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Government Institutions and the Dynamics of Urban Growth in China

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Abstract

Economic growth in China in recent decades has largely rested on the dynamism of its cities. High economic growth has coincided with measures aimed at improving the efficiency of local governments and with a mounting political drive to curb corruption. Yet the connection between government institutions and urban growth in China is still poorly understood. This paper covers the gap by assessing the extent to which government institutions matter for urban growth and what their role is relative to more traditional factors behind growth in Chinese cities. Using panel data for 283 cities over the period between 2003 and 2014, the results show that urban growth in China is a consequence of a combination of favourable human capital, innovation, density, local conditions, foreign direct investment (FDI), and urban government institutions. Both government quality and the fight against corruption at the city level have a direct effect on urban growth. Measures to tackle corruption at the provincial level matter in a more indirect way, by raising or lowering the returns of other growth-inducing factors.

Keywords: Economic growth, cities, government efficiency, corruption, China

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Introduction

High rates of economic growth have made China the envy of the world. Between 1990 and 2014, China's average growth rate was 9.82 percent per annum, clearly outperforming the growth of most countries in the developed and emerging worlds. Much of this dynamism has been a consequence of the rapid growth of Chinese cities. Urban growth in the larger cities, such as Beijing, Shanghai, and Guangzhou, has outstripped average growth for the country, making Chinese large agglomerations—as predicted by most theories of urban economics—the main motors behind economic development.

The lofty economic dynamism of Chinese cities has attracted considerable scholarly and policy interest on what factors determine urban growth in China. In recent years, the number of studies has risen exponentially. Most of these studies have focused on elements that are at the heart of the main theoretical strands of urban economics. The location and accessibility of Chinese cities is one of those elements. Numerous studies have highlighted how being located close to the coast and/or having a better endowment of transportation infrastructure and, therefore, greater accessibility is crucial for urban economic growth (He and Pan, 2010; Bosker et al., 2012; Chen and Partridge, 2013; Brakman et al., 2016). The role of agglomeration and density has also been thoroughly scrutinised. Large and densely populated Chinese cities benefit from positive agglomeration externalities, which are still not offset by increasing levels of congestion and pollution (Au and Henderson, 2006; Chauvin et al., 2017). Finally, education and innovation have been at the centre of research. Like elsewhere in the world, Chinese cities represent a magnet for skills and innovation (Chen and Feng, 2000; Fleisher et al., 2010; Zhang and Zhuang, 2011; Liu, 2014; Li et al., 2015). The best Chinese human capital has flocked to metropolitan areas both in order to be able to attend the best universities, but also to find the best jobs and the best opportunities for personal progress. Pools of highly skilled labour in combination with large concentrations of firms facilitate knowledge circulation and, therefore, innovation.

Yet, one important factor behind the dynamics of urban growth in China has been fundamentally neglected by research so far: the role of government institutions in generating and enabling the development of economic activity in urban China. In spite of the fact that the quality of government institutions has taken centre stage in Chinese policy thinking in recent years and that local capacity and integrity initiatives have become more prominent across different parts of China (Gong, 2015), there is limited research on how government institutions shape urban growth. There have been a handful of exceptions (Cole et al., 2009; Nie et al., 2014; Zhang et al., 2015). However, on the whole, we know next to nothing about how the huge variability in government quality and in levels of corruption across Chinese cities and provinces affects the development of new economic activity—the direct effect of government institutions—or facilitates/undermines the returns of improvements in accessibility, investments in skills and innovation, and the development of agglomeration economies—the indirect effects.
The aim of this research is precisely to fill in this gap in our knowledge by asking two fundamental questions. First, to what extent do government institutions matter for urban economic growth in China? This will be achieved by looking at how levels of government efficiency and efforts at the city and provincial level to fight corruption are contributing to the fostering of economic dynamism of 283 of the 333 largest prefecture-level cities in China – cities in ethnic minority autonomous regions are excluded from the analysis because of lack of

sufficient data—during the period between 2003 and 2014. The paper also assesses how government institutions feature relative to the more traditional factors driving urban growth—local conditions, FDI, economies of agglomeration, skills, and innovation—in promoting the economic dynamism of Chinese cities.

Second, we distinguish between the direct and indirect effects of government institutions for urban growth. Do government institutions directly shape urban economic trajectories or do they do so by influencing factors known to be drivers of growth? This question will be answered by considering, in first place, government efficiency and the fight against corruption as direct inputs, much in the same way as improvements in human capital, innovation, local conditions, or agglomeration economies. The indirect effects of government efficiency and the fight against corruption will also be taken into account. Institutions will be, by means of interaction terms, viewed as facilitators/deterrents for the effectiveness of other growth-inducing factors. Improvements in government efficiency and in tackling corruption can enhance the returns of other drivers of urban growth. Conversely, policies aimed at improving human capital, technological and other local endowments can become ineffective in cities with low government efficiency or where corruption is rife (Crescenzi et al., 2016; Di Cataldo and Rodríguez-Pose, 2017).

The results of the analysis highlight how government institutions represent important direct and indirect drivers of urban growth in China. In particular, government efficiency and the fight against corruption at the city level have directly shaped the economic trajectory of Chinese cities in recent years. Differences in the fight against corruption across Chinese provinces have, in contrast, not left a direct trace. Their influence on urban growth has been indirect: cities in provinces where there has been less tolerance of corruption by public officials have seen the returns of improvements in human capital, innovation, social conditions, or agglomeration externalities increase, while this has been much less the case in areas of the country where there has been a more lax attitude towards provincial-level corruption.

The paper contains six sections. The introduction is followed by a review of the drivers of urban growth in China, paying particular attention to the limited amount of scholarly research that has considered government efficiency and other institutional factors. Section 3 looks at the stylised facts behind urban growth in China since the turn of the century, focusing on differences in wealth, economic dynamism, and in government institutional quality. In section 4 the description of the model and the structure of the dataset are followed by the empirical analysis. Section 6 presents the conclusions and some preliminary policy implications.

Understanding of Urban Growth in China

The Traditional Engines of Urban Growth

Which factors are perceived to be the main drivers of economic growth depend very much on the theoretical framework adopted. In most approaches, skills and technology are considered basic for the development of economic activity in cities. Cities represent fundamental pools of human capital and technologies which, put together, create the right environment for improvements in innovation, productivity, employment, and economic growth (e.g. Florida et al., 2008; Storper and Scott, 2009; Glaeser, 2011). The New Economic Geography has tended to underline a different combination of factors. Where a city is located and how big it is are crucial to understand and predict its growth potential. Large cities benefit from considerable scale economies and agglomeration externalities that attract talent, generate knowledge, and facilitate the circulation of knowledge and innovation (Fujita and Thisse, 2003; Duranton and Puga, 2004; Rosenthal and Strange, 2004; Duranton, 2015). In a similar way, urban economics has highlighted the roles of agglomeration and density for the creation of positive externalities that lead not only to higher levels of productivity (Combes et al., 2012), but also to more innovative, smarter, healthier, and happier cities (Glaeser, 2011).

Research on the drivers of urban growth in China has been highly influenced by these strands of scholarly literature. Different authors studying urban growth in China have put the emphasis on different factors. Education and innovation, for example, have featured prominently in recent research on urban China (e.g. Chen and Feng, 2000; Fleisher et al., 2010; Zhang and Zhuang, 2011; Luckstead et al., 2014). These works have used a combination of provincial- and firm-level data to bring to the fore how skills and, in particular, technological capacity—fuelled by either investment in research and development, science and technology, or patenting—have influenced urban economic trajectories across China (Lai et al., 2006; Chun-Chien and Chih-Hai, 2008).

Other authors (e.g. Bosker et al., 2012; Chen and Partridge; 2013; or Brakman et al., 2016) have stressed the role of location and accessibility using both firm-level and county-level data. In particular, Chen and Partridge (2013) evaluated the spread and backwash effects across the Chinese urban hierarchy between 2000 and 2010. They found that market potential in China's mega-cities was inversely related to growth in smaller cities and rural communities, while medium-sized cities had positive spread effects. Hence, the location of a city and, especially, its placement in the urban hierarchy determined to a large extent its economic future.

Some key authors in urban economics have brought to the fore how agglomeration and density (and the externalities generated by their combination) affect the economic performance of urban China. These studies have highlighted the net benefits of urban agglomeration economies for Chinese cities. The bigger the city, the bigger the benefit, meaning that many of the growth problems of Chinese cities in the interior are related to being undersized (Au and Henderson, 2006). From this perspective, nationally imposed, strong migration restrictions in the Hukou have created artificial market restrictions that prevented the growth of the most dynamic Chinese cities. This was considered to have had considerable consequences for overall growth across China, hindering the development of economic activity and resulting in significant income losses (Au and Henderson, 2006). Chauvin et al. (2017) delved into the importance of population density finding that the correlation between density, on the one hand, and earnings and economic performance, on the other, was strongest in China, relative to other large economies, such as Brazil, India, and the United States. Agglomeration and density also affect land rents and prices and the labour market condition: Zheng et al. (2006) found that the liberalization of the labour and land markets has been fundamental in explaining the diverse economic fortunes of Chinese cities.

Among other growth inducing factors, Zheng and Kahn (2013), Snow et al. (2016), and Lin (2017), have drawn attention to the role of infrastructure for city-level growth, while Deng et al. (2010), Ding and Lichtenberg (2011), and Bai et al. (2011) have underscored issues of land availability and land use. Trade and FDI have also featured in the literature. Levels of trade were found by Chen et al. (1995) and Liu et al. (2002) to have heavily influenced urban growth trajectories. Changes in world demand have also been at the heart of analyses of urban performance, with much of the income and population growth of Chinese cities over the past 30 years powered by variations in trade (Zheng et al., 2010).

Finally, sectoral structure and population dynamics have also been deemed to influence urban performance. According to Chen and Feng (2000), Chinese provinces with a greater presence of private and semi-private enterprises, a better endowment of higher education, and greater access to international trade became leaders in terms of economic growth. The growth of working-age population has been considered to undermine levels of per capita GDP growth (Golley and Wei, 2015).

Institutions and Urban Growth in China

Yet, despite the significant attention afforded to urban economic development in China, one basic factor that is generally acknowledged to determine the economic performance of territories has been overlooked by the literature: institutions. Institutions, in general, and government institutions, in particular, have played a negligible role in the burgeoning literature dealing with urban economic growth in China. There are multiple reasons for this. First, institutions are hard to define and most authors dealing with their role in economic development adopt rather different definitions of institutions (Gertler, 2010; Rodríguez-Pose, 2013). Second, institutions very often do not change much over time. Institutions of all types are particularly embedded in territories and shape their economic fortunes for lengthy time periods (Putnam, 1993; Acemoglu et al, 2001; Duranton et al, 2009). Third, notwithstanding the problems of definition, institutions are very hard to measure. Most researchers working on institutions have resorted to either 'objective' or 'subjective' measures of institutions, all of which have been hugely controversial. Hence, measuring government quality or the level of fight against corruption—to mention just a couple of important institutional factors that can shape urban development—is inherently shrouded in controversy.

