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ARTIFICIAL ADMINISTRATIVE BOUNDARIES:
EVIDENCE FROM CHINA

PEI LI
XIAMEN UNIVERSITY

YI LU
TSINGHUA UNIVERSITY AND NATIONAL UNIVERSITY OF SINGAPORE

TUAN-HWEE SNG
NATIONAL UNIVERSITY OF SINGAPORE

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THE AUSTRALIAN NATIONAL UNIVERSITY
ACTON ACT 0200 AUSTRALIA

T 61 2 6125 3590

F 61 2 6125 5124

E enquiries.eco@anu.edu.au

<https://www.rse.anu.edu.au/research/centres-projects/centre-for-economic-history/>

Artificial Administrative Boundaries: Evidence from China

Pei Li, Yi Lu, Tuan-Hwee Sng*

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Abstract

What happens when subnational boundaries are badly drawn? We use China as a laboratory to investigate the ramifications. As Chinese provincial and long-standing socioeconomic boundaries are not fully aligned, counties of the same province may not share the same regional identity. Using Deng Xiaoping's economic liberalization campaign in 1991–92 to implement a difference-in-differences, we find that the annual growth differential between non-dislocated and dislocated counties increased by 3.1 percentage points after Deng's campaign galvanized the provinces to pursue economic expansion. We also uncover evidence of discrimination against the dislocated counties by the provincial authorities.

Key words: Artificial borders, Regional Favoritism, Decentralization, China

JEL Codes: D73, H11, H77, O43

*Pei Li, Xiamen University. Email: bengcome@gmail.com. Yi Lu, Tsinghua University and National University of Singapore. Email: luyi@sem.tsinghua.edu.cn. Tuan-Hwee Sng, National University of Singapore. Email: tsng@nus.edu.sg. We thank Pei Zhi Chia and Yi Xuan Tan for excellent research assistance. We gratefully acknowledge financial support from Singapore Ministry of Education Academic Research Fund Tier 1 FY2014-FRC3-002.

1 Introduction

Administrative boundaries that disregard socioeconomic, ethnic, or cultural patterns are artificial. A sizable literature studying national borders, especially in Africa, finds that artificial national borders tended to fuel civil conflict and lead to slower growth (Alesina et al., 2011; Michalopoulos and Papaioannou, 2016). In this paper, we investigate whether artificial subnational administrative boundaries generate negative economic consequences too.

Since subnational administrative boundaries exist in all but the smallest countries, the potential for dislocation is present practically everywhere. In fact, there are several known instances when the state intentionally reorganized subnational borders to reduce the autonomy of minority areas. Examples include the integration of German Bohemia and the Sudetenland into the province of Bohemia in interwar Czechoslovakia, Indonesia’s incorporation of Aceh into the province of North Sumatra in early-1950s, and Saddam Hussein’s redivision of Iraq into eighteen provinces in the 1970s (Coakley, 2003; O’Leary et al., 2005; Oishi, 2016).

However, the economic consequence of artificial subnational boundaries are empirically difficult to identify due to endogeneity issues. For instance, if the state manipulates subnational boundaries to break up an ethnic enclave, the act is likely to be accompanied by other policies designed to promote the same objective. Disentangling the effects of these policies would be extremely challenging, if not impossible.

In this paper, we investigate provincial boundaries in China and implement a unique difference-in-differences (DD) design to overcome the endogeneity problem. China makes an interesting case study because its modern-day provinces (Figure 1) mostly took their present shapes by the mid-seventeenth century. In some areas, provincial and longstanding socioeconomic boundaries are significantly misaligned, resulting in some counties being assigned to provinces with which they do not share a common regional identity (Qian, 1955; Skinner, 1977; Zhou, 2005).

Specialists of China have long pointed out that the popular perception of China as a homogeneous country is a mistaken one. Beneath China’s politically unified state is a landmass of rich and enormous regional diversity (Tregear, 1965; Pomeranz, 2000; Xu, 2011). We focus on China proper, the traditionally settled part of China, and use the macroregions identified by G. W. Skinner as our primary benchmark to identify misalignments between administrative and socioeconomic boundaries (Figure 2A). Widely

Figure 1: China’s Administrative Provinces (1990)



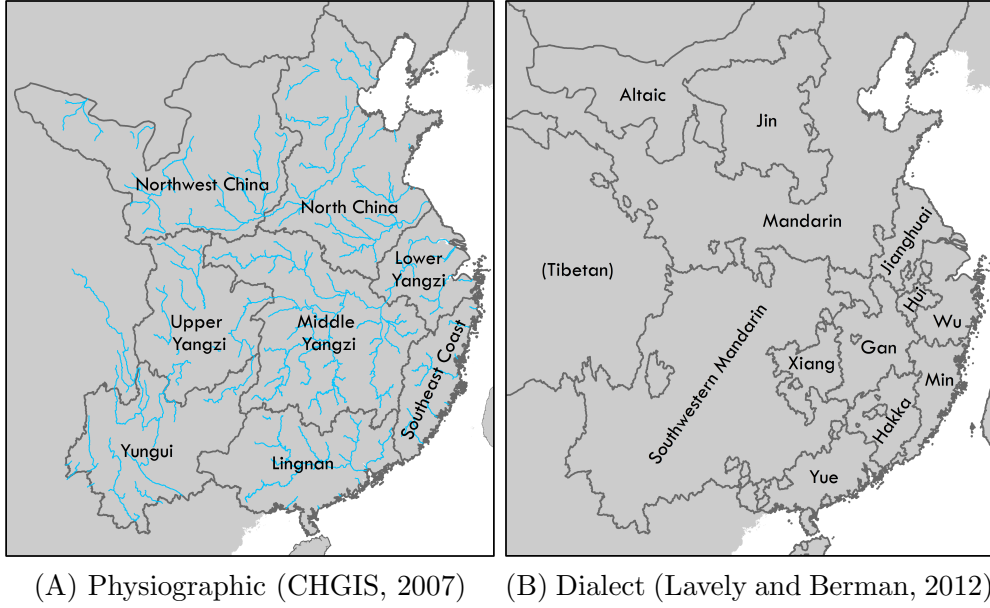
adopted among historians and anthropologists studying China, the Skinnerian macroregion framework is based on the observation that historically, China’s rivers served as the primary transportation and communication network for its people and therefore exercised a decisive influence in shaping its regional identities (Skinner, 1977). Skinner identified eight major drainage systems or macroregions in China proper. Building on his analysis, we define a county as “dislocated” if it does not lie in the same macroregion as its provincial capital city.¹

As an alternative benchmark, we equate dialect areas with cultural regions and use the spatial distribution of Chinese dialect groups provided by Lavelly and Berman (2012) to identify the dislocated counties (Figure 2B).

