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Abstract

Using data from Qing dynasty, this paper investigates long-run implications of the early development for the present development in China. We use city-level population density in 1776 as a measure of the early economic prosperity, and investigate how it is associated with today's development indicators such as the average night-light density, GDP per capita, average years of schooling, and trade openness. We find that more prosperous cities of the Qing dynasty are now brighter, richer, more educated, and more open.

JEL Classification: F14, N35, N95, O11, O53, P50

Keywords: China, Qing Dynasty, Light Density, Population Density, Openness, Schooling

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1 Introduction

Since the launch of reforms in 1978, China has been the most rapidly growing economy in the world. While this unprecedented economic growth made China the second largest economy in the world, the performance has been highly uneven across its different regions (Aziz and Duenwald 2003, Unel and Zebregs 2009). Several inland provinces have been falling behind the prosperous coastal ones. In 2010, for example, the income per capita in Shanghai was more than five times that of Gansu. This unequal performance has been a challenge to policy makers, and researchers have identified several factors that might have driven it. These factors include reallocation of resources from agriculture to manufacturing and service (Brandt et al. 2008), enterprise restructuring and privatization (Dong et al. 2006, Jefferson et al. 2008, Hsieh and Klenow 2009), financial reorganization (Yi 2010), and globalization (Unel and Zebreg 2009, Sun and Heshmati 2010), among many others.

Although these studies have shed light on our understanding of Chinese economic development over the last three decades, they do not explain why the reforms have not been implemented uniformly across the regions. In this paper, we argue that the wide economic differences across regions can be traced to their early development levels: rapidly growing areas are also the ones that were economically prosperous more than two centuries ago. More precisely, we use city-level population density in 1776 of the Qing dynasty as our measure of the early economic prosperity, and show that it is a strong predictor of the current development indexes such as night-light density, per capita GDP, the average years of schooling, and trade openness.[1] That is, economically prosperous cities about two centuries ago tend to be brighter, richer, more educated, and more open today. Our results are robust to the choice of control variables and years.

As the next section reviews in more detail, China has gone through several political, economic, and social crises and changes over the last two centuries. The Qing dynasty

[1] Cao (2000) has city-level population data from 1393 of the Ming dynasty. However, this survey contains a smaller set of cities and subjects to measurement errors. Populations surveys in 1776 and 1820 of the Qing dynasty are the most extensive and reliable ones (Cao 2001). The 1776 population data include 227 cities from 24 provinces (Figure 1), which cover the core and frontier regions of China (known as China proper). Using the 1820 population data (which cover 233 cities) yields qualitatively the same results.

had expanded economically and politically until the late eighteenth century, and the living standard during the second half of 1700s was likely higher than that in other parts of the world (Pomeranz 2000). However, the government officials faced more formidable domestic and foreign adversaries in the nineteenth century. Beginning with the Opium wars with Britain in 1839, the empire fought six wars against foreign powers and lost each of them, and finally collapsed in 1911. Political instability and civil war continued until the Nationalist Party unified the nation in 1927. China had relatively peaceful and productive years until the Japanese invasion in 1937. Several key cities were heavily bombed and destroyed by Japanese Army Air Service, resulting in millions of deaths. After communists seized power in 1949, China pursued a socialist industrialization policy over the next three decades. While the country enjoyed peace and some economic prosperity in early years of the revolution, the next two decades witnessed some disastrous consequences of this overly ambitious, heavy industry policy. Since 1978, the country has gradually moved to a more market-based economy, increased private ownership and openness to the world. It is remarkable to observe that despite two centuries of massive changes in economics, politics, and social order, more prosperous cities of the Qing empire are still enjoying higher living standards today.

As indicated above, we use the population density in 1776 as a proxy for the early development following many others (e.g., Acemoglu et al. 2002). We acknowledge the fact that the relationship between population density and economic development is quite complex, and more densely populated areas do not necessarily imply higher economic prosperity. For example, according to the Malthusian model, a higher than sustainable level of population would eventually limit population growth since resources are scarce. However, one may reasonably argue that during these early times only relatively prosperous areas could support dense population.

In measuring the current development level, we consider four indicators: night-light density, output per capita, average years of schooling, and trade openness. Except for the night-light density, other measures of development have been extensively used in the literature. In an interesting paper, Henderson et al. (2012) use satellite data on night lights to augment official growth measures. They use changes in night lights as a measure of economic growth, and show that lights growth is strongly correlated with GDP growth. They also use night lights data to measure economic growth at sub-national level.[2] Using night lights as a measure of development is particularly relevant to our analysis, because a significant amount of production is carried out in the informal sector (usually not counted by officials) and the Chinese official statistics are subject to serious measurement errors (Young 2005).[3]

Our paper joins a large body of work that investigates the determinants of China's development. One strand of this literature has focused on the effects of market-oriented reforms implemented since the late 1970s on China's current economic performance.[4] Another strand evaluates China's economic development from a longer time perspective. In this strand, some studies investigate why China fell behind Western Europe despite being economically comparable until the 19th century.[5] Some others link China's recent economic performance to the historical antecedents. Brandt et al. (2014) argue that deep historical roots surrounding China's present institutions and its past accumulation of skill have had a profound impact on recent Chinese development. Keller and Shiue (2007) show that the degree of integration of rice markets in the 1720s is a good predictor of income per capita in the 1990s. Similarly, Keller et al. (2013) analyze China's long-run trade performance focusing on Shanghai, and find that the levels of present trade are strongly correlated with

[2] Following Henderson et al. (2012), several studies have used night lights to analyze regional inequality within and across countries (e.g., Lessmann and Seidel 2016, Henderson et al. (2017).