These reasons potentially explain the lack of attention that scholars working on China—Chinese and otherwise—have paid to how government institutions affect urban development. However, growing residuals in economic growth equations are stressing that there is a need to delve deeper into the functioning of government institutions in order to better understand how cities, in general, and Chinese cities, in particular, grow.

The research that has tried to go into this field remains few and far between. To date, a few papers have looked at specific governance issues – and, especially, corruption – at firm-or individual-level. Nie et al. (2014), for example, explored the impact of corruption on local firms' total factor productivity (TFP), using firm-level data from 1999 to 2007. The impact of local corruption on productivity highly depended on the ownership structure of the firm. Corruption was deemed to have had no effect on state-owned firms while, somewhat surprisingly, leading to higher productivity in private firms. The negative effects of corruption on TFP were mainly felt in those firms with a larger ratio of fixed capital and in firms with a more complex structure of intermediate goods, which provided more opportunities for the emergence of corruption. Zhang et al. (2015) focused on the impact of corruption on the individual. They studied how corruption affected individual incomes based on a survey data for China in 2008, in combination with World Bank 2005 survey data. They reported that corruption greatly reduced income by decreasing the returns to education of residents in urban areas and increasing the returns for those living in rural areas. Choi et al. (2015) found a positive relationship between government quality at provincial level and firm performance, while Reinecke and Schmerer (2017) provided evidence to support the link between provincial government efficiency and firm-level exports.

The research that has ventured into the institutional minefield from a purely territorial perspective has been far less common. Cole et al. (2009) were the pioneers. They examined the impact of government efficiency and anti-corruption measures on FDI location in China using provincial-level data from 1998 to 2003. They showed that high levels of government efficiency and efforts to fight corruption drew considerable amounts of FDI to the provinces that had made the biggest strides in this respect. Tang et al. (2014: 151) pointed out that government efficiency at the provincial level was "an important factor in strengthening the regional economy," although they considered the direction of causality problematic.

Hence, there is a considerable gap in our knowledge about the extent to which differences in government quality and in the will to fight corruption affect the economic fortunes of Chinese cities. To the extent of our knowledge, there are no previous studies that have focused on government institutions using urban growth as dependent variable. There have been some attempts at dealing with institutional quality and economic growth at provincial level—such as the above-mentioned papers by Cole et al. (2009) and Tang et al. (2014)—but none considering the urban component.

In this paper we address this gap in existing knowledge by looking at two types of effects that can be associated with the relationship between government institutions and economic growth. The first is the direct link between institutions and economic activity. According to North (1990), institutions are the rules of the game that shape human activity. Government institutions, in particular, affect how different economic factors interact in space and can therefore generate trust or mistrust and determine transaction costs in different environments. Efficient governments and low levels of corruption therefore represent powerful incentives for economic activity (Ahrend et al., 2017). By contrast, inefficient governments and high levels of corruption increase transaction costs and discourage interaction. In this respect, government institutions are as much of a direct factor driving urban economic growth as skills, innovation, or infrastructure endowments.

Government institutions can also influence economic performance at city level in a more indirect way. In the presence of inefficient governments and high levels of corruption the returns to skills, innovation, and better accessibility can be seriously weakened. Corruption contributes to non-transparent labour markets in which employment and the use of skills are often related not to merit but to personal connections and the presence of clientelistic and nepotistic networks (Di Cataldo and Rodríguez-Pose, 2017). This can drive talent away from the labour market and lead to migration and brain drain. Similarly, inefficient governments will deliver ineffectual and/or wasteful policies, thus undermining the returns of any other type of investments conducted at the local level.

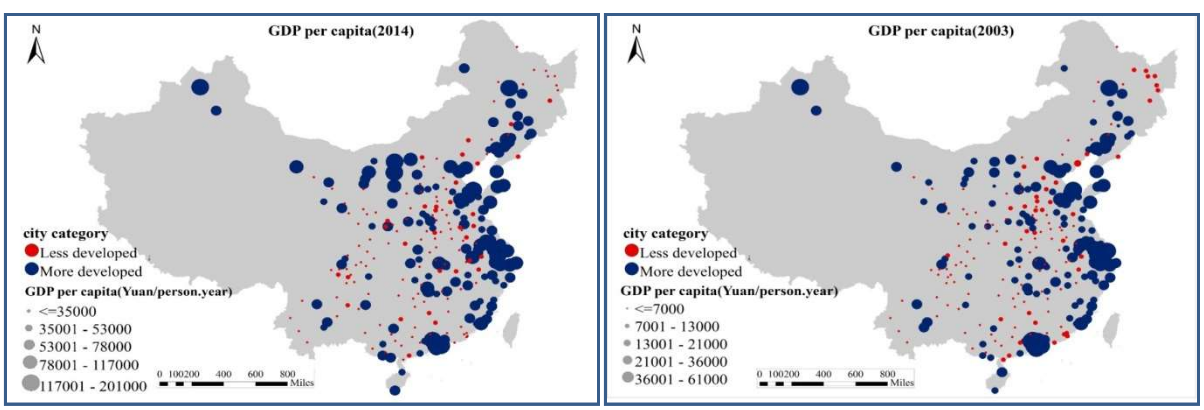
In this paper we examine both direct and indirect mechanisms by looking at how the government efficiency of different cities in conjunction with efforts to curb corruption both at the city and the provincial level affect urban economic performance in China.

Urban Growth in China: Some Stylised Facts

China is the urban 'champion' of the world. The country has witnessed the biggest urban transformation ever: between 1980 and 2010, the urban population in China rose by 480 million (Wong, 2013: 273). It also boasts the largest concentration of cities in the world. Among a total of 548 agglomerations in the world of more than 1 million people, 103 are located in China (citypopulation.de, 2017). The country also hosts the largest agglomeration (Guangzhou, with more than 48 million) and the third largest agglomeration (Shanghai, with more than 31 million) (citypopulation.de, 2017). Eight further cities—including Beijing, Tianjin, Xiamen, Chengdu, Hangzhou, Shantou, Wuhan, and Shenyang—are among the 50 largest metropolises in the world (citypopulation.de, 2017).

The geographical distribution of cities in China is, however, very uneven, both in terms of population and wealth. The largest agglomerations in China are located in the most accessible places: mainly on the eastern seaboard and along the main Chinese rivers: the Yellow River, the Yangtze River, and the Pearl River. Smaller agglomerations tend to be located further away from the coast in inland provinces such as Karamay in Xinjiang province (0.39 million people in 2014) or Jiayuguan in Gansu province (0.24 million people in 2014). This distribution mirrors, to a large extent, the division between rich and poor cities. The richest Chinese cities—pictured in a darker colour in Figure 1—are located along the coast, in the northeast, and along the course of the rivers. Both in the case of the urban hierarchy and the wealth of cities there was relatively little change between 2003 and 2014, the period covered in the analysis (Figure 1).

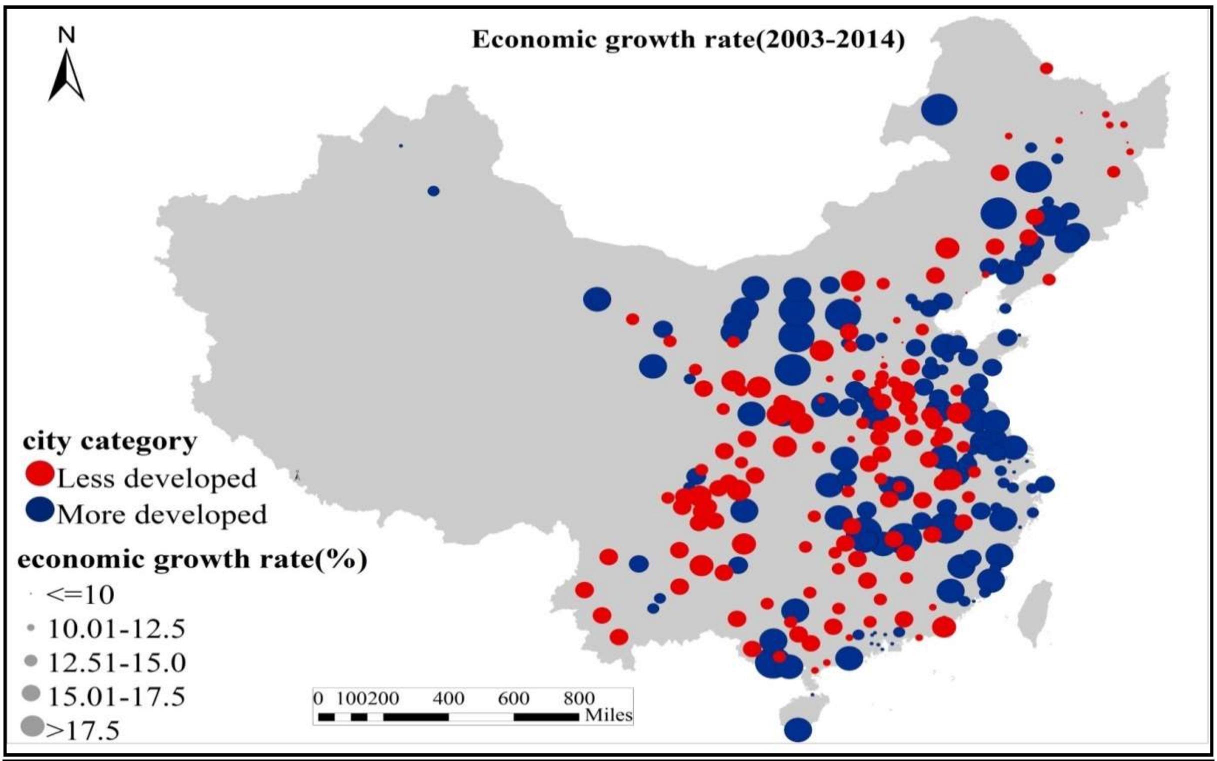
Figure 1. Cities in China by GDP Per Capita (2003 – 2014)



Source: Own elaboration using China City Statistical Yearbook data.

The core/periphery distribution in terms of urban size and wealth is, however, not replicated by urban growth rates during the period considered. As shown in Figure 2, many of the more developed cities did rather well in economic terms, but quite a large number—fundamentally cities along the Pearl River and Yangtze River deltas—had growth levels well below average. The same variety in economic performance can be observed among the less developed cities at the beginning of the period. Whereas a number of relatively less well-off cities in lagging behind provinces, such as Yulin (Guangxi province, average growth rate: 27.97 percent), Erdos (Inner Mongolia: 20.9 percent), Chaoyang (Liaoning province: 20.32 percent), or Liupanshui (Guizhou province: 20.16 percent) performed extremely well during the period of analysis, other less developed cities, such as the Guangdong province cities of Dongguan (average growth rate: 1.46 percent) and Zhuhai (6.20 percent), were among the poorest performers. Other cities in richer areas, such as Hengshui in Hebei (9.04 percent) and Qitaihe (9.16 percent) in Liaoning, had indistinct economic performances relative to the rest of the country (Figure 2).