To address concerns over extraneous factors and selection bias, we exploit an unanticipated policy shift to implement a DD design. In 1991–92, the ailing Chinese leader

¹Alternatively, we may define dislocation as being located outside the province’s most populous macroregion. The two definitions are equivalent because every provincial capital city in our study area is located inside the province’s dominant macroregion.

Figure 2: Physiographic and Dialect Regions in China



Deng Xiaoping launched the last major political campaign of his career to remove the ideological obstacles to his economic agenda. The campaign, which comprised a series of maneuvers including the promotion of the reform-minded Zhu Rongji to vice premier and a month-long tour of southern China to win hearts and minds, ended the decade-long political dispute within China's top leadership over the legitimacy of promoting capitalist methods of production in the communist state. In its aftermath, provincial and local officials raced to achieve faster growth (Vogel, 2011).

We hypothesize that due to the presence of regional linkages, the provincial authority would have a greater incentive to promote growth in non-dislocated counties since these counties account for the larger part of the province and therefore generate more growth complementarities within the province. Consequently, Deng's campaign, by galvanizing provincial authorities into leading the charge toward higher growth rates, should have increased the growth differential between the non-dislocated and dislocated counties. We empirically examine if this was indeed the case.

Besides the DD estimation, we also employ the boundary discontinuity (BD) method as an alternative measure to elicit causation. We use the boundaries that separate non-dislocated and dislocated counties as the discontinuity threshold and then check for discontinuity in night light intensity at the threshold.

The two methods deliver consistent results. The DD estimation shows that the growth trajectories of the non-dislocated and dislocated counties diverged after Deng’s campaign assured provincial leaders that they could now go all out to promote GDP growth without inviting accusations of advocating capitalism. Specifically, the difference in output growth between the two groups increased by 3.1 percentage points annually in disfavor of the dislocated counties after 1991. Likewise, the BD analysis indicates that the dislocated side of the boundary was marginally darker at night in 1992 (first year of data availability) and the contrast increased over time through the 1990s.

To shed light on the underlying mechanisms, we investigate the patterns of resource allocation using our DD framework. First, we examine the spatial distribution of two kinds of provincial-level public investments—power plants and provincial-level roads—to find out if the provincial authorities exerted differential efforts on non-dislocated and dislocated counties. In both instances, the spatial distribution of public construction shifted in disfavor of the dislocated counties after Deng’s campaign. We also look at inbound foreign direct investment (FDI), which required the approval of the provincial authority to materialize. We find that the fraction of FDI projects that landed in the dislocated counties decreased after 1991. By contrast, the relative performance of the dislocated counties post-1991 did not worsen in university enrolment ratio, a factor over which the provincial authorities had no direct control over.

Finally, we investigate if the birth places of the provincial party secretary and the provincial governor—the two highest ranking provincial positions—contributed to the growth inequality that we uncovered. It turns out that both mattered substantively. The post-1991 growth differential between non-dislocated and dislocated counties increased if the leader at the provincial helm came from the non-dislocated part of the province. We interpret this as evidence of regional discrimination.

Despite the fact that subnational boundaries are ubiquitous, the literature is mostly focused on the study of electorate boundary manipulation or gerrymandering in democracies (e.g., Coate and Knight, 2007; Friedman and Holden, 2008; Bracco, 2013). By studying administrative boundaries, we seek to draw attention to an important but often overlooked aspect of subnational demarcation that is relevant to democracies and nondemocracies alike.

Our paper is related to the literature that examines, theoretically and empirically, the optimal number of subnational jurisdictions (Alesina et al., 2004; Gordon and

Knight, 2009; Weese, 2015). It builds on studies that investigate the economic consequences of artificial states (Alesina et al., 2011; Michalopoulos and Papaioannou, 2016). We also engage the literature on regional favoritism. In their cross-country study, Hodler and Raschky (2014) find that a subnational administrative region is brighter at night if it is the birth place of the current political leader. Burgess et al. (2015) examine roadbuilding in Kenya and show that more roads are built in districts sharing the ethnicity of the president. Our findings complement these studies by providing evidence of regional favoritism generated at a different level—by the subnational governments.

The paper also intersects with the debate on whether decentralization is welfare-enhancing or welfare-reducing. A large literature has argued that decentralization enhances welfare by creating competition among local jurisdictions, which gives individuals better residential choices and punishes jurisdictions that provide public goods inefficiently or misallocate resources (Tiebout, 1956; Brennan and Buchanan, 1980; Qian and Roland, 1998). Others, however, warn that interjurisdictional competition for capital could lead to a lowering of environmental standards (Cumberland, 1979; Oates and Schwab, 1988), a race to the bottom in taxation, and an underprovision of non-business-oriented public goods such as parks and libraries (Oates, 1972; Keen and Marchand, 1997), or it could induce jurisdictions to help firms evade central taxes or regulations (Cai and Treisman, 2004). Our findings highlight another potential pitfall of decentralization: when subnational administrative borders are misaligned, granting subnational units more autonomy (in China’s case to pursue economic growth) may not benefit everyone equally and could harm the minority (dislocated) areas.