[3] Clark et al. (2017) use data on night lights to evaluate the quality of China's official GDP data over the period 2004–2013. In obtaining optimal weights for GDP growth, they find that bank loans, railroad freight, and electricity are significant predictors of night lights growth.

[4] Zhu (2012) provides a comprehensive review of this literature, and proposes several policies (e.g., reforming financial sector) that can further improve the economic performance.

[5] Pomeranz (2000) argues that the easy access to coal supplies and ports (which led to the widespread use of steam engines) and the trade with the New World were the driving forces behind the divergence between Europe and China. Another view is that Western Europe's well-functioning markets operated under its inclusive and allocative institutions provided impetus for the industrial revolution (Acemoglu and Robinson 2014). However, Shiue and Keller (2007) argue that the performance of markets in China and Western Europe overall was comparable in the late eighteenth century. In a recent survey, Brandt et al. (2014) evaluate several explanations put forward for the great divergence, and consider institutions as a key factor for why China fell behind Europe.

that in the 1870s.

This paper also relates to a growing literature that investigates the effects of historical variables on contemporary development. A full account of this literature is beyond the scope of this paper, and here we touch upon a few influential studies.[6] In two influential papers, Acemoglu et al. (2001 & 2002) argue that past institutions created by various types of colonization policies shaped current institutions.[7] Using the settler mortality rate as instrument, they show a large effect of institutions on long-run development. Bockstette et al. (2002) argue that a longer history of statehood might be favorable to economic development. They derive a state antiquity index, and show that it is strongly correlated with current institutional quality, income per capita, and growth. Comin et al. (2010) show that 1500 AD technology is a strong and robust predictor of per capita income and technology adoption today.

In this literature, our paper is more related to studies that document the persistence of regional development. Davis and Weinstein (2002) consider the Allied bombing of Japanese cities during the second World War, and find that most cities returned to their relative position in the distribution of city sizes within about 15 years. Henderson et al. (2017) consider the 119 European cities in 10 modern European countries in 1500, and show that only 15 of them have fewer than 50,000 people today.[8] Finally, Chanda and Ruan (2017) construct a measure of urban population density in 1850 for more than 2,000 sub-national regions across 135 countries, and find strong evidence of persistence in regional development. Since our analysis focuses on China, we investigate persistence at a more detailed regional level. In this way, we can also control for differences in institutions and cultures across the provinces.[9] Further, our analysis considers additional development indicators such as schooling and openness.

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[6]See Spolaore and Wacziarg (2013) for an extensive review of this literature.

[7]Using data on place of origin of today's country populations, Chanda et al. (2014) find persistence of fortune for people and their descendants. Their finding is consistent with Glaeser et al. (2004), who show that human capital is a more basic source of growth than are institutions.

[8]Other studies that have also documented the persistence of cities include Eaton and Eckstein (1997), Bleakley and Lin (2012), and Jedwab et al. (2017).

[9]Chanda and Ruan's analysis includes 32 regions from China, which are mostly provinces.

The rest of the paper is organized as follows. The next section introduces a brief history of China, especially emphasizing the last two centuries. Section 3 discusses the data and provides summary statistics. Section 4 describes the econometric methodology that we employ, and presents the results. Section 5 concludes.

2 A Brief History

The Qing dynasty, the last imperial dynasty of China, was founded by the semi-nomadic Manchus from northeast of the Great Wall in 1644.[10] During the first half of their ruling period, the Manchus extended their rule over a vast area (covering Central Asia, Mongolia, and Tibet), and doubled the Ming dynasty's population, reaching 300 million or more by 1800 (Rowe 2010). The successful reigns of the Kangxi (1662–1722) and Qianlong (1736–1795) emperors display a period when progressive economic and social reforms are implemented. The empire went through a commercial revolution, in which interregional trade led to a rapid urbanization of rural areas and increased economic prosperity. Production in agriculture, mining, and manufacturing increased, international trade flourished, and the middle class expanded. The average standard of living during the high point of the Qing dynasty (i.e., the 1700s) was likely higher than that in other parts of the world, including Western Europe (Pomeranz 2000).

By the early eighteenth century, the empire had been challenged and weakened by several factors such as rapidly growing population, limited reserves of food, deteriorated public infrastructure, outmoded industry policies, corruption of officials, and foreign incursions (Brandt et al. 2014). After emperor Jianqing's death in 1820, the problems exacerbated further, and the imperial government had to deal with multiple domestic and foreign adversaries until its collapse in 1911 (Naughton 2006). Beginning with the Opium War with Britain in 1839, China fought six major wars against foreign powers, and lost each of them.