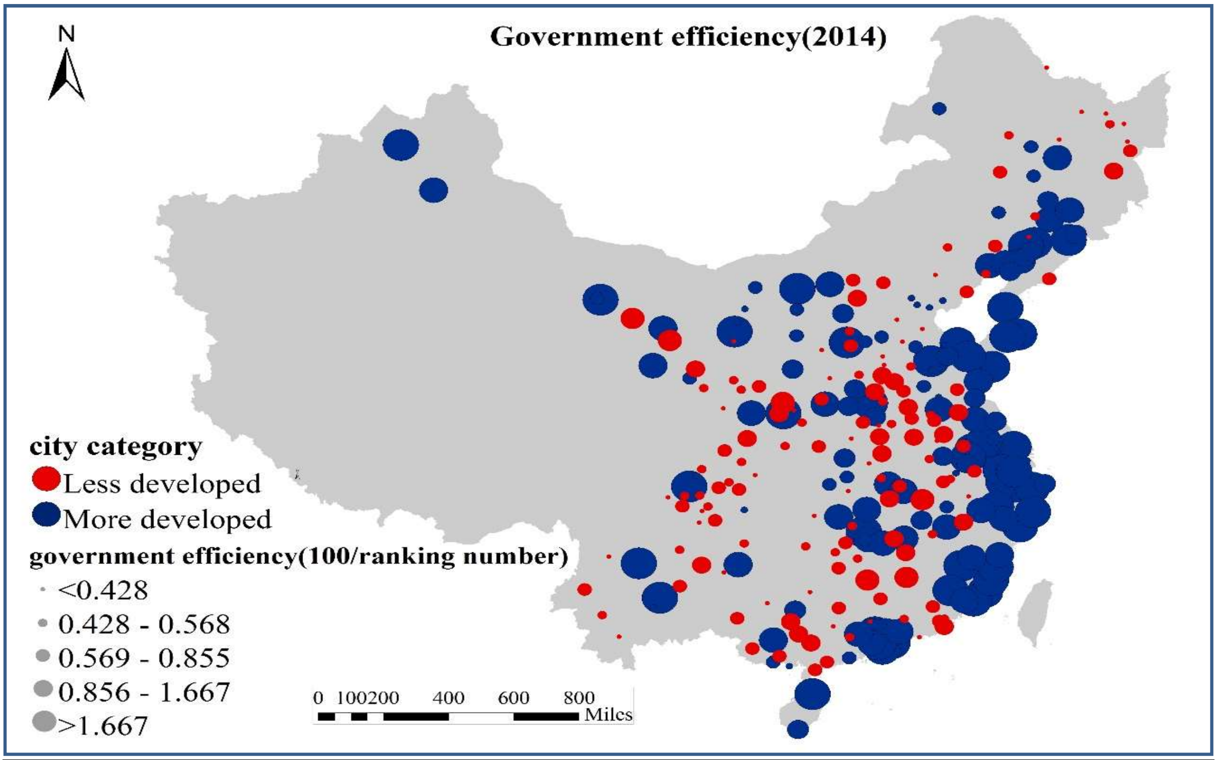
Figure 2. Urban Economic Growth Rate (2003 – 2014)



Source: Own elaboration using China City Statistical Yearbook data.

If we consider institutional quality, its distribution across cities in China differs significantly, depending on whether government efficiency or attempts at controlling corruption are considered. In terms of government efficiency, there is a strong correlation between wealth and good government. Most of the cities that top the government efficiency ranking are well-off cities located along the coast. From Harbin, in the northeast to Haikou, on the southern island of Hainan, the majority of coastal cities have levels of government efficiency clearly above average. Some large and relatively wealthy cities in the interior, including, Kunming, Xi'an, Tongchuan, Changsha, Karamay, Taiyuan, Baotou, or Ganzhou, also score relatively well in the government efficiency ranking (Figure 3). By contrast, low government efficiency is the norm along an axis that covers the first ring of inland cities beyond the coast. This ring includes, to name a few, Hebi, Zhangjiajie, Lvliang, Ezhou, Baoding, Luohe, Dazhou, or Wuzhong, cities that are mostly located in Hebei, Henan, Anhui , Hunan, Hubei, and Guangxi provinces. Low government efficiency is also in evidence further inland in Sichuan, Ningxia, and Gansu provinces (Figure 3). This geographical distribution of urban government efficiency mirrors that proposed by Tang et al. (2014) at provincial level.

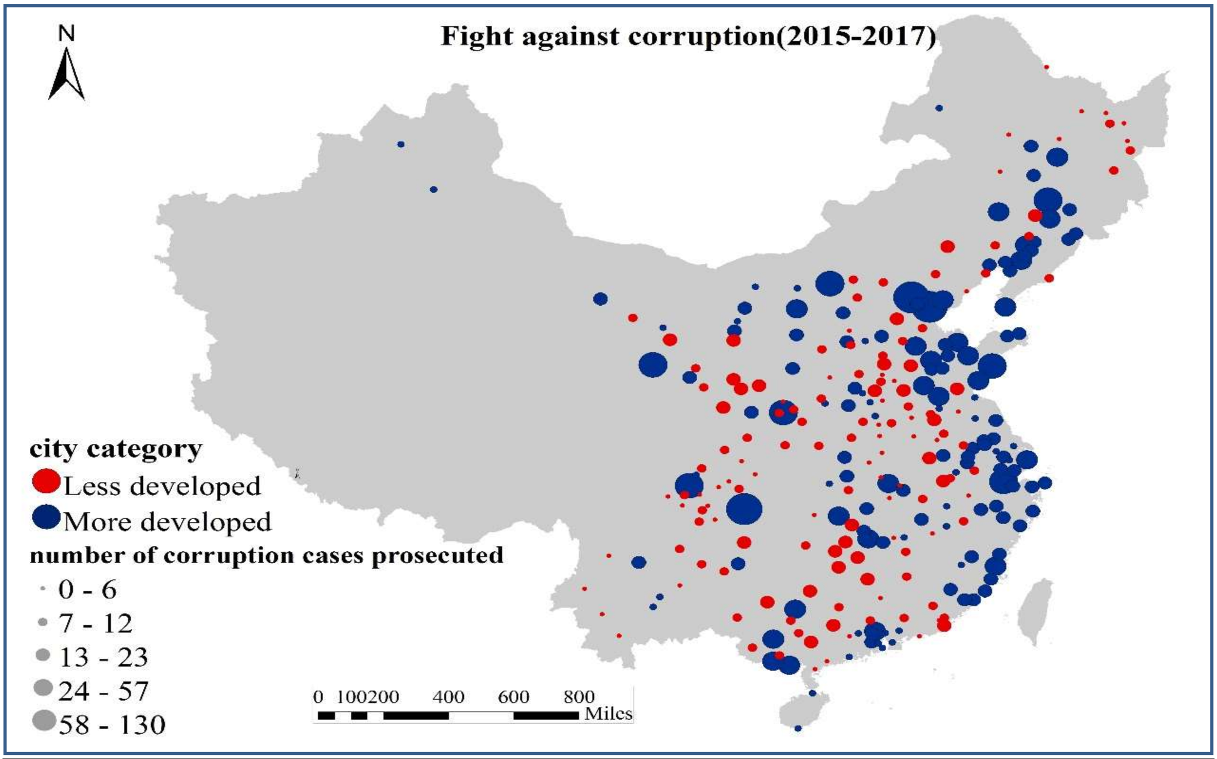
Figure 3. Government Efficiency



Source: Own elaboration using data from the Research Report of Local Governments' Efficiency in China 2016. Science Press. Beijing

The core/periphery pattern is, however, not reproduced in terms of the fight against corruption. While some of the most developed cities like Beijing, Tianjin, and Qingdao top the rankings in the number of corruption cases brought to justice, many wealthy cities in Guangdong or Jiangsu provinces, such as Dongguan, Zhanjiang, Shaoguan, Suzhou, Suqian, and Lianyungang, had lower levels of prosecution than some of less developed cities in Jilin or Qinghai provinces, such as Changchun, Liaoyuan, and Xining (Figure 4). Hence, the fight against corruption was more evenly spread across the economic development spectrum than government efficiency.

Figure 4. Fight Against Corruption



Source: Own elaboration using corruption prosecution data from http://www.ccdi.gov.cn/

Model, Data, and Econometric Strategy

Model and Data

What drives urban growth in China? In order to answer this question we resort to analysing the different potential urban growth drivers in China, while paying particular attention to the direct and indirect role of government institutions on urban growth. A simple endogenous growth model in which economic growth is explained by the endowments of human capital, innovation and technology, density, FDI, and local conditions—the 'social filter' (Fagerberg, 1988; Rodríguez-Pose and Villarreal-Peralta, 2015)—is proposed.

The model adopts the following form:

$$\Delta lnGDPpc_{i,t} = \alpha + \beta_1 lnGDPpc_{i,t-1} + \alpha_1 lninno_{i,t-1} + \alpha_2 hc_{i,t-1} + \alpha_3 density_{i,t-1} + \alpha_4 lnpopu_{i,t-1} + \alpha_5 socialfilter_{i,t-1} + \alpha_6 FDI_{i-1} + \alpha_7 institutions_i + \nu_t + \varepsilon_{it} \quad (1)$$

where

$\Delta lnGDPpc_{i,t} = lnGDPpc_{i,t} - lnGDPpc_{i,t-1}$ is the dependent variable and depicts the economic growth rate measured by the change in the natural logarithm of GDP per capita from time t-1 to time t in city i;

$\Delta lnGDPpc_{i,t} = lnGDPpc_{i,t} - lnGDPpc_{i,t-1}$ represents the natural logarithm of GDP per capita at time t-1 in city i. The initial GDP per capita is used as an indicator of the degree of wealth of the city, as a means to assess if initial city wealth influences subsequent economic performance – and, in the process, identify potential urban convergence or divergence trends;

$lninno_{i,t-1}$ represents a proxy for the innovation output of city i at time t-1. Innovation is proxied by the natural logarithm of patent applications per capita;

$hc_{i,t-1}$ depicts the human capital endowment at time t-1 in city i, proxied by the average schooling years of the population;

$density_{i,t-1}$ is the population density at time t-1 in city i. Density represents a measure of positive urban externalities regularly used in the urban economics literature (e.g. Charlot and Duranton, 2004; Nakamura, 2006; Crescenzi et al., 2012);

$lnpopu_{i,t-1}$ is the natural logarithm of the population of city i at time t-1, which is traditionally used in the literature as a proxy for urban agglomeration (e.g. Fujita et al., 1999; Au and Henderson, 2006; Castells-Quintana and Royuela, 2014);

$socialfilter_{i,t-1}$ represents the social filter of city i at time t-1. The social filter is a composite index resulting from combining a unique set of social and structural elements that may facilitate or deter the development of economic activity in a given place (Rodríguez-Pose, 1999: 82). The social filter used in the analysis includes indicators of demographic structure (share1524 or the share of the population between 15 and 24 as a share of the total population in city i), sectoral composition (shareagri or the employment share in the agricultural sector in city i), use of human resources (unemp or the unemployment rate in city i), and ownership structure (sharepri or the share of employment in private firms in city i, including the self-employed). The composite social filter index is created by means of Principal Component Analysis (PCA). The test results for the first Principal Component Analysis are reported in Table A-5 in the appendix;

FDI_{i-1} stands for the percentage of the local economy dependent on foreign direct investment, proxied by the value of FDI as a share of GDP at time t-1 in city i.