The rest of the paper is organized as follows. Section 2 provides short background discussions on the emergence of China’s present-day provincial borders, regions in China, and Deng’s 1991–92 political campaign. We then build a simple model in Section 3 to illustrate our conceptual framework. In Section 4, we introduce the data and explain our empirical strategy. Sections 5 and 6 present the findings and investigate the underlying mechanisms. Section 7 concludes.

2 Background

2.1 Chinese Provinces

While there exists a sizable body of literature discussing external borders, internal administrative boundaries are relatively understudied. However, some research provides strong, if indirect, evidence showing that internal administrative divisions have important welfare consequences. For instance, Campante and Do (2014) detect higher levels of corruption and lower levels of public good provision in US states where the state’s capital city is relatively isolated; Kahn et al. (2015) find that Chinese provinces are more ready to discharge pollution downstream when the downstream area is administered by another province.

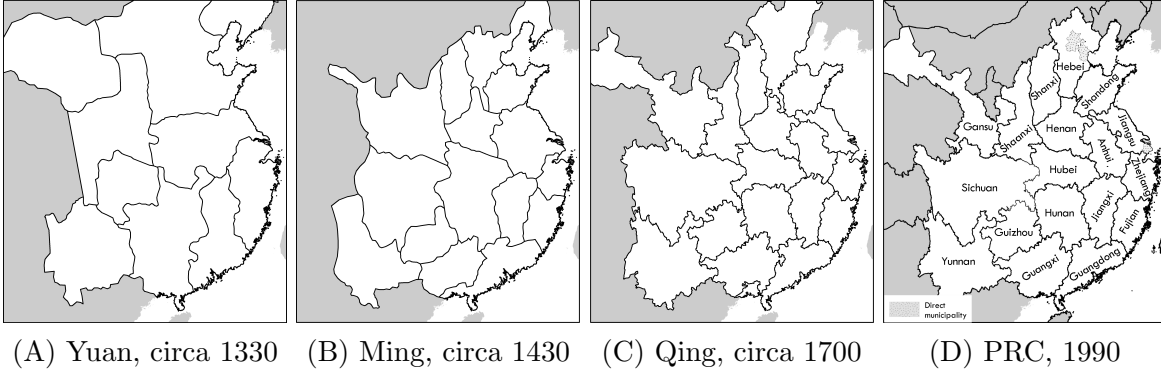
Furthermore, there are many real-world examples of states manipulating internal boundaries to achieve political objectives. As early as the classical age, when the Romans conquered Macedon in the second century BC, they reorganized the land into four republics to prevent a Macedonian resurgence (Hammond, 1989). The British routinely adjusted the administrative boundaries of Nigeria in the early twentieth-century to facilitate colonial control (Carland, 1985). During the 1970s, Saddam Hussein reorganized Iraq into eighteen provinces and intentionally kept Kurdistan administratively fragmented to weaken the Kurdish identity (O’Leary et al., 2005). Such actions are likely to generate socioeconomic ramifications.

China, with its long history of bureaucratic government and territorial administration (Fukuyama, 2011), offers an interesting opportunity to study the consequences of artificial internal boundaries. The present-day Chinese provincial system first emerged during the Mongol-Yuan dynasty in the thirteenth century (Whitney, 1970). By the late seventeenth century, the provinces had largely settled into the shapes that one observes today (Figures 3A–D).

Historical accounts suggest that when the imperial rulers demarcated the provinces, their decisions were not based on preexisting regional socioeconomic structures alone. Historical accidents played an important role. For example, because the Mongols set up provinces in China in a piecemeal manner, many of the provincial boundaries merely reflected the timings that different areas fell under Mongol control (Li, 2011).

Strategic and military considerations mattered too. Chinese scholars have long argued that the shapes of the provinces reflected in part the desire of the central govern-

Figure 3: Provinces Through the Dynasties (Herrmann, 1966; Tan, 1975; CHGIS, 2007)



ment to break up natural economic regions so as to prevent concentrations of regional power (Guy, 2010). For instance, during the 1660s, when the Qing emperor Kangxi split the oversized Jiangnan province in two, instead of creating two east-west oriented provinces, one to administer the Huai River Basin and the other to administer Lower Yangzi Basin, he delineated two north-south oriented provinces, Jiangsu and Anhui, to share the two basins roughly equally.

After the Chinese Revolution of 1911–12 ended two millennia of imperial rule, some politicians and intellectuals called for a complete overhaul of the provincial boundaries to better reflect socioeconomic realities. In the 1930s, the Chinese government under the Nationalist Party made plans to redelineate the provincial boundaries with the goal of removing existing distortions (Hu, 1945; Whitney, 1970). However, progress was disrupted by incessant fighting among the warlords and the Sino-Japanese War. And the work was abandoned in 1949 when the Communists took power and shifted the political priority to class struggle. Consequently, the historical provincial borders largely survived to the present day and are now widely seen as sanctified by history.

2.2 Chinese Socioeconomic Regions

To identify the dislocated counties in our empirical analysis, we need a set of “natural regions” to determine whether a county is located in the same region as its provincial capital. Our primary benchmark is the set of Chinese macroregions described by the anthropologist G. W. Skinner (1977) in his seminal work *The City in Late Imperial China* (Figure 2A).

The choice is motivated by two considerations. First, in the past few decades the

Skinnerian macroregion classification has been “the dominant paradigm in Chinese historiography” (Cartier, 2002). It is the standard tool that historians and anthropologists employ to study Chinese regional history.