[10] Rowe (2010) provides a comprehensive account of the Qing dynasty. Brandt et al. (2014) examine the long-run evolution of China's economy, and investigate roots of China's recent economic progress in the distant past. Their analysis not only covers the Qing dynasty, but also its predecessors the Song and Ming dynasties.

In addition, there were several internal uprisings such as the Taiping and the Boxer rebellions during the 1860s and 1890s. The latter one was subdued by an international force including the US, and in return China agreed to pay a huge reparation. Following another uprising in 1911, the dynasty came to an end and China became a republic in 1912.

Immediately after the republic was founded, China collapsed into political instability and civil war created by rival military regimes. The warlord era continued until 1927 when the Nationalist Party unified the nation (Naughton 2006). Despite the widespread political chaos, the 1912-37 period witnessed a wave of industrialization and significant change (Brandt et al. 2014). Modern factory production grew rapidly in sectors such as textiles, food processing, mining, and metallurgy; foreign investment increased the pace of modernization, and facilitated access to the world. By 1935, textile mills in China produced 8 percent of the world's cotton yarn (Brandt et al. 2014).

The Republic of China had relatively peaceful and prosperous years until Japan's invasion in 1937. The war was the result of Japan's imperialist policy, dating back to the late 19th century, to dominate China politically to secure its economic interests (Naughton 2006). Using its superior military technology, between 1937 and 1943 the Japanese Army Air Service heavily bombed Nanjing, Shanghai, Guangzhou, and Chongqing, destroyed power plants, water supplies, stations, hospitals, roads, and bridges along with a massive toll of human lives. The war continued until Japan's surrender to the Allies in 1945. Soon after this Sino-Japanese War, the country plunged into another civil war between nationalists and communists, resulting in the Communist Party's victory in 1949.

After the unification of China under the Communist Party, Mao Zedong's government implemented fiscal and monetary policies to restore the budget and stop the hyperinflation, and implemented a large scale land reform. More important, the Party sought to implement a socialist *big-push* development strategy, where the government controlled the economy, owning all large factories, channeling investment toward heavy industry, mandating allocation of resources and output, and setting prices (Brandt et al. 2014). Although this strategy brought some success in early years, overall it was not a sustainable strategy and its short-term development plans sometimes ended up with tragic failures. During the Great Leap Forward (GLF), the big-push strategy intensified by transferring enormous amount of resources from agriculture to heavy industry. This created a serious shortage in food reserves, and the problem worsened when a full-blown famine hit in 1960, leaving about 25-30 million dead by the end of 1961 (Naughton 2006). Attempts to revive the economy after the GLF, however, were ended by a new campaign known as the Cultural Revolution (1966-76). Although the campaign was not directly related to the economy, by purging anyone who was critical of his policies, Mao essentially closed the doors to possible economic reforms (Naughton 2006).

Deng Xiaoping took control of the Communist Party in 1978, and began implementing reforms to improve economic performance moving the country towards a more market-oriented economy. The hallmark of the reforms was their gradual and experimental implementation. Reforms included rural liberalization, introduction of a dual-track pricing system, fiscal decentralization, restructuring state-owned enterprises and privatization, and expanding trade and foreign investment. By the mid-1990s, the majority of products were sold at market prices (Chow 2007). Reforms created unprecedented growth and prosperity in the economy; even the most conservative estimates indicate that per capita income over the last three decades had annually grown at more than 6 percent (Young 2005). However, as indicated in the introduction, the growth performance has been highly uneven across regions in China.

3 Data and Descriptive Statistics

Our analysis uses data on 227 cities from 24 provinces as shown in Figure 1, which cover about 40 percent of China's mainland, account for more than 80 percent of the total population, and generate about 90 percent of China's total output. Our sample size is determined by the availability of population data from the Qing dynasty.[11] The data on city population

[11] As shown in Figure 1, the population data are not available for all cities in these provinces. For example, we have data only from two cities in Hainan province.

in 1776 are from Cao (2001) who compiled from historical archives, and the 2010 population data are from the City Statistical Yearbook (2011). In matching city boundaries in 2010 with that in the Qing dynasty we use the concordance tables in Xue (2001), and some boundary information from Liang (2008). Cities whose boundaries changed significantly are excluded from our analysis. We also note that some cities over the time split into several new cities (e.g., Ningxia now has 5 cities). In such cases, we combined all of the present-day cities to match with the parent city in the Qing dynasty.

We use the population density in 1776 as our measure of the early economic development in China. Several other studies (e.g., Acemoglu et al. 2002) have also used the population density as a proxy for economic prosperity. After identifying each city's boundary, we use the Gridded Population of the World (GPWv4, 2016) database developed by the Center for International Earth Science Information Network at Columbia University to measures surface areas in square kilometers. The land area obtained from this database excludes permanent ice and water areas. Dividing the population by the calculated land area, we obtain the number of people living in each square kilometers as a measure of population density.[12]

This paper investigates the impact of the early development on today's living standards, and the standard approach is to use income per capita as a proxy for prosperity. Our preferred measure for the present living standards is night-light density measured from outer space during 2010. We use this proxy for several reasons. First, we have data on output produced (i.e. GDP), but we do not have income data. These two figures are highly correlated, but correlation is far from perfect at the sub-national level. Second, city-level GDP data reported by the Chinese officials are subject to serious measurement errors (Young 2005). Third, some of the economic activity (especially, in rural regions) is