ν_t is a time-dummy; and

ε_{it} is the error term.

The main independent variables of interest refer to proxies of government institutions. These appear in the model as:

$institutions_i$ which portray the quality of government institutions in city i. Three different indicators for institutions are used in the analysis. The first one is the 'government efficiency index' for prefectural cities in 2016. The data are derived from a ranking of the efficiency of city governments at prefectural level in China in 2016 (Academy of Government, 2016; Tang and Zhu, 2017), which propose a composite city-level government efficiency index evaluating four dimensions of government efficiency: a) public services (weight=0.55); b) government scale

(0.2); c) national welfare (0.1); and d) transparency of government affairs (0.15). A total of 36 different variables are included in these four categories (greater detail about the individual components included in this index can be found in Table A-3 in the appendix). The resulting index is transformed into a ranking of government efficiency for each Chinese city. The inverse of the ranking number for each city is included in the analysis as an indicator of overall city-level government efficiency index. The higher the value of the variable, the higher the government efficiency attributed to any particular Chinese city.

The second proxy for government institutions reflects one of the main policy drivers aimed at improving institutional quality across China in recent years: the fight against corruption. The fight against corruption at the local level in China has acquired greater prominence in recent years. The central government in Beijing is increasingly holding local governments more accountable for integrity management (Gong, 2015) and for tackling corruption. However, the variety of local government responses in this field remains striking. The fight against corruption is represented by two different variables in the analysis: one at city level and the other at provincial level. At city level, it is measured by the number of corruption cases prosecuted in each individual city between November 2015 and July 2017—the only period for which public data were available at the time of collection. The data stems from a website set up by the Chinese government with the aim of increasing transparency and disclosing potential corruption cases among civil servants for each city on a monthly basis. By measuring the total number of corruption cases prosecuted in each city, we are able to get a proxy about how seriously local authorities are tackling corruption amongst their employees. By measuring the total number of corruption cases prosecuted in each city, we are able to get a proxy about how seriously local authorities are tackling corruption amongst their employees.

The fight against corruption is also considered at the provincial level. Provinces have been crucial factors in the drive to curb corruption in China, but the zeal with which different provinces have tried to address corruption varies significantly from one province to another (Dong and Torgler, 2013). As the Chinese administrative system works as a nested hierarchy (Wong, 2009), city-prefectures interact mostly upstream with provincial governments. This implies that what happens at provincial level in terms of confronting corruption is bound to have an influence at the city level. We use the number of criminal cases involving civil servants per 100,000 public officials as a means to measure differences in the stress put by provinces to fight corruption. We expect that, given the size of Chinese provinces, the connection of this variable with urban growth will be lower than that of tackling corruption by local authorities. However, it is often the case that measures against corruption at a provincial level set the tone for similar proceedings in the cities within a given province. Hence, the association between fighting corruption at provincial level and city economic growth can be expected to be weaker and more indirect than that of fighting corruption at city level.

The names of variables with their units of measure and data sources can be found in Table 1. Table A-1 in the appendix lists the descriptive statistics of the main variables.

Table 1. Definition and Source of Variables

Variables	Name	Measurements	Data availability	Data Source
Dependent variable				
economic growth rate	ΔlnGDPpc	Change in the natural logarithm of GDP per capita	prefectural level	China City Statistical Yearbook
Explanatory variables				
Economic and socioeconomic variables				
innovation	patents	Natural logarithm of share of patent applications per 10,000 inhabitants	prefectural level	SIPO (State Intellectual Property Office of the P.R.C)
human capital	human capital	Average schooling years of the population above 6	prefectural level	China Population Census Data (2000/2010).
density	density	Population density (10,000 inhabitants per square kilometre)	prefectural level	China City Statistical Yearbook
agglomeration	population	Natural logarithm of the population at year-end (10,000 inhabitants)	prefectural level	China City Statistical Yearbook
social filter index	social filter	Socio-economic structure of the region, including demographic structure, sectoral composition, use of resources, and ownership structure	prefectural level	China Population Census Data (2000/2010); China City Statistical Yearbook; Own elaboration
FDI	FDI	Realised value of FDI as a share of GDP, US dollars are converted to RMB yuan based on annual average exchange rate	prefectural level	China City Statistical Yearbook
Institutional variables				
government efficiency	gov efficiency	Inverse of government efficiency rank 2016(100/rank number)	prefectural level	Research Report of Local Governments' Efficiency in China 2016. 2016. Science Press. Beijing
fight against corruption(city)	fcorruption(city)	Number of corruption cases prosecuted between November, 2015 and July, 2017.	prefectural level	http://www.ccdi.gov.cn/
fight against corruption(city)	fcorruption(province)	number of criminal cases involving civil servants per 100,000 public officials	provincial level	Procuratorial Yearbook of China; http://china.caixin.com; China City Statistical Yearbook

All explanatory variables in the model are lagged by one year, providing a panel data structure. The data in this study cover 283 cities over 2013-2014 period. We thus assume that economic growth is the result of past endowments and of investments aimed at promoting economic growth in Chinese prefectures. There are two exceptions to this rule. The data for government efficiency and the fight against corruption at city level is only available for one period of time, 2016 for the former and 2015-2017 for the latter. This reflects a lack of panel data for most government institution indicators. Institutional data is hard to come by and even harder to trace back in time. Lack of this type of institutional data forces us to assume that the efficiency of city governments and efforts to fight corruption in China have not varied greatly during the period of analysis. While this assumption implies certain risks, many authors working on the importance of institutions for economic development have highlighted that institutional quality in a given place changes very slowly with time, if at all. This is, for example, the case of Putnam (1993), who stresses that the institutional problems that have dragged down levels of development in the

Italian South were already generated in the Middle Ages. Similarly, Acemoglu et al. (2001) indicate that the differences in development in the Americas are rooted in colonial government institutions. And Duranton et al. (2009) go even further by emphasising that the family structures that emerged from the fall of the Roman Empire still determine differences in levels of development across European regions today. Hence, it can be considered reasonable to assume that Chinese cities that had more efficient governments which were keener on pursuing corruption in 2003, remained so until the end of the period of analysis.

Econometric Strategy

The use of two time-invariant independent variables has implications for the econometric approaches that can be adopted. The inclusion of the variables depicting government efficiency and the fight against corruption at the city level rules out the possibility of conducting fixed effects panel data analysis. Two alternatives are employed. First, the regression is run using panel data with random effects, which allows for the introduction of time-invariant variables. Second and more importantly, we resort to a Hausman-Taylor (HT) estimation as our main econometric strategy.

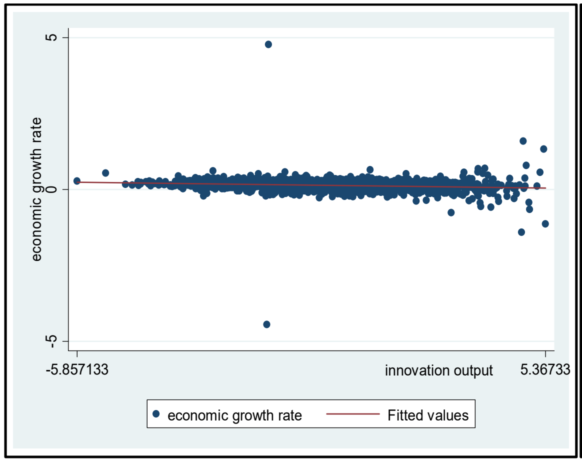
The HT basically represents a blending of a fixed- and a random-effects estimator. The advantage of the model is that for all time-varying indicators included in the analysis, the resulting coefficients are similar to those of panel data, fixed effects models. This is a consequence of relying on the within transformation of each variable for which panel data are available to compute consistent coefficients (Baltagi et al., 2003). The advantage of HT econometric methods relative to fixed effects panel data analysis is that it allows the estimation of coefficients for time-invariant variables and uses the other regressors as instruments for the calculation of the coefficients for the time invariant variables. As the two time invariant institutional government variables are exogenous, the expectation is that the coefficients derived from the analysis are not biased.

What Drives Urban Growth in China?

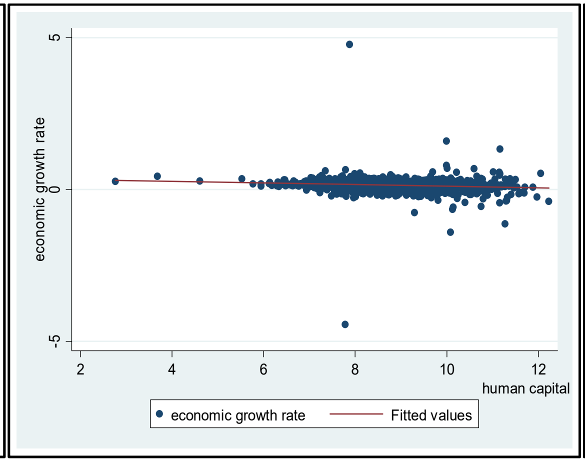
More skills, innovation, better local conditions, or more density on their own are not sufficient to generate the high levels of urban economic growth that China has experienced over the last decade and a half. In Figure 5 each of the key independent variables in the analysis—depicting the factors that may spur urban growth—is plotted against urban economic performance between 2003 and 2014. In all cases, the regression lines are virtually flat. This signals that neither human capital, nor innovation, density, government efficiency, the fight against corruption, or a combination of local conditions (the social filter) on their own can explain why some cities have had better economic trajectories than others in China (Figure 5). Indeed, not a single factor seems to propel Chinese urban growth during the period of analysis.

But is Chinese city growth the result of a combination of all these factors? And what role do government institutions play at the local level? These are precisely the questions that the econometric analysis addresses. In Table 2 we present the results of the random effects panel data analysis and that of the Hausman-Taylor estimations.