Second, the Skinnerian classification is consistent with traditional perceptions of China’s socioeconomic regions. It acknowledges the popular division of China proper into a northern half dominated by the Yellow River Basin and a southern half dominated by the Yangzi River Basin;² the distinction between the elevated Northwest and the low-lying North China plain along the Yellow river;³ the conceptualization of the Yangzi River Basin as having three constituent parts (Upper, Middle, and Lower);⁴ the presence of a well-defined and economically productive region known as Lingnan in the far south; and the existence of two rugged zones (inland Yungui and coastal Southeast) on either side of Lingnan. If we compare the Skinnerian classification with three other characterizations of Chinese regions—those proposed by Hu (1936), Tregear (1965), and Marks (2012) respectively—their similarities are overwhelming.⁵

Befitting China’s history as a river civilization in which major historical settlements were established in river valleys, the Skinnerian macroregions are based on river networks. Each macroregion is a drainage basin, with watersheds as boundaries. According to Skinner, since China’s riverine system was the primary mode of transportation during the age of unmechanized transport, the bulk of socioeconomic interactions traditionally took place within the macroregion as interregional contact was hampered by the rugged terrains that usually separated one macroregion from another. Therefore, each macroregion was a regional economy “characterized by the concentration in a central area of resources of all kinds [...] and by the thinning out of resources toward the periphery;” they “are at once social communities, parapolitical systems, and culture-bearing units” (Skinner, 1985, 280, 288).

²The two halves were known to the thirteenth-century traveler Marco Polo as Cathay and Manji respectively (Polo, 1958). Their boundary approximates the zero-degree Celsius isotherm in January. Today, cities north of the boundary receive free winter heating from the state (Chen et al., 2013). It also symbolizes China’s wheat-rice divide. According to Talhelm et al. (2014), Chinese living north of the divide generally display a more independent streak, while a more collective mindset has prevailed in the south due to the greater irrigation needs of paddy rice.

³Historically known as Guanzhong and Guandong, respectively (Lewis, 2007).

⁴Historically known as Bashu, Jingchu, and Wuyue, respectively.

⁵Hu (1936) recognizes seven of the eight regions in the Skinnerian framework and lumps the fringe Southwest or Yungui into Upper Yangzi; Tregear (1965) considers the Huai River Basin as a region separate from the rest of the North China plain, but his classification is otherwise identical to Skinner’s; Marks (2012) and Skinner (1977) identify the same eight regions in China proper.

To ensure that our results are not overly dependent on the Skinnerian classification of Chinese physiographic regions, we use an alternative benchmark of linguistic or dialect areas that is based on Lavelly and Berman (2012) (Figure 2B). As the historian Martin Heijdra suggests, thinking about Chinese regions as dialect areas is a good complement to the Skinnerian physiographic approach (Heijdra, 1995, 310). As we shall see, the two benchmarks deliver similar findings.

2.3 Deng’s Campaign of 1991–92

We now provide a discussion of Deng Xiaoping’s campaign in 1991–92 to highlight (1) the unexpected nature of the event and (2) the campaign’s legacy of empowering the Chinese provinces to pursue capitalist-style economic growth.

Divided Party Leadership in the 1980s. While Deng Xiaoping was widely regarded as China’s preeminent leader between 1978 and 1990, his authority was considerably more limited than that of his predecessor Mao (Wong and Zheng, 2001). On important issues, he had to contend with the views of other party elders, especially Chen Yun, the architect of China’s first Five-Year Plan. Like most of the other party elders, Chen held a relatively conservative view of the economy and favored more central planning than did Deng. He openly disagreed with Deng in 1984–85 over the setting up of Special Economic Zones (SEZs). Many China observers viewed Chinese politics in the 1980s as one featuring “twin peaks”—in Deng and Chen, there were not one, but two paramount leaders (Dillon, 2015, 268).

This peculiar power structure and the top leaders’ differing visions for China’s economic future created huge political risks for the provincial and local officials (Xu, 2011). While they were urged by Deng and his protégés to take greater initiatives in promoting economic growth, many of them chose to adopt a cautious attitude to avoid bearing the wrath of the conservatives, who rallied around Chen (Nathan, 1990).

Deng’s Assault on Conservative Policies in 1991–92. Deng’s ability to maintain policy initiatives waned in the aftermath of the 1989 Tiananmen Incident, which saw the ousting of his handpicked successor Zhao Ziyang as party secretary (the *de jure* party chief). In November 1989, Deng retired from his last official position as chairperson of the Central Military Commission (CMC). Upon Deng’s retirement, Chen, who remained

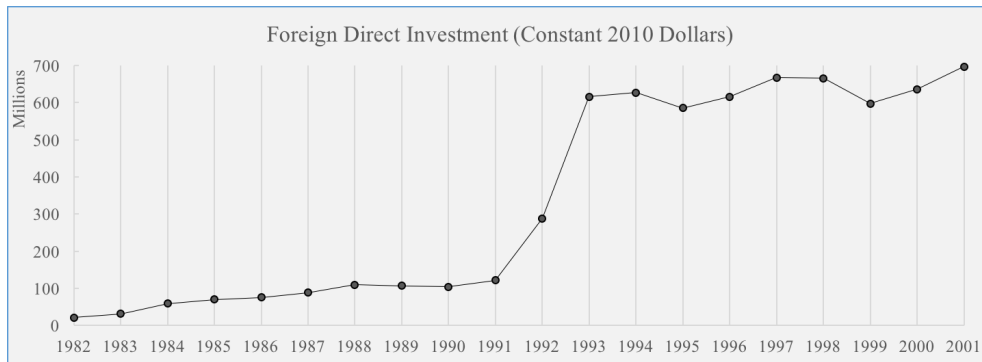
as chairperson of the powerful Central Advisory Commission, pronounced the target of restoring the state-owned share of the economy to 80% (Baum, 1994; MacFarquhar, 2011). At the time, the new party secretary Jiang Zemin was leaning toward the conservatives. Jiang openly referred to self-employed traders and peddlers as crooks who “cheat, embezzle, bribe, and evade taxation” and pledged to investigate their dealings (Becker, 2000, 169). The conservative political mood was so pervasive that some farmers reportedly sold their livestock in anticipation that the state would soon recollectivize the farms (Fenby, 2013, 644).