[12] Log population density in 1776 is highly correlated with that in 2010 (the coefficient of correlation is about 0.80). We also investigate whether the population density across cities has converged over this period. Formally, we run the regression $g_c = \text{const} + \beta \ln \text{Popden}_{1776} + \varepsilon_c$, where g_c denotes the average annual growth rate of the population density in city c (i.e., $g_c = (\ln \text{Popden}_{2010} - \ln \text{Popden}_{1776})/234$). We find that $\hat{\beta} \approx -0.0013\,[0.009]$, where the number in brackets represents the p-value. Thus, there is an absolute convergence in population density across cities. Including additional controls (such as province fixed effects, latitude, distance to a port, etc) into our basic regression equation increases the speed of convergence to 0.0020.

conducted in the informal sector, which is not fully counted by the official statistics. Finally, one needs PPP-based conversion rates to obtain a comparable production/income figures across regions.

Henderson et al. (2012) were the first to use night lights as a proxy to measure economic growth, especially using night lights to augment official income growth measures. Following their lead, we also use the average night-time light density during 2010 as a measure of development. Satellite data on night lights are from National Geophysical Data Center (NGDC).[13] Following Henderson et al. (2017), we use the radiance-calibrated version of the light data. The advantage of using this new dataset is that information about low light places are less distorted and all topcoding is removed.[14] Lights data are distributed as a grid of pixels (0.86 square kilometer), and the total amount of lights in each city is obtained by aggregating the light intensity in each grid across the land area. Dividing the light amount by the city's land area, we obtain the average light intensity.

We also investigate the impact of early development on average GDP per capita, using city-level GDP data from the Provincial Statistical Yearbook (2011). Our GDP data are in 2010 prices, but analysis based on GDP data from 2000 yields qualitatively similar results. In addition to GDP per capita, we also consider two other development indicators in 2010: the average years of schooling and trade openness. The data on the average years of schooling are from the 2010 Population Census of China, and import and export data are from the Provincial Statistical Yearbook (2011) and the Monthly Custom Statistics (2011). In our regression analysis, we also use the average annual temperature and precipitation in each city over the 2000–2010 period as well as their variations as additional controls, and they are from the China Meteorological Data Service Center.

Table 1 reports the summary statistics on these key variables across provinces (and numbers in parentheses are the standard deviations). Beijing, Chongqing, Ningxia, and

[13]The NGDC is a part of the National Oceanic and Atmospheric Administration, which obtains the raw satellite data on night lights from the United States Airforce Defense Meteorological Satellite Program (DMSP) that have been recording the intensity of lights with their sensors.

[14]As will be shown below, the results based on the earlier version of light data (which range from 0 to 63) yields very similar results.

Shanghai do not have any standard deviations, because each of these cities represents the whole province. GDP per capita is in 1000s of Yuan, and trade openness is measured by (Imports+Exports)/GDP and expressed in percent. Note that for each key variable, there is a substantial variation across provinces. Beijing and Shanghai are usually at the top of the list in each variable, while Gansu, Ningxia, and Yunnan ranked at bottom. The development has not been uniform across cities. Beijing, which was relatively more densely populated in 1776, is now more bright, richer, more educated and open. Anhui was also densely populated in 1776, but now is less bright, poor, less educated, and less open. Table 2 reports correlation across these variables, and note that the population density in 1776 is positively correlated with all other indicators, and the correlation is especially strong with light density. Note also that night-light density is strongly correlated with per capita income and openness.

4 Empirical Implementation

4.1 Econometric Specification

We index cities by c and provinces by p, and use the following model to assess the relation between the early development and the present one:

$$Y_c = \beta \text{Popden}_{c,1776} + X_c + \alpha_p + \varepsilon_c, \tag{1}$$

where Y_c denotes log value of the following development measures: the average night-light density, GDP per capita, years of schooling, or trade openness in 2010. $\text{Popden}_{c,1776}$ represents log population density in 1776, X_c is a set of control variables, α_p is an indicator variable that equals one if city c is in province p and zero otherwise, and ε_c is the error term.

The set X include several geographic variables including distance to the nearest port, distance to the capital city of each province, the mean levels of temperature (Celsius) and rainfall (mm) between 2000 and 2010, the corresponding average annual variations in temperature and precipitation, and a river dummy that equals one if one of the four major rivers (Huai, Xi, Yangzi, and Yellow) passes through the city.[15] We use log values of all continuous control variables.

We use heteroskedasticity robust standard errors clustered at the province level. However, to minimize any potential problems in inference that may stem from a small number of clusters (24 provinces), we obtain $p-$values associated with a test of significance for each coefficient using the wild bootstrap t-procedure (developed by Cameron et al. 2008) clustered at the province-level with 100,000 replications.

4.2 Results

Table 3 reports the results for each outcome based on equation (1). All regressions include province fixed effects, and the p-values are shown in square brackets. Columns 1 and 2 show the effect of early development on light density in 2010 without and with controls, respectively. The estimate is 0.550 and highly significant (at the 1-percent level), implying that had the population density been 1 percent higher in 1776, the average light density in each city would have been about 0.55 percent higher in 2010. The estimate on the distance to the nearest port are negative and highly significant (at the 1-percent level), whereas other coefficients are insignificant.