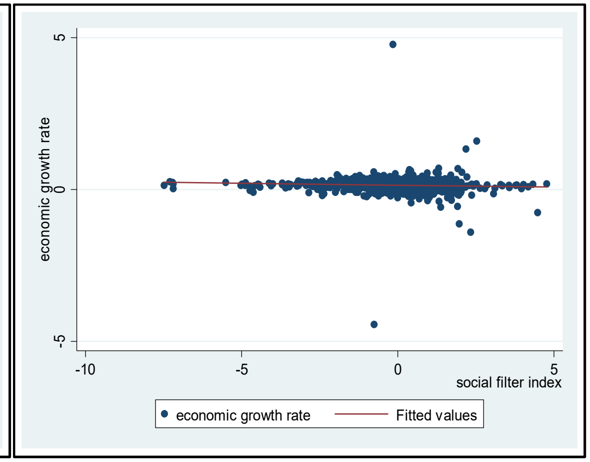
Figure 5. Individual Correlations Between Potential Growth Drivers and Urban Economic Performance (2003 – 2014)



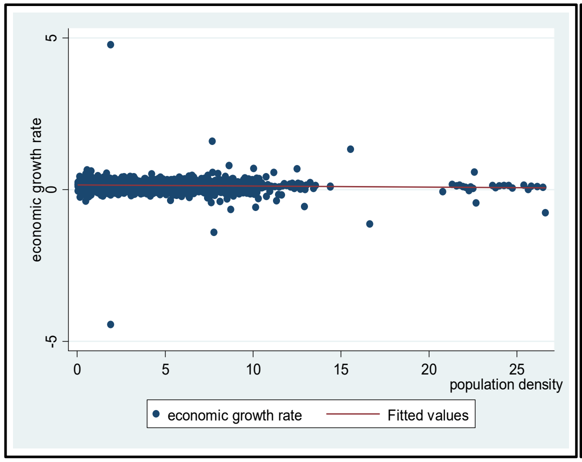
Innovation



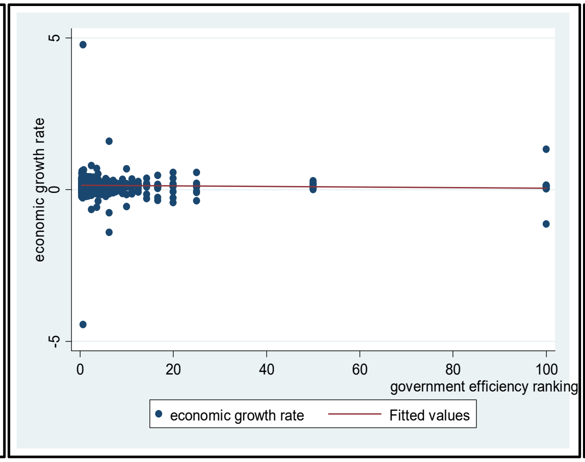
Human capital



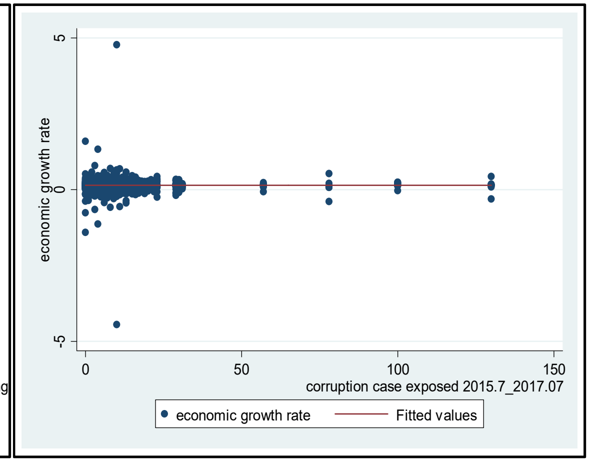
Social filter



Density



Government efficiency



Fight against corruption

The coefficients of Table 2 show that urban growth in China is indeed the outcome of a combination of multiple factors that, put together, drive economic activity and economic growth in Chinese cities. The coefficients for innovation (patenting) and human capital are strongly positive and significant regardless of the econometric method used. They are also robust to the introduction of different government institution proxies (Table 2). The variables for density and the social filter—depicting the overall socio-economic environment in any given Chinese city—are positive and strongly significant in the Hausman-Taylor estimations (Table 2, Regressions 4 to 6). These results are robust to the decomposition of the social filter into its four components – the share of private firms, the percentage of population working in the agricultural sector, the share of population between 15 and 24, and the unemployment rate (Table A-2). The coefficients for all the components of the social filter have the expected sign: positive and significant for the share of private firms; negative and significant for the share of agricultural workers; insignificant for the share of young population; and negative and significant for unemployment rate (Table A-2). The coefficients for FDI are positive and statically significant in all regressions in Table 2.

Table 2. Determinants of Economic Growth, 2003-2014

	(1) Random effects	(2) Random effects	(3) Random effects	(4) Hausman Taylor	(5) Hausman Taylor	(6) Hausman Taylor
GDP per capita	-0.126***	-0.125***	-0.116***	-0.561***	-0.560***	-0.536***
	(0.007)	(0.007)	(0.007)	(0.013)	(0.013)	(0.013)
patents	0.021***	0.020***	0.021***	0.021***	0.023***	0.014***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)	(0.005)
human capital	0.017***	0.016***	0.018***	0.052***	0.053***	0.046***
	(0.005)	(0.005)	(0.005)	(0.010)	(0.010)	(0.010)
density	-0.001	-0.000	0.000	0.012***	0.015***	0.015***
	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)	(0.004)
population	-0.020***	-0.024***	-0.021***	-0.140***	-0.167***	-0.163***
	(0.005)	(0.005)	(0.005)	(0.028)	(0.029)	(0.029)
social filter	0.003	0.004	0.001	0.015***	0.015***	0.006
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)
FDI	0.004***	0.003**	0.003**	0.009***	0.009***	0.008***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
gov efficiency	0.000			0.010***		0.010***
	(0.000)			(0.003)		(0.002)
fcorruption(city)		0.001***			0.006***	0.011***
		(0.000)			(0.002)	(0.003)
fcorruption(province)			-0.024			0.003
			(0.043)			(0.056)
constant	1.349***	1.359***	1.261***	6.231***	6.311***	6.082***
	(0.083)	(0.083)	(0.082)	(0.228)	(0.232)	(0.230)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2888	2932	2845	2888	2932	2802
Cities	283	283	283	283	283	283
F				133.922	133.386	113.490

Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Hence, the most dynamic Chinese cities have grown as a result of a better endowment of skills, a greater capacity to innovate, better local social economic conditions, larger inflows of FDI, and more positive externalities derived from density.

The government institution variables are also connected to urban economic growth. In particular, the overall index of government efficiency and the fight against corruption at city level are all positively associated with economic growth and, with the only exception of government efficiency in Regression 1 (Table 2), significant at the 1 or 5 percent level. Cities with more efficient, transparent, capable, and accountable governments perform better. Similarly, the deeper the fight against corruption became at the local level, the greater the benefits in terms of economic growth. The only government institution variable that is not connected with growth in any way is the fight against corruption at provincial level. The coefficient is positive but insignificant in both the random effects and the Hausman-Taylor estimations (Table 2, Regressions 3 and 6). This may be the consequence that, in a country like China with provinces that are far larger than most European states, the efforts by provincial governments to curb corruption may be ineffectual at the local level. There may therefore be a greater need—as indicated by the positive and significant corruption coefficient at the city level—to conduct the fight against corruption locally. However, the introduction of the fight against corruption at provincial level in Table 2, Regression 6 lowers significantly the connection between the social filter variable and city-level economic growth. It may thus just be the case that, while government efficiency and the fight against corruption at the local level have a direct effect on economic growth, measures aimed at confronting corruption at the provincial level have a more indirect, subtler effect. A reduction of corruption at the provincial level may well affect the returns of other factors behind urban growth in China.

In order to check whether this is the case, we conduct the same regression introducing interaction terms between the fight against corruption at the provincial level and the four key factors—innovation, human capital, density, and the social filter—that were identified in Table 2 as fundamental drivers of urban growth in China.[1] As can be seen from the results of the analysis (Table 3), the introduction of the interaction terms in the Hausman-Taylor estimations does not generally affect the coefficients of the principal variables. The fight against corruption at the province level remains mostly insignificant, while the coefficients for patenting, human capital, density, and the social filter, with only a few exceptions, remain positive and significant. The association between the two other institutional variables and economic growth is also positive and significant throughout.

[1] The same exercise was conducted for the government efficiency and the fight against corruption at city level variables yielding non-significant results. This implies that these two city level institutional indicators mainly exercise a direct influence on urban growth.

Table 3. Determinants of Economic Growth, Add Interaction Terms

	(1) Hausman Taylor	(2) Hausman Taylor	(3) Hausman Taylor	(4) Hausman Taylor	(5) Hausman Taylor
GDP per capita	-0.536***	-0.537***	-0.544***	-0.543***	-0.538***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
patents	0.014***	0.014***	-0.028***	0.010**	0.015***
	(0.005)	(0.005)	(0.009)	(0.005)	(0.005)
human capital	0.046***	0.050***	0.055***	-0.013	0.047***
	(0.010)	(0.010)	(0.010)	(0.014)	(0.010)
density	0.015***	0.016***	0.016***	0.016***	-0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)
population	-0.163***	-0.165***	-0.168***	-0.159***	-0.167***
	(0.029)	(0.029)	(0.029)	(0.028)	(0.029)
social filter	0.006	-0.027**	0.006	0.005	0.007*
	(0.004)	(0.011)	(0.004)	(0.004)	(0.004)
FDI	0.008***	0.007***	0.006***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
gov efficiency	0.010***	0.010***	0.011***	0.010***	0.010***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
fcorruption(city)	0.011***	0.011***	0.011***	0.011***	0.011***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
fcorruption(province)	0.003	0.032	0.047	-2.686***	-0.274***
	(0.056)	(0.057)	(0.056)	(0.454)	(0.082)
sf*fc(province)		0.119***			
		(0.036)			
patents*fc(province)			0.145***		
			(0.026)		
hc*fc(province)				0.313***	
				(0.052)	
density*fc(province)					0.085***
					(0.018)
constant	6.082***	6.052***	6.097***	6.634***	6.176***
	(0.230)	(0.230)	(0.230)	(0.243)	(0.229)
Year dummies	Yes	Yes	Yes	Yes	Yes
Observations	2802	2802	2802	2802	2802
Cities	283	283	283	283	283
F	113.490	108.803	110.951	110.929	109.443

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

All coefficients for the interaction terms between the fight against corruption at provincial level and the four key drivers of urban growth in China are positive and significant at the 1 percent level. How can this be interpreted? The positive for coefficients for the interaction terms signal that improvements in the social filter, innovation, human capital, and density at city level in China yield significantly larger returns in those provinces where the fight against corruption has been pursued in a more earnest way. This is particularly the case for the social filter index, where a one standard deviation increase in the social filter in cities located in provinces with a low tolerance of corruption is connected with much higher urban economic growth, relative to provinces that have not engaged in tackling corruption to the same extent. In fact, for cities in the latter provinces, any improvement in the local social filter is not associated at all to improvements in growth performance (see Figure A-1 in the appendix). The same, albeit to a lesser extent, applies for density and patenting, while the lowest effects of corruption fighting measures at provincial level are felt in the case of improvements in human capital (Figure A-1 in the appendix).

One caveat about these results is related to potential endogeneity. Better government institutions can generate urban growth, but urban growth can also lead to the improvement of government institutions. The same applies for skills, innovation, density, and local conditions. Whereas, for example, skills are regarded as a driver of economic growth, richer societies produce better-trained individuals. Dealing with this type of multiple and simultaneous endogeneities is not simple and renders instrumental variable (IV) analysis almost impractical. There are no simple solutions to this problem. The use of dynamic panel analysis, through a system general methods of moments (GMM) estimation, provides, however, a partial alternative to address this issue. Table 4 reports the results of conducting the analysis of Model (1) using the system GMM estimations.