In 1990, Deng, who was reportedly in poor health, complained in an interview that “[n]obody takes any notice of me” (Fenby, 2013, 646). But a year later, he launched a surprise campaign to resuscitate his reform agenda. Knowing that he lacked sufficient support from other top leaders to assert his policy agenda, he canvassed support from the lower rungs (Vogel, 2011). He fired the opening salvo by visiting Shanghai in spring 1991 and masterminding the publication of a four-part pro-reform commentary in the Shanghai-based *Liberation Daily*. The commentary claimed that “1991 is the year of reform” and sent a strong signal of Deng’s intent. The act, which took the central leadership by surprise, was well-received among the provincial leaders (MacFarquhar, 2011). In April that year, Zhu Rongji, the reform-minded party secretary of Shanghai, was promoted to vice premier under Deng’s patronage. And in January 1992, Deng initiated the last major political action of his life and visited Shenzhen, Zhuhai, Guangzhou, and Shanghai in South China, where he bypassed the leadership in Beijing and directly sought support for economic reform from the provincial and local officials as well as from the masses.

During his visit, Deng encouraged local officials to pursue faster growth and not to be afraid of experimenting with capitalist methods (Pantsov and Levine, 2015, 425). As a veiled warning to Jiang, the party secretary, Deng warned that “[W]hoever is against reform must leave office” (Vogel, 2011, 670). He then held a meeting in Zhuhai that was attended by top military officials, sending a strong signal that he still commanded the loyalty of the military despite his official retirement. According to his biographer, Jiang then “realized that his skewing to the more conservative views of the elders and his Politburo colleagues in Beijing was, in light of Deng’s onslaught, no longer the most stable position to hold” (Kuhn, 2004, 214). Facing the turning tide, he decisively repositioned himself to support Deng’s agenda.

In the Fourteenth Party Congress held later that year, Jiang declared China a “so-

Figure 4: FDI inflow into China. Source: World Bank.



cialist market economy” and promised faster GDP growth and a greater role for market forces in the economy. The Congress also disbanded the CAC, a select group of party elders headed by Chen, thereby closing the institutional channel that allowed the party elders to influence the political process. Against these developments, the conservatives mounted an unexpectedly weak resistance due to the untimely death of four prominent conservative elders (Baum, 1994; Dillon, 2015).⁶ The election of Hu Jintao—Deng’s pick for Jiang’s future successor—into the Politburo Standing Committee gave further assurance that Deng’s agenda would outlast Jiang’s tenure.

The Effects of Deng’s Campaign. Deng’s campaign had an instant impact on the Chinese economy. In 1989 and 1990, China’s GDP expanded by 4.1% and 3.8%, respectively. Its growth rate jumped to 9.2% in 1991 and 14.2% in 1992. The international publicity that Deng’s southern tour received, alongside the lifting of restrictions on attracting foreign capital, further led to an unprecedented surge in inbound foreign direct investment after 1992 (Figure 4).

Deng’s campaign left its mark by making GDP growth the top priority for officials and by freeing them to adopt capitalist methods without fear of being accused of betraying the communist cause. And the provincial and local officials duly responded by leading the charge toward faster growth. According to Coase and Wang (2012), China’s post-1992 economic growth differed fundamentally from its pre-1989 expansion: while growth in the 1980s was primarily driven by grassroots initiatives and private entrepreneurship, the transformative force in the 1990s was regional competi-

⁶They are Wang Renzhong, Li Xiannian, Deng Yingchao, and Hu Qiaomu. Wang Zhen, another leading conservative elder, died a year later.

tion. As provincial and local leaders sought new ways to drive growth, the Chinese economy boomed.

3 Conceptual Framework

We now provide a highly stylized model to illustrate how empowering provincial leaders to pursue economic growth would generate inequality between non-dislocated and dislocated counties.

Consider an economy of six counties, $i \in \{1, 2, 3, 4, 5, 6\}$. Counties 1, 2, 3 are located in one region, while counties 4, 5, 6 are located in another. The two regions are separated by a mountain range. For historical reasons, counties 1, 2, 4 are administered by province A while counties 3, 5, 6 are administered by province B. Suppose the provincial capitals are located in counties 1 and 6 respectively so that counties 3 and 4 are dislocated (by our definition of dislocation).

The political authority, who may be either a central planner or two provincial leaders, can exert effort to increase output. Consider counties i , j , and k , three counties located in the same region. The output of county i is given by $y_i = e_i^\alpha e_j^\beta e_k^\beta$, where $\alpha + 2\beta = 1$ and $\alpha > \beta$. Here, e_i denotes the effort that the authority exerts (primarily) to grow y_i . Due to growth spillovers, e_j and e_k contribute positively to y_i —but there is no spillover from counties on the opposite side of the mountain range. Likewise, e_i contributes positively to y_j and y_k , but does not benefit counties outside i 's region.

If a central planner is in charge, her problem is given by

$$\max_{e_i} \sum_{i=1}^6 \theta_i y_i - C\left(\sum_{i=1}^6 e_i\right), \quad (3.1)$$

where $\theta_i > 0$ represents the weight the planner assigns to county i ; $C(\cdot) \geq 0$ denotes the cost of effort, $C(0) = 0$, $C'(\cdot) > 0$, and $C''(\cdot) > 0$.

Alternatively, two leaders may administer provinces A and B separately. Without loss of generality, consider the problem of provincial leader A, which is given by

$$\max_{e_1, e_2, e_4} \theta_1 y_1 + \theta_2 y_2 + \theta_4 y_4 - C(e_1 + e_2 + e_4). \quad (3.2)$$

Solving the FOCs yields the following implications:

Implication 1. [Impartial central authority] *If the authority is a central planner who does not discriminate between the counties, i.e., $\theta_1 = \theta_2 = \dots = \theta_6$, in equilibrium $e_1^{c*} = e_2^{c*} = \dots = e_6^{c*}$ and therefore $y_1^{c*} = y_2^{c*} = \dots = y_6^{c*}$.*

Implication 2. [Impartial provincial leaders] *If political authority is decentralized under two provincial leaders who do not discriminate between the counties, i.e., $\theta_1 = \theta_2 = \dots = \theta_6$, in equilibrium $e_1^{d*} = e_2^{d*} = e_5^{d*} = e_6^{d*} > e_3^{d*} = e_4^{d*}$ and therefore $y_1^{d*} = y_2^{d*} = y_5^{d*} = y_6^{d*} = \bar{y}^{d*} > y_3^{d*} = y_4^{d*} = \underline{y}^{d*}$.*

Implication 1 is straightforward. It states that an unbiased central planner would divide her effort equally among all counties. However, Implication 2 states that a provincial leader who is unbiased and weighs the counties under her watch equally would nevertheless choose to exert more effort on the non-dislocated counties, which form the larger part of the province, to take maximum advantage of growth spillovers. In this case, while there is no discrimination in intent, there is discrimination in practice. Put together, the model predicts that *if dislocation exists*, a move from centralization to decentralization would increase regional inequality. Note that this result does not require provincial leaders to be biased in favor of the non-dislocated counties. It holds because they do not internalize growth externalities.

