-statistics for these tests are generally small, with p-values all greater than 0.1, suggesting that we cannot reject H_0. In sum, both the histograms and the balancing tests indicate that the conditional independence assumption and common support conditions are satisfied.
In estimating logit model (4) using data from 1994–1997, we obtained one propensity score for each jurisdiction-year observation. Thus, each county or city has multiple propensity scores. For a city, it is straightforward to keep the propensity score in correspondence with the treatment (i.e., the year when it was upgraded). For a county, propensity scores were kept for all four years and were treated as independent control observations in the actual matching. This allowed us to use all the information from the control group about the probability of receiving treatment in any of these years.

Matching Results

Table 9 shows the propensity score matching results for three variables that are available only for the post-upgrading period. The first variable, floor space per person, comes from the census data set. The estimate is not significant, suggesting that cities do not outperform counties. The other two variables come from the public finance data set.[16] We found that extrabudgetary revenues are significantly higher in cities relative to counties. Given that under a city status, local governments have more discretion over revenue collection, it is not surprising that they extract more revenues from sources out of the budget.

Table 9. Propensity score matching results

	Coefficient	T-ratio
Floor space per person in 2000	0.296	0.37
Extra-budgetary revenues (1999–2004)	970	6.0
Revenue from land (2000–2004)	333	2.4

Another outcome variable is the revenue from land. According to Zhang, Mount, and Boisver (2004) and Ping (2006), since the 1990s, industrialization and urbanization have driven up the demand for land and have dramatically increased land value (Lichtenberg and Ding, 2009). Thus, local governments have a strong incentive to convert agricultural land into nonfarm usage in order to generate more revenues. The result on land revenue shows that increased administrative authority brought by city status was indeed accompanied by more revenues from land.

Using DID propensity score matching method, we estimate the effect of city status on the change of values from 1990 to 2000. In addition, we performed a regression-adjusted matching, which controls for the same set of conditioning variables as in matching but uses a linear functional form. To do this, we ran an ordinary least squares (OLS) regression of the difference between 2000 values and 1990 values on the $Upgrade_i$ dummy and all the conditioning variables used to construct propensity score in the logit model. Table 10 shows the estimated coefficients and corresponding t-ratios. The outcomes are grouped into four categories: public goods and services, urbanization, immigration, and employment. For level variables, we have presented the estimates on their log values.

In terms of the provision of public goods, there is generally not much difference between counties and cities. The attending rate in secondary and above-level schools, the crude death rate, and the disability rate are not significant. In terms of (the reduction in) the illiteracy ratio, cities are doing even worse than counties, which could be caused by a lower initial value. The increase in the ratio of immigrants in total population is not significantly different between counties and cities. The percentage of population with an urban household registration status (*hukou*) grew faster from 1990 to 2000 in cities, which could reflect an expanded quota of urban household registration in cities. To shed light on the real urbanization level, it is necessary to examine urban employment, especially of those in the service sectors. We do find significant increase in the employment size of banking and insurance, real estate, health, education, and government in newly established cities. These results show that the title of city did bring some employment opportunity in some "modern" sectors. However, in many other sectors that are more important in terms of employment size, such as manufacturing, construction, transportation, and commerce, cities did not have a significantly larger increase in employment. Overall, the increase in the ratio of population being employed is not significantly different between counties and cities. The DID propensity score matching method even shows a negative coefficient for cities. In sum, these results on employment show that city status did not create more industrial sector jobs.

[16] The findings on extrabudgetary revenue and land revenue are also robust to the use of their log values as dependent variables.