In columns 3 and 4, we repeat the same exercise where the dependent variable is log GDP per capita. Note that the coefficient on the Popden_{1776} in column 3 becomes smaller and less significant once the controls are included: the effect of early development decreases from about 0.175 to 0.125.[16] Thus, had the population density been 1 percent higher in 1776, the average per capita GDP in each city would have been about 0.13 percent higher in 2010. Consistent with expectation, note that the distance to the nearest port, the distance to province's capital, and average temperature have a negative effect on GDP per capita, while access to a river has a positive effect.

[15] We do not include "latitude" in our regressions, since it is highly correlated with temperature and precipitation. Including latitude does not have any significant impact on the coefficient of $\text{Popden}_{c,1776}$. There are several other very small rivers running through China Proper, but the above rivers have been considered most important ones in China's development (especially, during the Qing Dynasty).

[16] Our control variables do not include schooling and openness, since they are outcome variables and thus considered bad controls (Angrist and Pischke 2009).

Columns 5 and 6 report results from regressions where the dependent variable is the log average years of schooling in 2010. Including controls reduces the estimated coefficient on Popden_{1776} substantially. The estimate in column 6 implies that if the population density were 10 percent higher in 1776, the average years of schooling in 2010 would have been 0.25 percent higher, which further implies that the average years of schooling in 2010 would have been about 9 years (since it is about 8.95 years). Estimates in column 5 indicate that the average years schooling is higher in places closer to a port and capital.

Finally, we also investigate implications of early development for trade openness. According to columns 7 and 8 in Table 2, early development has a positive and highly significant effect on trade openness in 2010. Note that adding controls to our model reduces the coefficient of interest more than 40 percent. Column 8 indicates that had the population density been 1 percent higher in 1776, 2010 trade openness would have been 0.315 percent higher. We also consider specifications where export/GDP and import/GDP are separately regressed on Popden_{1776} and controls. Estimated coefficients are 0.320^{**} [0.043] and 0.431^{**} [0.025] for export and import, respectively.

We check whether the results are driven by any particularly influential observations, and thus for each outcome variable we plot the partial regression results obtained from model (1). Figure 2 represent these plots, and note that they do not show any apparent outliers.[17] As a further robustness check, we also consider the impact on these development indicators measured in 2000. In measuring night lights in 2000, we use an older version where density ranges between 0 and 63. Note that results reported in Table 4 qualitatively mostly remain the same. Note also that the impact of Popden_{1776} on GDP per capita and trade openness is considerably higher in Table 4 (although the effect on the openness is not significant).[18] In sum, our analysis implies that more densely populated cities in the 1776 Qing dynasty are also more developed today in the sense that they are brighter, richer, more educated,

[17] Our sample includes five provinces each having only one city: Beijing, Chongqing, Ningxia, Shanghai, and Tianjin. We repeat the analysis without these cities, and our point estimates and their significance are almost identical to those reported in Table 3.

[18] The real GDP data are in 2010 prices, and to calculate real values provincial-level GDP deflators are used. Substantially higher impact of the early development on GDP per capita and openness may stem from measurement errors.

and more open.

5 Conclusion

There is growing literature that has investigated the factors behind China's unprecedented growth performance observed since the market-oriented reforms implemented about four decades ago. China was a poor country in the late 1970s, and today it has the second largest economy in the world and is among upper-middle income countries in terms of income per capita. But China's fast development has been unevenly distributed across its regions, and improving economic conditions in lagged areas has been a difficult task for policy makers.

This paper, using insights from the recent empirical studies in the comparative development literature, argues that the early development is a strong and robust predictor of today's living standards. Specifically, we use the population density of more than 220 cities in 1776 of the Qing dynasty as a proxy for the early economic prosperity, and investigated how it has affected these cities' current development level. We find that more prosperous cities in 1776 are still enjoying better living standards today in the sense that they are brighter, richer, more educated, and more open.

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Table 1. Summary Statistics on Key Variables