Implication 3. [Biased provincial leaders] *If political authority is decentralized and provincial leaders favor the non-dislocated counties such that $\theta_1 = \theta_2 = \theta_5 = \theta_6 > \theta_3 = \theta_4$, in equilibrium $e_1^{d**} = e_2^{d**} = e_5^{d**} = e_6^{d**} > e_3^{d**} = e_4^{d**}$ and therefore $y_1^{d**} = y_2^{d**} = y_5^{d**} = y_6^{d**} = \bar{y}^{d**} > y_3^{d**} = y_4^{d**} = \underline{y}^{d**}$. In addition, $\bar{y}^{d**}/\underline{y}^{d**} > \bar{y}^{d*}/\underline{y}^{d*}$.*

Implication 4. [Biased provincial leaders] *If political authority is decentralized and provincial leaders favor the dislocated counties such that $\theta_3 = \theta_4 = \underline{\theta} > \theta_1 = \theta_2 = \theta_5 = \theta_6 = \bar{\theta}$, in equilibrium $e_1^{d***} = e_2^{d***} = e_5^{d***} = e_6^{d***}$ and $e_3^{d***} = e_4^{d***}$; $y_1^{d***} = y_2^{d***} = y_5^{d***} = y_6^{d***} = \bar{y}^{d***}$ and $y_3^{d***} = y_4^{d***} = \underline{y}^{d***}$. Depending on the parameter values, either $\bar{y}^{d***} \geq \underline{y}^{d***}$ or $\bar{y}^{d***} < \underline{y}^{d***}$.*

Implication 3 is also straightforward. It states that if the provincial leader is biased and gives more weight to the non-dislocated counties—i.e., the intent to discriminate is now present—regional inequality will be worse than the scenario in which she is unbiased.

Now, consider the reverse case, in which the provincial leader is biased in favor of the dislocated county. Would this lead to regional inequality in the reverse direction?

Not necessarily. Implication 4 states that a provincial leader who is biased toward the dislocated county may still end up exerting more effort to develop the non-dislocated counties. This is because there are two countervailing forces at work here: the provincial leader’s personal preference and her ability to exploit growth spillovers in the non-dislocated counties. She will exert more effort on the dislocated counties if the intensity of her bias ($\underline{\theta} - \bar{\theta}$) is strong or if growth spillover (β) is small, and less so otherwise.

4 Data, Variables, and Estimation Framework

4.1 Data and Variables

We assemble a rich dataset that measures county-level socioeconomic and political conditions in China, primarily between 1986 (the first year of China’s Seventh Five-Year Plan) and 1995 (the last year of China’s Eighth Five-Year Plan). Most of the data are drawn from official statistical publications, the rest from a variety of sources. Table 1 presents the descriptive statistics.

We focus on the eighteen provinces in China that lie between the Great Wall and the South China Sea (Figure 1). Known as China proper to sinologists since the nineteenth century, these provinces represented the traditionally settled, agrarian areas of China and were home to 98% of the Chinese population in 1800 (Sng and Moriguchi, 2014). We exclude county-level urban districts from our study due to data unavailability.⁷ We also exclude the three centrally administered municipalities of Beijing, Tianjin, and Shanghai because they are mostly comprised of urban districts. This leaves us with a panel dataset of 1,514 counties over the 1986–1995 period.

We draw the county-level population figures from various issues of the *Sub-counties and Cities Nationwide Demographic Yearbook* (1986–1995) and the national population censuses of 1982, 1990, and 2000. We collect data on county-level GDP, industrial output, and rural household income from provincial-level annual statistical yearbooks, supplemented by city-level statistical yearbooks and county-level statistical commu-niqués. To account for inflation, which varied not only over time but also across space, we deflate all monetary values using the provincial price deflators constructed by Brandt and Holz (2006), with Beijing as the base province and 1984 as the base year.

⁷Most official statistical publications report urban data at the city level and do not provide district-level statistics. Typically, a city comprises several districts.

Table 1: Variable Definition and Summary Statistics

Variable	Definition	Mean	SD	Coverage
<i>Dislocation Measures</i>				
Dislocation	=1 if county is physiographically dislocated; else =0	0.18	0.39	86–95
DislocationAlt	=1 if county is linguistically dislocated; else =0	0.26	0.44	86–95
<i>Outcome Variables</i>				
GDP per capita	GDP per capita (RMB)	1130.1	1150.7	86–95
Primary share	GDP share of primary sector	0.57	0.20	86–95
Secondary share	GDP share of secondary sector	0.28	0.18	86–95
Tertiary share	GDP share of tertiary sector	0.15	0.07	86–95
Plant#	Number of power plants in county	0.44	0.80	86, 88–95
Capacity per capita	Installed capacity of power plants per capita (watt)	72.67	396.33	86, 88–95
Road length	Length of provincial roads (km)	73.43	59.34	90, 00
Road length per capita	Length of provincial roads per capita (m)	0.26	0.86	90, 00
Firm#	Number of foreign firms in county	7.75	40.22	87, 96
College enrolment	Number of college students per 10,000 population	24.49	122.96	90, 00
<i>Geographical Covariates</i>				
Latitude	Latitude of county seat (degree)	31.10	4.97	85
Longitude	Longitude of county seat (degree)	111.58	5.80	85
Hilly ratio	Hills and mountains as share of land area	0.48	0.39	85
Drainage density	Length of streams and rivers per unit area (km/km ²)	0.08	0.03	85
Distance to province	Distance from county seat to provincial capital (km)	170.60	126.14	85
Revolution county	=1 if designated as revolution county; else =0	0.15	0.35	85
Ethnic county	=1 if designated as ethnic county; else =0	0.20	0.40	85
<i>Leadership Background</i>				
LeaderNonDislocated	=1 if <i>i</i> from non-dislocated part of province; else =0			
	– <i>i</i> : Provincial governor	0.37	0.47	86–95
	– <i>i</i> : Provincial party secretary	0.52	0.49	86–95
LeaderDislocated	=1 if leader from dislocated part of province; else =0			
	– <i>i</i> : Provincial governor	0.06	0.24	86–95
	– <i>i</i> : Provincial party secretary	0.07	0.02	86–95