The main results reported in Table 4 are generally robust to this different estimation method aiming to address potential endogeneity problems. There are, however, a number of changes, which mainly concern patenting. This proxy for innovation, which displayed positive and significant coefficients throughout in Table 2, is now negatively associated to urban growth (and with significant coefficients in Regressions 1, 2, 3 and 7). Moreover, the introduction of the fight against corruption variable at the provincial level weakens considerably the significance of the human capital, density, and FDI variables. In Table 4, Regressions 4 and 5 the coefficients for these three variables lose significance. The analysis including the interaction terms between the fight against corruption at provincial level, on the one hand, and patenting, human capital, density, and the social filter, on the other (Table 4, Regressions 6 to 9) yield only one positive and significant coefficient for the interaction with patenting. All other interactions are no longer significant. Hence, once endogeneity is taken into account, the indirect effects of corruption at provincial level on urban growth, by altering the returns of human capital, density and the social filter, vanish. By contrast, the positive connection between government efficiency and the fight against corruption at city level, on the one hand, and urban growth, on the other, remain robust to the consideration of potential endogeneity issues.

Table 4. Determinants of Economic Growth, System GMM Estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
GDP per capita	-1.072***	-1.066***	-1.067***	-1.017***	-0.980***	-0.986***	-1.038***	-1.014***	-0.929***
	(-24.786)	(-25.462)	(-25.561)	(-24.232)	(-21.673)	(-19.168)	(-15.166)	(-13.472)	(-27.537)
patents	-0.311**	-0.340***	-0.311**	0.011	-0.040	-0.015	-0.399***	0.071	-0.071
	(-2.309)	(-2.617)	(-2.471)	(0.145)	(-0.532)	(-0.189)	(-2.906)	(0.801)	(-1.105)
human capital	0.689***	0.625***	0.631***	0.267	0.184	0.178	0.027	-0.120	0.114
	(3.602)	(3.205)	(3.314)	(1.169)	(1.016)	(1.126)	(0.104)	(-0.244)	(0.914)
density	0.142**	0.162***	0.145**	-0.008	0.015	0.003	-0.029	-0.080	0.043
	(2.374)	(2.637)	(2.535)	(-0.183)	(0.335)	(0.058)	(-0.552)	(-1.577)	(0.480)
population	-0.565*	-0.656**	-0.552**	0.004	-0.124	-0.089	-0.327	-0.201	-0.112
	(-1.906)	(-2.149)	(-2.084)	(0.013)	(-0.505)	(-0.399)	(-1.113)	(-0.714)	(-0.481)
social filter	0.083	0.060	0.070	0.140**	0.107	0.046	0.076	0.187***	0.057
	(1.407)	(0.995)	(1.276)	(2.135)	(1.618)	(0.580)	(0.978)	(3.326)	(1.635)
FDI	0.036	0.033	0.027	-0.093	-0.085	-0.093	0.145*	-0.064	-0.037
	(0.382)	(0.346)	(0.304)	(-1.467)	(-1.333)	(-1.355)	(1.923)	(-0.797)	(-0.678)
gov efficiency		0.021***			0.024***	0.024***	0.017***	0.020***	0.023***
		(2.632)			(3.031)	(3.157)	(3.012)	(2.584)	(3.454)
fcorruption(city)			0.016**		0.021**	0.020**	0.014	0.013	0.021**
			(2.268)		(2.206)	(2.026)	(1.405)	(1.091)	(2.306)
fcorruption(province)				0.090	0.228	0.249	0.526	-17.529	0.183
				(0.248)	(0.647)	(0.693)	(1.051)	(-1.142)	(0.163)
sf*fc(province)						0.243			
						(0.647)			
patents*fc(province)							2.020***		
							(4.502)		
hc*fc(province)								2.031	
								(1.160)	
density*fc(province)									0.025
									(0.077)
constant	6.730***	7.562***	6.923***	7.558***	8.153***	8.155***	11.087***	12.412**	7.890***
	(2.595)	(2.805)	(2.834)	(4.592)	(5.449)	(5.290)	(5.511)	(2.520)	(5.105)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2932	2888	2932	2845	2802	2802	2802	2802	2802
Cities	283	283	283	283	283	283	283	283	283
P value of Hansen test	0.031	0.039	0.025	0.065	0.088	0.127	0.069	0.196	0.063
AR(1)	[0.106]	[0.118]	[0.092]	[0.121]	[0.181]	[0.208]	[0.066]	[0.063]	[0.000]
AR(2)	[0.349]	[0.492]	[0.487]	[0.701]	[0.883]	[0.875]	[0.779]	[0.183]	[0.345]

z statistics in parentheses. * p<.1, ** p<0.05, *** p<0.01. The second lags of natural logarithm of GDP per capita are used as instru

One final check concerns the robustness of these results to the introduction of spatial spillovers. The economic performance of cities anywhere in the world depends on how dynamic and/or well-off the cities surrounding it are. Any city surrounded by more dynamic cities—and, consequently, ones likely to have a better endowment of skills and FDI, a higher capacity to innovate, better local conditions, and, in all likelihood, a denser economy—will have, according to most analyses including spatial econometrics, a higher opportunity to grow. By contrast, cities surrounded by relatively less dynamic cities will not benefit from the positive agglomeration externalities that proximity to more dynamic cities affords. In order to test whether this is the case and whether the introduction of spatial dependency may affect the reported coefficients (and, in particular, those for government institutions variables), we modify Model (1) in the following manner:

$$\Delta lnGDPpc_{i,t} = \alpha + \beta_1 lnGDPpc_{i,t-1} + \theta_1 W\Delta lnGDPpc + \alpha_1 lninno_{i,t-1} + \alpha_2 hc_{i,t-1} + \alpha_3 density_{i,t-1} + \alpha_4 lnpopu_{i,t-1} + \alpha_5 socialfilter_{i,t-1} + \alpha_6 FDI_{i-1} + \alpha_7 institutions_i + v_t + \varepsilon_{it} \qquad (2)$$

where all the variables are as in Model (1), with the exception of the addition of:

$W\Delta lnGDPpc$, which represents the spatial lag of economic growth rate. W is the spatial weight matrix,

Three different spatial weight matrices have been considered (W1, W2, W3):

a) A spatial neighbouring matrix, W1, where:

$$w_{ij}^{NE} = \begin{cases} 1 & if\ city\ j\ directly\ shares\ a\ border\ or\ a\ vertex\ with\ city\ i \\ 0 & otherwise \end{cases}$$

b) An inverse distance spatial weight matrix, W2,[2] where:

$$w_{ij}^{ID} = \begin{cases} 0 & if\ i = j \\ \dfrac{\frac{1}{d_{ij}}}{\sum_j \frac{1}{d_{ij}}} & if\ i \neq j \end{cases}$$

c) A quadratic inverse distance spatial weight matrix, W3, where:

2 The distance is the Euclidean distance between city i and city j

$$w_{ij}^{ID} = \begin{cases} 0 & if\ i = j \\ \dfrac{\frac{1}{d_{ij}^2}}{\sum_j \frac{1}{d_{ij}^2}} & if\ i \neq j \end{cases}$$

The results of the analysis are presented in Table 5. They reveal the presence of strong growth spillovers related to being located in proximity to fast-growing cities. The coefficients for the spatial dependency variables are always positive and significant at the 1 percent level, regardless of whether just neighbouring cities are considered or whether the analysis is conducted a spatial weights matrix, or a quadratic inverse distance spatial weight matrix (Table 5). Chinese cities seem to benefit considerably from spillovers from neighbouring cities.

The introduction of the spatial weights, however, does not affect the direction and significance of the coefficients of the other variables. The government institutional variables of interest—government efficiency and the fight against corruption at city level—remain positive and highly significant throughout. The same applies for patenting, human capital, density, the social filter, and FDI. They all retain their positive and highly significant connection to urban growth in China. The variable proxying for the fight against corruption at the provincial level is still insignificant and tends to lower the coefficient for the social filter.

Table 5. Determinants of Economic Growth in China, Add Spatial Terms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Hausman Taylor	Hausman Taylor	Hausman Taylor	Hausman Taylor	Hausman Taylor	Hausman Taylor	Hausman Taylor	Hausman Taylor	Hausman Taylor
w1grow	0.412***	0.426***	0.346***						
	(0.029)	(0.028)	(0.030)						
w2grow				1.480***	1.514***	1.297***			
				(0.121)	(0.121)	(0.134)			
w3grow							0.559***	0.572***	0.510***
							(0.042)	(0.042)	(0.047)
GDP per capita	-0.514***	-0.512***	-0.506***	-0.526***	-0.525***	-0.506***	-0.522***	-0.520***	-0.503***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
patents	0.026***	0.027***	0.021***	0.025***	0.026***	0.021***	0.026***	0.027***	0.022***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)
human capital	0.065***	0.066***	0.063***	0.064***	0.065***	0.060***	0.064***	0.064***	0.060***
	(0.013)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
density	0.014***	0.018***	0.017***	0.013***	0.017***	0.017***	0.013***	0.017***	0.017***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
population	-0.139***	-0.164***	-0.164***	-0.144***	-0.170***	-0.164***	-0.141***	-0.167***	-0.161***
	(0.027)	(0.029)	(0.029)	(0.028)	(0.030)	(0.029)	(0.028)	(0.029)	(0.028)
social filter	0.016***	0.017***	0.010*	0.016***	0.017***	0.009*	0.016***	0.016***	0.009*
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
gov efficiency	0.008***		0.009***	0.009***		0.009***	0.008***		0.009***
	(0.003)		(0.003)	(0.003)		(0.003)	(0.003)		(0.003)
fcorruption(city)		0.006***	0.009***		0.006***	0.010***		0.006***	0.009***
		(0.002)	(0.003)		(0.002)	(0.003)		(0.002)	(0.003)
fcorruption(province)			0.030			0.045			0.032
			(0.071)			(0.071)			(0.071)
constant	5.034***	5.639***	5.014***	4.975***	5.739***	4.844***	5.092***	5.749***	4.956***
	(0.232)	(0.254)	(0.237)	(0.239)	(0.259)	(0.242)	(0.234)	(0.257)	(0.238)
Observations	3007	3051	2921	3007	3051	2921	3007	3051	2921
Regions	283	283	283	283	283	283	283	283	283
F	101.163	103.560	77.909	96.825	98.113	75.234	98.996	100.447	77.078

Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Conclusions and Policy Implications

Rapid economic growth in China in recent decades has been to a large extent fuelled by the dynamism of its cities. Urban China is not only richer, but has also tended to be more economically dynamic than rural and small-town China. Cities have provided the opportunities and jobs that have attracted millions of Chinese in what is an unprecedented urban transformation process (Wong, 2013: 273). Cities have also spawned a rapid development of firms and become a magnet for inward investment.

The swift development of cities has coincided with a rising interest in the role of government institutions. Measures to improve the efficiency of local governments have been adopted throughout China (Tang et al., 2014) and the Chinese government has embarked in an ever more ambitious policy to curb corruption (Dong and Torgler, 2013; Gong, 2015). Yet, the link between government efficiency and urban growth in China remains poorly understood. Most work on city-level economic growth in China has been confined to issues of agglomeration, infrastructure and accessibility, industry structure, or skills and innovation. The analyses on how government institutions shape economic activity in China have been few and far between and, to the extent of our knowledge, there is no research that has linked government institutions to urban growth at city level. This is the gap that this paper has aimed to fill.