Province	Population Density 1776	Light Denisty 2010	GDP/Capita (1,000 Yuan) 2010	Average Schooling 2010	Trade/GDP (Percent) 2010
Anhui	194.00	5.61	21.51	8.26	12.84
	(152.22)	(4.94)	(14.47)	(0.78)	(11.81)
Beijing	122.16	32.38	112.21	11.71	144.57
	—	—	—	—	—
Chongqing	56.59	3.46	23.99	9.10	10.61
	—	—	—	—	—
Fujian	100.34	5.84	39.84	9.01	50.10
	(78.80)	(6.91)	(90.19)	(0.63)	(61.03)
Gansu	34.05	1.28	14.99	9.03	12.34
	(50.38)	(0.77)	(90.00)	(1.60)	(21.76)
Guangdong	105.97	11.30	49.22	9.61	103.45
	(74.28)	(15.96)	(33.66)	(0.98)	(88.39)
Guangxi	34.60	2.67	20.99	8.76	10.92
	(14.01)	(1.42)	(70.04)	(0.57)	(16.30)
Guizhou	32.15	1.87	13.51	7.61	5.60
	(18.65)	(1.66)	(56.96)	(0.88)	(6.85)
Hainan	231.20	16.61	30.24	10.42	32.77
	(143.55)	(0.72)	(28.17)	(0.43)	(27.49)
Hebei	98.98	11.35	28.24	9.40	13.56
	(70.81)	(6.78)	(14.05)	(0.37)	(7.10)
Henan	145.89	7.90	24.52	8.92	4.84
	(63.87)	(6.26)	(10.39)	(0.74)	(2.97)
Hubei	100.08	3.49	27.37	9.18	11.24
	(76.18)	(4.65)	(15.78)	(0.97)	(8.74)
Hunan	69.33	2.38	25.18	9.15	6.01
	(23.29)	(1.99)	(15.74)	(0.59)	(4.59)
Jiangsu	314.87	24.73	53.18	9.30	75.34
	(274.87)	(19.08)	(23.74)	(0.77)	(72.55)
Jiangxi	98.47	2.53	21.16	8.85	15.50
	(96.75)	(1.98)	(11.62)	(0.63)	(15.11)
Ningxia	26.10	4.97	26.69	8.09	7.85
	—	—	—	—	—

Table 1. Summary Statistics on Key Variables–Continued

Province	Population Density 1776	Light Denisty 2010	GDP/Capita (1,000 Yuan) 2010	Average Schooling 2010	Trade/GDP (Percent) 2010
Shaanxi	38.68	5.19	26.12	9.52	8.04
	(43.65)	(4.07)	(12.59)	(1.21)	(7.88)
Shandong	183.31	14.75	41.97	8.96	31.83
	(66.41)	(5.12)	(20.42)	(0.71)	(26.14)
Shanghai	339.77	63.12	74.63	10.73	145.47
	—	—	—	—	—
Shanxi	77.72	6.97	25.88	9.72	9.47
	(55.22)	(2.53)	(10.69)	(0.57)	(10.99)
Sichuan	48.84	3.33	19.97	8.55	13.12
	(40.33)	(4.56)	(12.52)	(0.72)	(13.14)
Tianjin	124.46	44.50	93.66	10.4	75.87
	—	—	—	—	—
Yunnan	20.59	2.40	16.11	7.76	12.22
	(11.17)	(1.75)	(89.36)	(0.83)	(14.03)
Zhejiang	220.18	14.75	49.67	8.78	63.47
	(154.91)	(10.80)	(14.90)	(0.67)	(28.26)
	84.02	5.91	33.25	9.04	50.14
	(100.29)	(8.57)	(23.43)	(0.98)	(61.50)

Notes: Satellite data on night lights are from National Geophysical Data Center. The data on population in 1776 are from Cao (2001) and Liang (2008); GDP, population, and the average years of schooling are from City and Provincial Statistical Yearbooks (2011) and the 2010 Population Census of China. Trade data from the Monthly Custom Statistics (2011).

Table 2. Correlation Among Key Variables

	Pop. Density	Light Density	GDP/Capita	Schooling	Openness
Pop Density	1.000	0.747	0.505	0.430	0.528
Light Density		1.000	0.740	0.610	0.658
GDP/Capita			1.000	0.715	0.624
Schooling				1.000	0.511
Openness					1.000

Notes: All variables are measured in logs.

Table 3. Impact of Population Density in 1776 on China's Development in 2010

Variable	Light Density		GDP per Capita		Schooling		Trade Openness	
	1	2	3	4	5	6	7	8
$Popden_{1776}$	0.697***	0.550***	0.174**	0.125*	0.042***	0.024**	0.539***	0.315***
p-value	[0.000]	[0.000]	[0.038]	[0.067]	[0.007]	[0.023]	[0.002]	[0.005]
Dist. to Port		−0.245***		−0.154**		−0.016*		−0.362***
p-value		[0.000]		[0.012]		[0.093]		[0.004]
Dist. to Capital		−0.157***		−0.086***		−0.026***		−0.193***
p-value		[0.000]		[0.000]		[0.000]		[0.001]
Temp mean		−0.090		−0.656**		−0.137*		1.370*
p-value		[0.771]		[0.043]		[0.086]		[0.081]
Temp sdv		−0.604		−0.267		−0.022		−0.550
p-value		[0.473]		[0.160]		[0.426]		[0.429]
Rainfall mean		−0.140		−0.376		−0.106		−1.490
p-value		[0.775]		[0.428]		[0.551]		[0.309]
Rainfall sdv		−0.108		−0.148		0.034		0.389
p-value		[0.729]		[0.471]		[0.524]		[0.434]
River		0.070		0.189*		0.019		−0.143
p-value		[0.522]		[0.054]		[0.109]		[0.534]
Observations	227	233	227	227	227	233	225	225
Adj. R^2	0.745	0.772	0.485	0.645	0.519	0.755	0.577	0.651

Notes: All regressions include province fixed effects. All continuous variables (including dependent variable) are measured in logs. Numbers in square brackets are p-values obtained from wild bootstrapping (100,000 replications) clustered at the province level; ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