We aggregate the firm-level data in the *Directory of Foreign Investment Enterprises* (1979–1987) and the 1996 *National Census of Basic Units* to derive the number of foreign firms in every county. We obtain county-level power generation capacity by aggregating the plant-level data in the *Annual Statistics of the Electric Power Industry* (1986, 1988–95).⁸ We compute the lengths of provincial roads by digitizing the 1990 and 2010 SinoMaps Press national transportation maps. We draw data on the provincial party secretaries and governors from Liao and Fan (1989) and He (1996).

For night light intensity, we follow the pioneering work of Henderson et al. (2012) and draw luminosity data from the U.S. Defense Meteorological Satellite Program, which captures satellite images of the earth at night at 20:30–22:00 local time. Light intensity is reported for every 30 arc-second output pixel, which is approximately 0.9 km² at the

⁸Our dataset covers all power plants (thermal, hydraulic, etc.) with installed capacity of 6,000 KW and above. They accounted for 95.4% of China’s electricity generation capacity in 1995 (*Electric Power Yearbook* 1996).

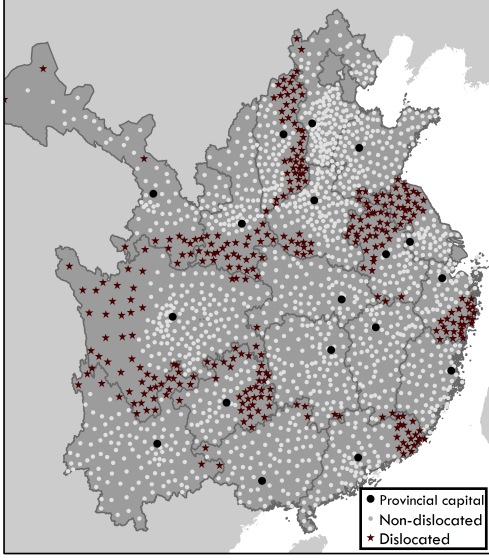


Figure 5: Distribution of County Seats

	Non-Dislocated Counties (a)	Dislocated Counties (b)
Illiteracy Rate (%)	36.19 (11.79)	44.97 (14.60)
Infant Mortality Rate (‰)	36.31 (20.66)	52.12 (33.66)
Mortality Rate (‰)	6.86 (1.52)	8.02 (2.93)
Males per 100 Females	105.38 (5.10)	107.57 (5.78)
Dependency Ratio (%)	40.25 (3.57)	41.72 (3.21)
Agricultural Labor Share (%)	84.70 (8.95)	83.94 (10.91)
Observations	1,225	278

Standard errors in parentheses. Source: Population Census 1982.

Table 2: Socioeconomic Conditions, 1981

equator. The values range from 0–63, with a higher value representing more light.

To ensure statistical consistency, we check the records on China’s Ministry of Civil Affairs website to track the county-level administrative changes. Because our analysis requires a balanced panel, we drop 19 counties from our dataset. Of these 19 counties, 14 were established after 1986, 4 were abolished before 1995, and 1 has no data. As Figure 9 in Appendix 8.1 illustrates, county boundaries were very stable during the sample period and boundary changes do not pose a concern for our analysis.

4.2 Estimation Framework

Figure 5 displays the locations of the dislocated counties. It is important to note that these counties were home to several major cities and transportation hubs in China’s history and should not be equated with peripheral areas with difficult terrains.⁹ However, as Table 2 illustrates, by the early 1980s they fared poorly relative to other counties according to several common development indicators. The pattern is similar for dialect areas: minority dialect areas lag behind majority areas in economic development (Gao and Long, 2014).

⁹For example, Hanzhong in Shaanxi was the base of Liu Bang, who founded the Han dynasty (206 BCE–220 CE); Nanyang in Henan was one of the five largest cities in early imperial China; and Xuzhou in Jiangsu was a major city along the Grand Canal during the Tang dynasty (618–907).

To see if such regional inequality can be explained by ill-conceived administrative boundaries, a simple—but crude—framework would be a direct comparison of the performance of the dislocated counties (i.e., counties located outside the physiographic or dialect regions of their provincial capitals) and others (Figure 5):

$$y_c = \beta \cdot Dislocation_c + \mathbf{X}_c\gamma + \varepsilon_c, \quad (4.1)$$

where y_c is the outcome of county c ; $Dislocation_c$ takes a value of 1 if the county is dislocated or 0 otherwise; $\mathbf{X}_c$ is a set of county-level controls, to be explained below; and ε_c is the error term.

The unbiased estimation of β requires that conditional on $\mathbf{X}_c$, $Dislocation_c$ is uncorrelated with ε . Note that our regressor of interest, $Dislocation_c$, measures the misalignment between the physiographic or dialect boundaries and the provincial administrative boundaries. While physiographic boundaries are largely determined by physical features, dialect boundaries are possibly endogenously formed. For this reason, we use the Skinnerian physiographic regions as our primary benchmark and the dialect areas only as a robustness check.