Table 10. Difference-in-differences propensity score matching estimation

	Difference-in-differences (regression-adjusted matching)		Difference-in-differences propensity score matching	
	coefficient	**t-ratio**	**coefficient**	**t-ratio**
Education and health outcomes				
Illiteracy ratio (above 15 yrs)	0.0053	0.81	0.016	2.71***
Secondary and above education ratio (above 6 yrs)	–0.00086	0.58	–0.00026	0.14
Crude death rate	0.010	0.11	0.10	1.16
Disability rate	–0.0010	0.86	0.00037	0.33
Urbanization and immigration				
Urban population ratio	0.0048	1.15	0.010	1.76*
Immigrants ratio	0.0058	1.34	0.0048	0.79
Employment				
Employment ratio	0.016	1.06	–0.0025	0.18
Employment size by sector (1,000)				
Log(employment in agriculture)	–0.029	1.31	–0.044	1.55
Log(employment in mining)	–0.22	1.64*	–0.11	0.99
Log(employment in manufacturing)	0.069	1.26	0.066	1.24
Log(employment in electricity and water supply)	–0.063	1.06	–0.070	1.27
Log(employment in construction)	–0.026	0.30	0.025	0.29
Log(employment in geology)	0.14	1.19	0.056	0.45
Log(employment in transportation and storage)	–0.014	0.30	0.026	0.60
Log(employment in commerce)	0.0060	0.17	0.018	0.48
Log(employment in banking and insurance)	0.034	1.40	0.087	2.80***
Log(employment in real estate)	0.21	2.10**	0.089	1.05
Log(employment in social service)	0.036	0.68	0.055	1.14
Log(employment in health and sports)	0.071	2.50***	0.10	4.10***
Log(employment in education and culture)	0.027	1.00	0.057	2.83***
Log(employment in research)	–0.015	0.13	–0.077	0.67
Log(employment in government)	0.067	2.14**	0.092	3.02***

Note: Significance levels of 10%, 5%, and 1% are represented by *, **, and ***, respectively.

6. CONCLUSIONS

Using county-to-city upgrading as an example, this paper proposes an important reason for the underurbanization in China—the lack of a viable way to create cities. We employed several empirical methods to estimate the effect of city status, including difference-in-differences, propensity score matching, and DID propensity score matching methods. Our results have confirmed the expansion of government revenue and public employees after localities achieve city status. However, the economic growth rate falls in newly upgraded cities. Moreover, city status does not yield better performance of local public goods and services provision than county status, and fails to generate an agglomeration effect in promoting urbanization. The reason for this could be a lack of appropriate local government incentives after awarding them city status. In addition to our political economic explanation, lack of agglomeration due to the small size of cities could be another reason for their bad performance. This upgrading policy was called off by the central government in 1997. Since then, no more county-level cities have been established. Tens of thousands of small towns below the level of county thus bear the responsibility of providing nonagricultural employment. Accordingly, it is even harder to generate the agglomeration effect of urbanization. Thus, the underurbanization that has occurred since then is of no surprise.

Without a viable way of creating cities, China's urbanization process has slowed. Recently, promoting urbanization has been listed high on the policy agenda. The Eleventh Five Year Plan for 2006-2010 placed strong emphasis on the development of metropolitan regions across China.[17] The conventional thinking is to continue promoting migration so as to achieve the goal of urbanization (World Bank 2008). Our findings show that the central government should also reform the local governance structure to allow for a more natural emergence of new cities, so that economic density could be increased according to market needs. The recent practice of allowing local governments to exchange some entitlements, such as staff quota of policy officers, between the developed and lagging regions is one such example (Luo and Zhang 2009). Given the strong need of urbanization, more indigenous institutional innovations are needed to find a viable way of creating cities, which would also provide compatible incentives to local governments.

[17] Starting from the beginning of 2008, the "Urban and Rural Planning Law of the People's Republic of China" was enacted, substituting the old "Urban Planning Law of the People's Republic of China" that was enacted in 1990. The new law has dropped the guidance of "controlling the big cities" that was stated in the old law.

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IFPRI HEADQUARTERS

2033 K Street, NW
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Tel.: +1-202-862-5600
Fax: +1-202-467-4439
Email: ifpri@cgiar.org

IFPRI ADDIS ABABA

P. O. Box 5689
Addis Ababa, Ethiopia
Tel.: +251 11 6463215
Fax: +251 11 6462927
Email: ifpri-addisababa@cgiar.org

IFPRI NEW DELHI

CG Block, NASC Complex, PUSA
New Delhi 110-012 India
Tel.: 91 11 2584-6565
Fax: 91 11 2584-8008 / 2584-6572
Email: ifpri-newdelhi@cgiar.org