Table 4. Impact of Population Density in 1776 on China's Development in 2000

Variable	Light Density	GDP per Capita	Avg. Schooling	Trade Openness
$Popden_{1776}$	0.602***	0.184***	0.029***	0.453
p-value	[0.000]	[0.003]	[0.008]	[0.109]
Dist. to Port	−0.216**	−0.135***	−0.013*	−0.439**
p-value	[0.013]	[0.002]	[0.095]	[0.020]
Dist. to Capital	−0.124***	−0.002***	−0.025***	−0.272***
p-value	[0.002]	[0.000]	[0.000]	[0.003]
Temp mean	0.061	−0.537*	−0.087	0.702
p-value	[0.864]	[0.065]	[0.197]	[0.573]
Temp sdv	0.500	−0.044	−0.076*	−2.190**
p-value	[0.116]	[0.667]	[0.094]	[0.019]
Rainfall mean	−0.261	−0.037	−0.064	−2.050
p-value	[0.602]	[0.871]	[0.665]	[0.578]
Rainfall sdv	−0.460	0.004	−0.011	0.457
p-value	[0.204]	[0.979]	[0.719]	[0.626]
River	0.176	0.132*	0.015	0.288
p-value	[0.117]	[0.068]	[0.174]	[0.385]
Observations	216	216	216	174
Adj. R^2	0.794	0.736	0.761	0.674

Notes: All regressions include province fixed effects. All continuous variables (including dependent variable) are measured in logs. Numbers in square brackets are *p*-values obtained from wild bootstrapping (100,000 replications) clustered at the province level; ***, **, and * represent statistical significance at the 1%, 5%, and 10% level, respectively.

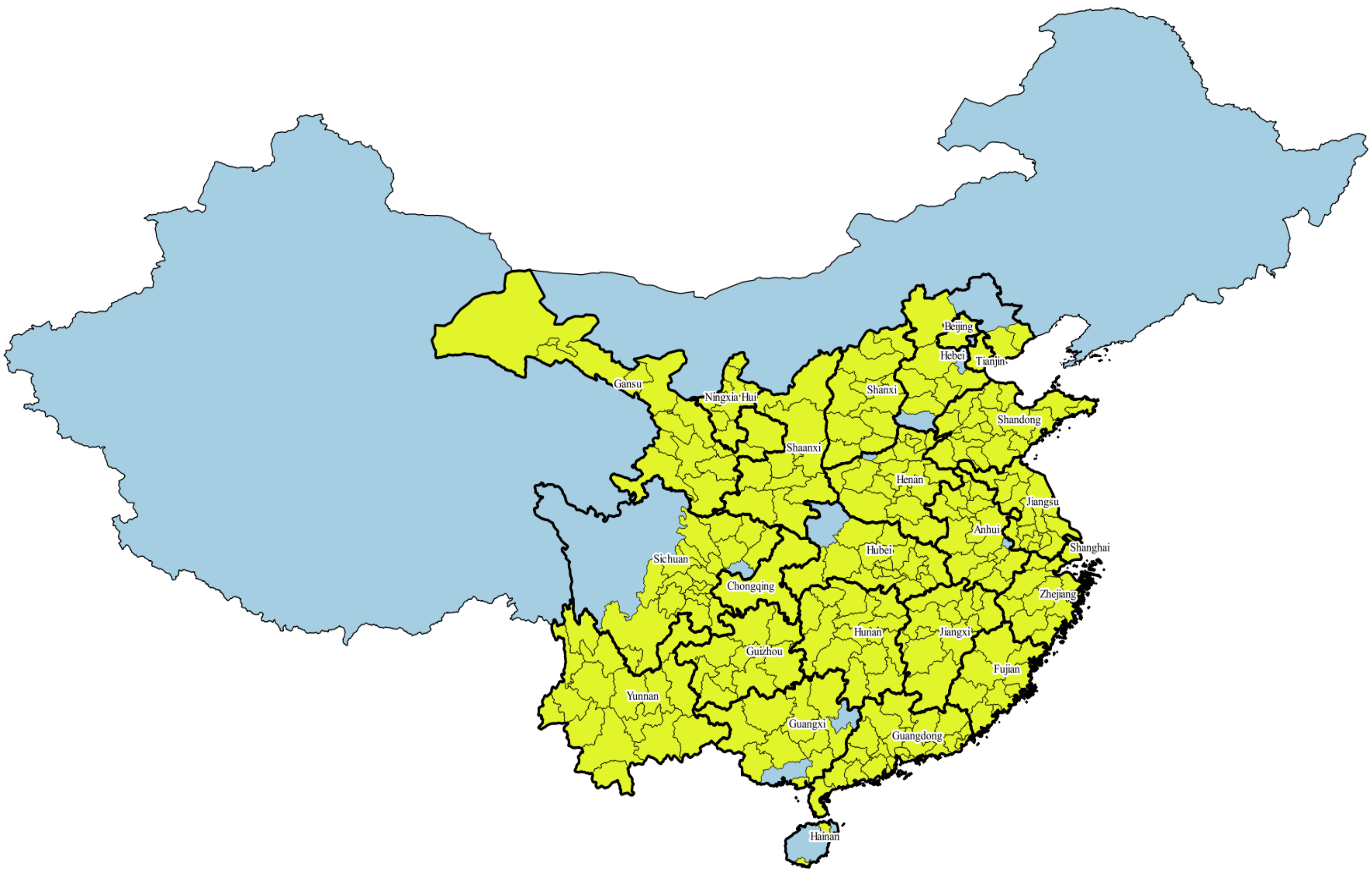
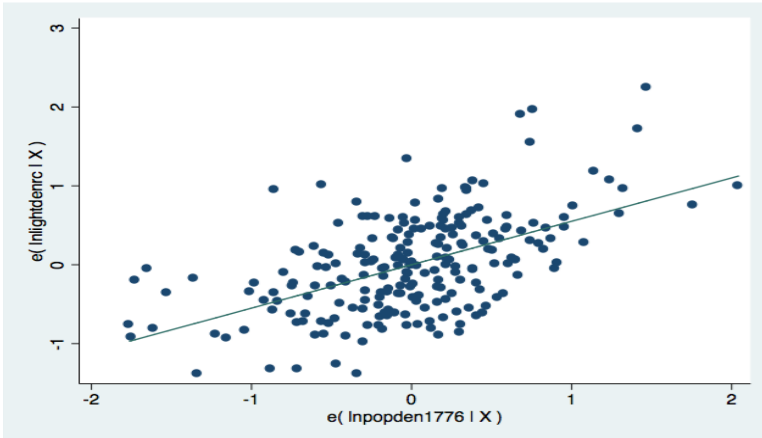
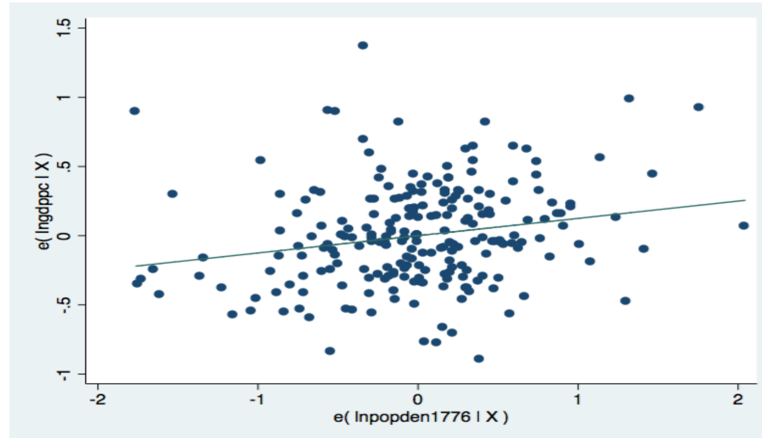