The results of the analysis, covering 283 Chinese cities for the period between 2003 and 2014, highlight how urban growth in China not driven by just a single factor. Individual factors—from human capital and innovation to density, agglomeration, the social filter, and FDI, as well as government efficiency and the fight against corruption—can, on their own, not explain Chinese urban economic growth. The growth in the most dynamic Chinese cities is the result of a combination of favourable human capital, FDI, innovation endowments, density, and socio-economic conditions that blend in some urban areas in order to generate economic dynamism. Chinese cities also benefit from positive spillover effects linked to economic growth in neighbouring urban areas.

The analysis has also brought to the fore the role of government institutions in urban growth. In a period when considerable attention has been paid to the efficiency of local governments and were there has been a serious push to curb corruption throughout the country, cities with more efficient governments and those that have pursued local corruption with greater zeal have also grown faster. However, the impact of government institutions on urban economic growth is not only direct. The fight against corruption at provincial level has contributed to enhance the returns of other factors behind economic growth, such as human capital, innovation, density, or the local social environment. By contrast, in provinces where a more lax approach towards corruption has been adopted, the returns of other factors behind urban growth have suffered.

Consequently, the results of the analysis point towards the need to reflect about what type of urban interventions and policies are likely to yield greater economic returns across cities in China. Simple policies based on just one dimension are unlikely to do the trick. Urban growth policies can become more successful if they take into account the complexity and variety of local conditions across China and bring institutions to the fore. Disregarding government institutions will not only limit overall growth, but also undermine the effects of alternative policies.

The analysis presented in the paper represents, however, only a start. It signals that government institutions matter for urban growth and that they matter in multiple ways. But data limitations prevent us from digging deeper into the exact mechanisms through which government efficiency and the fight against corruption impinge on Chinese urban growth. Better institutional data covering longer periods of time, together with more in-depth case study analyses will be necessary to extract the full set of connections and complex intricacies that determine urban economic performance in China.

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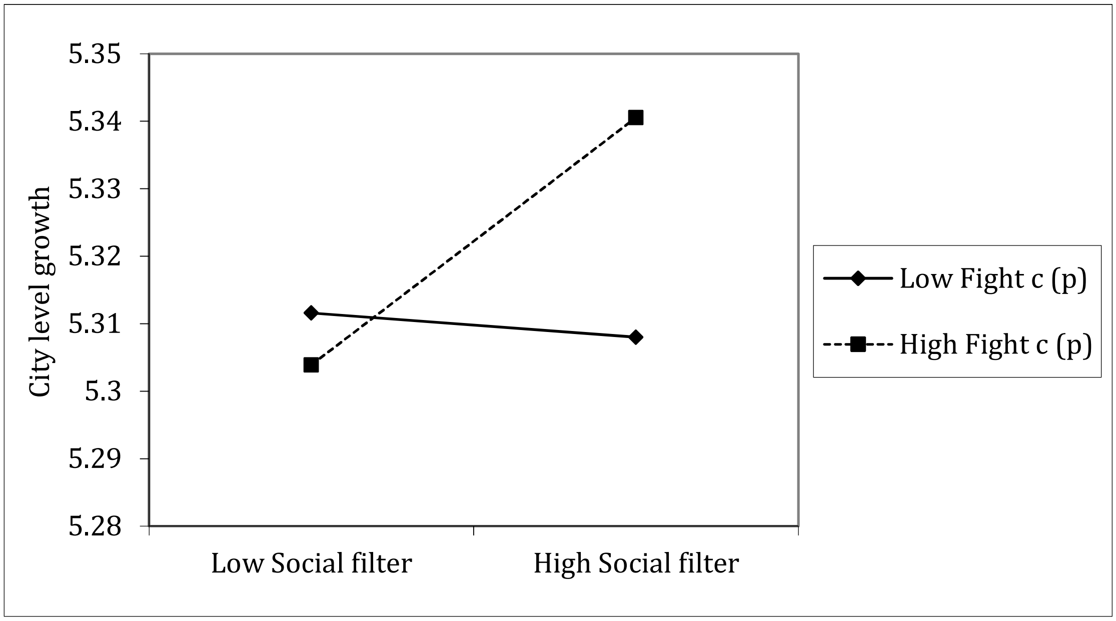
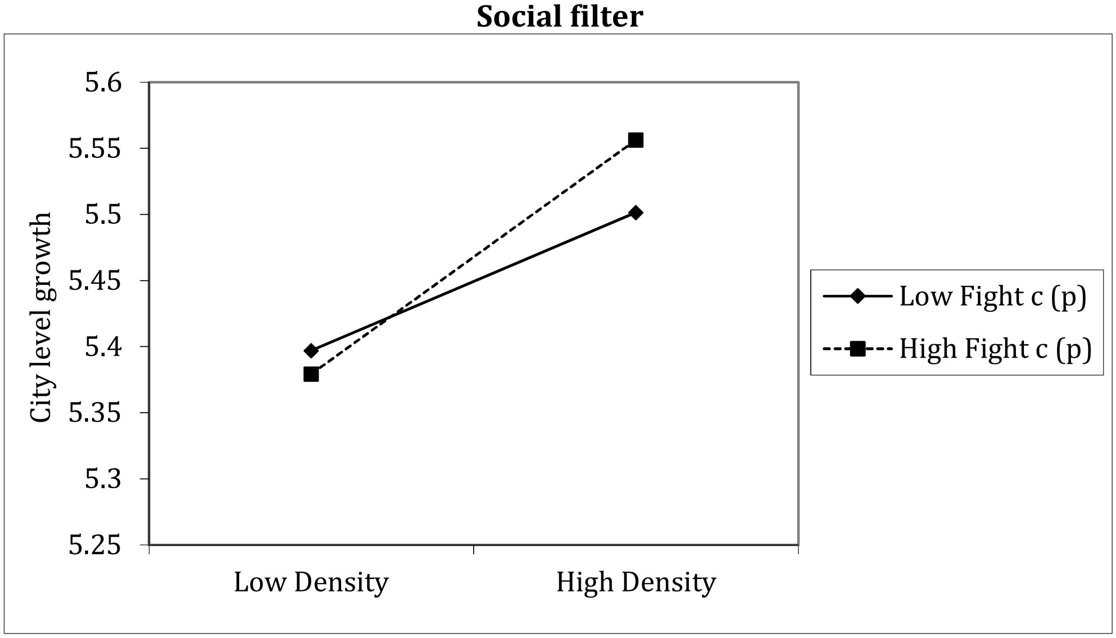
Appendix

Figures

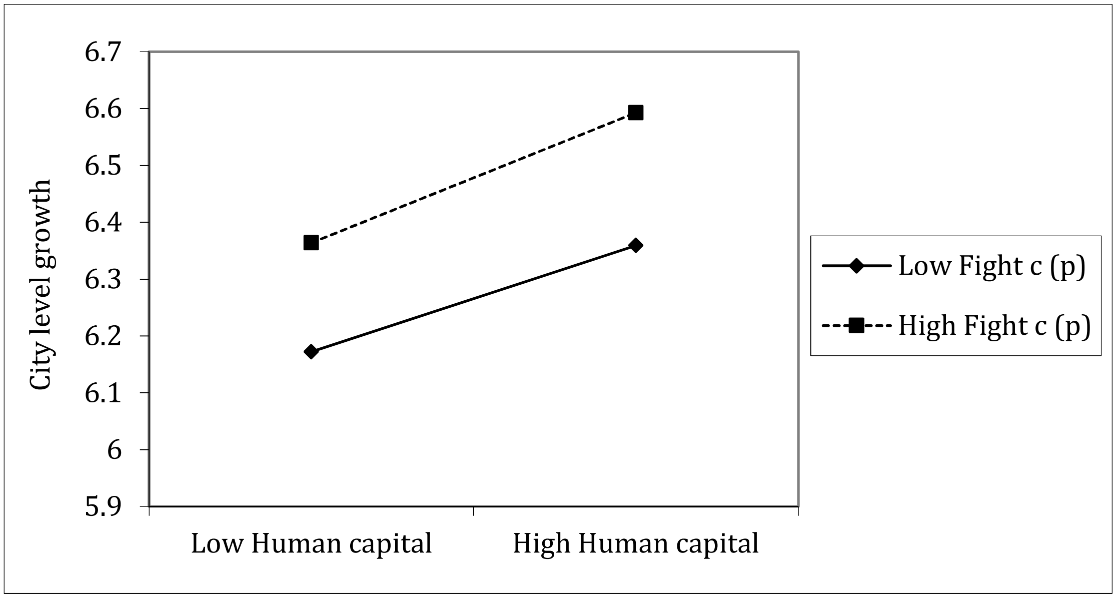
Figure A-1. Interpreting the Interaction Terms



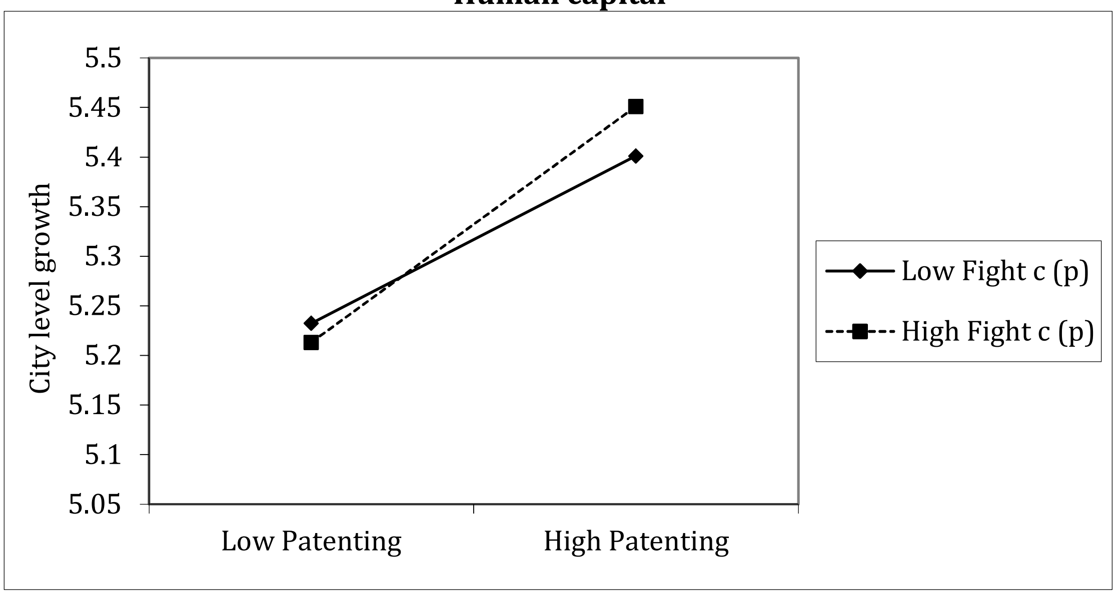
Social filter



Density



Human capital



Patenting

Tables

Table A-1. Descriptive Statistics for the Main Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
economic growth rate	3095	0.143	0.167	-4.459	4.776
GDP per capita	3387	9.966	0.812	4.595	13.056
patents	3393	0.144	1.716	-5.857	5.367
human capital	3396	8.778	0.932	2.763	12.894
density	3396	4.229	3.226	0.047	26.615
population	3396	5.851	0.690	2.795	8.124
social filter	3342	0.000	1.000	-7.427	4.004
gov_efficiency	3348	2.078	7.102	0.342	100.000
fcorruption(city)	3396	10.502	11.561	0.000	130.000
fcorruption(province)	3304	0.274	0.074	0.078	0.622