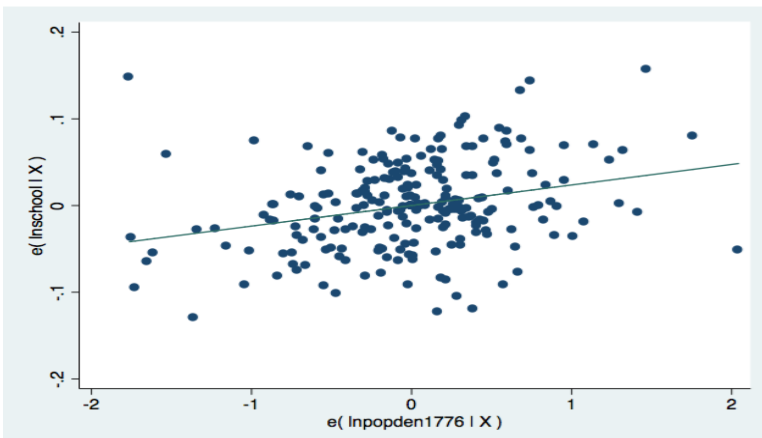
Figure 1: Provinces and Cities Used in the Analysis



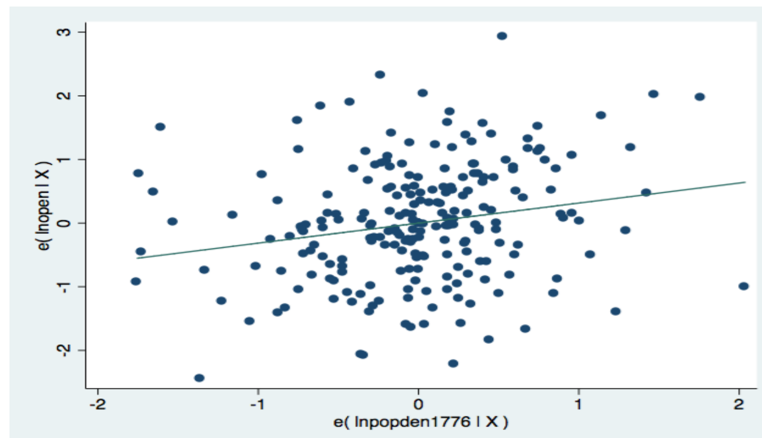
a. Night-Light Density



b. GDP per Capita



c. Schooling



d. Trade Openness

Figure 2: Partial Regression Plots for Each Outcome. X includes all controls and province fixed effects in equation (1).