Table A-2. Determinants of Economic Growth, Decomposing Social Filter

	(1) Hausman Taylor	(2) Hausman Taylor	(3) Hausman Taylor	(4) Hausman Taylor	(5) Hausman Taylor	(6) Hausman Taylor
GDP per capita	-0.561***	-0.557***	-0.559***	-0.556***	-0.558***	-0.544***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
patents	0.027***	0.027***	0.028***	0.028***	0.028***	0.024***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
human capital	0.072***	0.070***	0.078***	0.070***	0.079***	0.060***
	(0.013)	(0.013)	(0.014)	(0.013)	(0.014)	(0.013)
density	0.017***	0.015***	0.016***	0.015***	0.016***	0.015***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
population	-0.171***	-0.171***	-0.164***	-0.166***	-0.172***	-0.173***
	(0.030)	(0.029)	(0.030)	(0.029)	(0.030)	(0.030)
social filter	0.009***	0.009***	0.010***	0.009***	0.009***	0.009***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
gov_efficiency	0.010***	0.010***	0.010***	0.010***	0.010***	0.010***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
sharepri	0.001***				0.001*	
	(0.000)				(0.000)	
shareagri		-0.003***			-0.003***	
		(0.001)			(0.001)	
share1524			-0.004		-0.003	
			(0.003)		(0.003)	
unemp				-0.000**	-0.000**	
				(0.000)	(0.000)	
social filter						0.012**
						(0.006)
constant	5.515***	5.550***	6.073***	6.078***	5.537***	6.084***
	(0.240)	(0.239)	(0.260)	(0.259)	(0.242)	(0.263)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3034	3021	3048	3048	3007	2994
Cities	283	283	283	283	283	283
F	85.544	84.126	85.166	85.080	72.532	81.139

Standard errors in parentheses.* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A-3. Government Efficiency Indices

	Factors(weight)	Sub factors(weight)	Indices definition
1	Public services (weight=0.55)	Science and technology; education; culture and public health services(weight=0.4)	per capita patent applications (items/10,000 persons)
			per capita primary and middle schools (units/10,000 persons)
			per capita enrolments in primary and middle schools (person/10,000 persons)
			government budgetary expenditures appropriation in education (%)
			radio coverage rate of the population (%)
			ratio of health care institutions and total population (unit/10,000 persons) (%)
			per capita beds in health care institutions (unit/ 1,000 persons)(%)
			per capita employed medical technicians in healthcare institutions (person/1000 persons)
		Public security services (weight=0.15)	ratio of deaths in production safety accidents and total population (%)
			ration of deaths s in production safety accidents and general domestic production(GDP) (cases/1,000 million Yuan)
			annual days of air quality equal or above grade II (day)
		Social security services (weight=0.15)	public budgetary expenditures appropriation in social security net and employment effort (%)
			government budgetary expenditures appropriation in affairs of housing security
		Economic development services (weight=0.3)	ratio of total investment in fixed assets and GDP (%)
			per-capita business volume of postal services (yuan)
			popularization rate of fixed line telephone (sets/100 persons)
			popularization rate of mobile telephone (sets/100 persons)
			popularization rate of internet (%)
			treatment rate of consumption wastes (%)
2	Government scale (weight=0.2)		public expenditures appropriation in covering the expenses of public officials, including the expenses on the affairs of overseas visits, transportation, and dining (yuan/ (persons. kilometre square))
			per capita government budgetary expenditures (yuan/(persons. kilometre square))
			ratio of non-taxed revenue and general public budget revenue (%)
			number of annual new public servants (person)
3	National welfare		per capita disposable income of rural households (yuan)

	(weight=0.1)		per-capita disposable income of urban households (yuan)
			consumer price index (preceding year=100)
			per-capita GDP (yuan)
			registered unemployment rate in urban areas (%)
4	Transparency of government affairs (weight=0.15)	Government information disclosure (weight=0.8)	disclosure of information about government leaders
			disclosure of information about three public expenses
			disclosure of report on the work of the government
			disclosure of report on government budget
			disclosure of plan on government affairs
			disclosure of statistical bulletin
			disclosure of the job vacancy of the Civil Servants Exams
		Officials' working efficiency (weight=0.2)	efficiency in response to personal consultation affairs
			efficiency in executing public affairs

Note: The four municipalities, including Beijing, Shanghai, Tianjin, and Chongqing, do not participate in the ranking of government efficiency.

Table A-4. Government Efficiency Ranks by City, 2016

City	Rank	City	Rank	City	Rank
Shenzhen	1	Anyang	101	Xinzhou	201
Fushun	2	Jinchang	102	Dezhou	202
Shannan	3	Mudanjiang	103	Kaifeng	203
Guangzhou	4	Xuzhou	104	Qiqihar	204
Suzhou	5	Huangshi	105	Yichang	205
Zhuhai	6	Datong	106	Taizhou	206
Wuxi	7	Xinxiang	107	Nanchong	207
Quanzhou	8	Guigang	108	Jiamusi	208
Nanjing	9	Puyang	109	Bazhong	209
Xiamen	10	Changde	110	Zhoukou	210
Changzhou	11	Yueyang	111	Zunyi	211
Shaoxing	12	Xining	112	Heyuan	212
Wenzhou	13	Harbin	113	Dingxi	213
Kunming	14	Yulin	114	Hulunbuir	214
Xi'an	15	Xinyang	115	Liaocheng	215
Dongguan	16	Panjin	116	Yangjiang	216
Hangzhou	17	Baise	117	Zhaotong	217
Ningbo	18	Lianyungang	118	Bijie	218
Putian	19	Yingkou	119	Fangchenggang	219
Nantong	20	Anqing	120	Chaozhou	220
Danzhou	21	Baoshan	121	Yulin	221
Dalian	22	Yancheng	122	Lu'an	222
Zhenjiang	23	Baicheng	123	Pingliang	223
Jinan	24	Bozhou	124	Huaihua	224
Zhangye	25	Jixi	125	Shangluo	225
Karamay	26	Changchun	126	Shaoyang	226
Fuzhou	27	Lhasa	127	Meishan	227
Foshan	28	Qujing	128	Guyuan	228
Weihai	29	Yan'an	129	Shantou	229
Changsha	30	Wuhu	130	Changzhi	230
Tongchuan	31	Jincheng	131	Hengyang	231
Chenzhou	32	Shiyan	132	Xiaogan	232
Shenyang	33	Xuchang	133	Mianyang	233
Taizhou	34	Fuxin	134	Yiyang	234
Dongying	35	Hezhou	135	Linfen	235
Yinchuan	36	Pingdingshan	136	Zhongwei	236
Qingdao	37	Liaoyang	137	Tai'an	237
Jinhua	38	Yuncheng	138	Yibin	238
Haikou	39	Yongzhou	139	Beihai	239
Yangzhou	40	Jieyang	140	Tongling	240
Zhongshan	41	Baishan	141	Zigong	241

Taiyuan	42	Loudi	142	Anshun	242
Maanshan	43	Zhoushan	143	Weinan	243
Linzhi	44	Suining	144	Jingzhou	244
Sanming	45	Hefei	145	Xingtai	245
Baotou	46	Heze	146	Guilin	246
Ganzhou	47	Luoyang	147	Haidong	247
Yantai	48	Suzhou	148	Chengde	248
Huzhou	49	Guangyuan	149	Turpan	249
Weifang	50	Dandong	150	Cangzhou	250
Chengdu	51	Meizhou	151	Yichun	251
Jiuquan	52	Qingyang	152	Zaozhuang	252
Panzhihila	53	Ulanqab	153	Huangshan	253
Longyan	54	Luzhou	154	Lijiang	254
Zhengzhou	55	Qinzhou	155	Yuxi	255
Wuwei	56	Xiangyang	156	Hami	256
Jiaxing	57	Linyi	157	Ya'an	257
Jiujiang	58	Zhanjiang	158	Nanyang	258
Tonghua	59	Sanya	159	Laiwu	259
Yingtan	60	Tongren	160	Pu'er	260
Wuhan	61	Chongziio	161	Wuzhou	261
Zhangzhou	62	Huanggang	162	Tianshui	262
Suqian	63	Zibo	163	Jiaozuo	263
Shangrao	64	Shaoguan	164	Shuangyashan	264
Sanmenxia	65	Nanchang	165	Shizuishan	265
Zhumadian	66	Jinzhong	166	Langfang	266
Anshan	67	Zhangjiakou	167	Tangshan	267
Jiangmen	68	Xuancheng	168	Heihe	268
Xianning	69	Shuozhou	169	Qingyuan	269
Xinyu	70	Liuzhou	170	Deyang	270
Guiyang	71	Benxi	171	Handan	271
Fuyang	72	Qinhuangdao	172	Wuhai	272
Lishui	73	Leshan	173	Hengshui	273
Ningde	74	Chuzhou	174	Huainan	274
Ji’an	75	Guang'an	175	Suizhou	275
Nanning	76	Maoming	176	Wuzhong	276
Chaoyang	77	Shijiazhuang	177	Shanwei	277
Bengbu	78	Daqing	178	Dazhou	278
Longnan	79	Ankang	179	Changdu	279
Xianyang	80	Neijiang	180	Luohe	280
Shangqiu	81	Jingmen	181	Baoding	281
Yichun	82	Chifeng	182	Hechi	282
Nanping	83	Jingdezhen	183	Qitaihe	283
Huizhou	84	Xiangtan	184	Suihua	284

Zhuzhou	85	Huaibei	185	Hegang	285
Hanzhong	86	Bayannur	186	Binzhou	286
Pingxiang	87	Jining	187	Tiding	287
Liupanshui	88	Songyuan	188	Ezhou	288
Baoji	89	Lanzhou	189	Lvliang	289
Laibiri	90	Yunfu	190	Shigatse	290
Baiyin	91	Siping	191	Zhangjiajie	291
Jinzhou	92	Erdos	192	Hebi	292
Liaoyuan	93	Huludao	193		
Hohhot	94	Tongliao	194		
Urumchi	95	Yangquan	195		
Jilin	96	Chizhou	196		
Huai'an	97	Ziyang	197		
Zhaoqing	98	Fuzhou	198		
Quzhou	99	Jiayuguan	199		
Rizhao	100	Lincang	200		

Table A-5. Test Results for the Principle Component Analysis

Principal component analysis: eigenanalysis of the correlation matrix

Component	Eigenvalue	Difference(%)	Cumulative(%)
Comp1	1.511	37.780	37.780
Comp2	0.935	23.378	65.158
Comp3	0.864	21.593	82.751
Comp4	0.690	17.249	100

Principal component analysis: principal components' coefficients

Variable	Comp1
shareagri	0.423
share1524	-0.426
unemp	0.424
sharepri	-0.348

Note: the score for *Comp1* has been pre-multiplied by -1 to match the interpretation of social filter index.