Another potential source of endogeneity comes from the provincial administrative boundaries. As Section 2.1 highlights, China’s provincial system was first established in the thirteenth century and the provincial boundaries have remained largely unchanged since the mid-1600s. Given the advances in military and transportation technologies over the past two centuries, the political and strategic considerations that helped shape these boundaries centuries ago are likely to be irrelevant today. However, the geographical features that gave rise to these considerations are still a part of today’s landscape and have to be controlled for in the estimation. Hence, in our empirical analysis we include the latitude and longitude of the county seat, drainage density, and the share of land area covered by hills and mountains in the control vector $\mathbf{X}_c$.

Admittedly, these controls do not fully address the concerns over endogeneity. To improve our identification, we use Deng Xiaoping’s 1991–92 political campaign, which empowered provincial officials to promote economic growth, as an intervention to implement a DD design.

4.2.1 DD Framework

A milestone in modern Chinese history, Deng Xiaoping’s surprise offensive in 1991–92 put his economic liberalization agenda on a firm and permanent footing. It not only removed the ideological obstacles that discouraged officials from pursuing economic expansion but also led to the implementation of a performance evaluation system whereby the top leadership assessed provincial and local officials based on the GDP growth rates of their jurisdictions (Whiting, 2001; Li and Zhou, 2005; Zhuang, 2007).¹⁰

Implications 1 and 2 predict that, in the presence of dislocation, the development would lead to increased regional inequality in favor of the non-dislocated counties. To test this prediction, we utilize the county-level panel data that we have assembled to estimate the following DD equation:

$$y_{ct} = \lambda_c + \beta \cdot Dislocation_c \times Post_t + \lambda_t + (\mathbf{X}_c \times Post_t) \cdot \gamma + \varepsilon_{ct}, \quad (4.2)$$

where $Post_t$ is an indicator of the post-1991 years; λ_c is a set of county fixed effects capturing all county-level time-invariant characteristics (to control for the historical determinants of the provincial boundaries); and λ_t is a set of year fixed effects (to capture macro-level shocks common to all counties). Following the recommendation of Bertrand et al. (2004), we cluster the standard errors at the county level.

We investigate if β is negative, i.e., if the growth performance of the dislocated counties deteriorated relative to the non-dislocated counties after Deng’s campaign. Below we discuss the identifying assumption of our DD estimation.

4.2.2 DD Identifying Assumption

Our identifying assumption is that, in the absence of Deng’s campaign, the non-dislocated and dislocated counties would have followed similar growth trends, i.e.,

$$E[\varepsilon_{ct} \cdot Dislocation_c \times Post_t | \mathbf{X}_c \times Post_t, \lambda_c, \lambda_t] = 0. \quad (4.3)$$

The assumption may be violated in two ways: (A) $E[\varepsilon_{ct} \cdot Post_t | \mathbf{X}_c \times Post_t, \lambda_c, \lambda_t] \neq 0$ or (B) $E[\varepsilon_{ct} \cdot Dislocation_c | \mathbf{X}_c \times Post_t, \lambda_c, \lambda_t] \neq 0$. We discuss them in turn below.

¹⁰The idea of “using productivity as the criterion for selecting cadres” was scorned by the conservatives and remained politically sensitive until 1992 (MacFarquhar, 2011, 491).

(A) Timing and objective of Deng’s campaign. Note that we include year fixed effects and therefore control for all across-the-board year-to-year differences in equation (4.3). The remaining channel for $E[\varepsilon_{ct} \cdot Post_t | \mathbf{X}_c \times Post_t, \lambda_c, \lambda_t] \neq 0$ to arise is if Deng initiated his campaign in response to other developments that were related to regional inequality. This is extremely unlikely because Deng mounted his campaign with national concerns—to change China’s course—in mind. He was not targeting issues that were regional or local in nature. Furthermore, available evidence suggests that the opening act of Deng’s campaign, the publication of the pro-reform commentary in the *Liberation Daily* to canvass support from the lower rungs of the Party and the masses, came as a complete surprise to the central leadership.¹¹

(B) Demarcation of provincial boundaries. If the provincial boundaries were not randomly demarcated, $E[\varepsilon_{ct} \cdot Dislocation_c | \mathbf{X}_c \times Post_t, \lambda_c, \lambda_t] = 0$ may not hold. Nonrandomness could originate from two sources. First, the factors that determined border demarcation centuries ago might have persisted even through the sample period to affect regional development in the 1990s. Given the socioeconomic upheavals that China has experienced since the 1839–42 Opium War and the technological strides made in the past few centuries, such highly persistent factors—if they exist—are likely to be related to geographical features. By including county fixed effects in equation (4.3), we largely control for these time-persistent county characteristics. To further account for the possibility that geographical factors might affect the non-dislocated and dislocated counties differently before and after Deng’s campaign, we also include the interactions between the post-1991 indicator $Post_t$ and the geographical vector $\mathbf{X}_c$ in our DD estimation. Furthermore, we add the interaction between $Post_t$ and distance to the provincial capital to control for any differential effects of distance before and after 1991.

Second, there might exist state policies that targeted the non-dislocated and dislocated counties differently. To the best of our knowledge, there were no such policies. However, for our study period, there were two prominent national programs targeting a subgroup of counties that could potentially create estimation bias: the revolution county program (which offered preferential policies to counties in which the Communist

¹¹The conservative premier Li Peng complained afterward that the influence of the commentary was “terrible” and “it caused the unified thinking that the center had expended a great deal of effort to bring about to become chaotic again” (MacFarquhar, 2011, 492).

Party conducted guerrilla warfare before 1945) and the ethnic county program (which offered preferential policies to counties populated by ethnic minorities). To capture any differential effects of these programs before and after 1991, we include the interactions between $Post_t$ and these programs as additional controls in the DD estimation.

In Section 5.2, we conduct two further checks on the validity of our DD identifying assumption.

4.2.3 BD Framework

We also employ the BD framework as an alternative empirical approach and investigate nightlight intensity differences between the non-dislocated and dislocated counties. Using satellite-captured nightlight intensity as a proxy for economic activity is a useful check on the robustness of our DD results, which are based on official statistics and may be subject to measurement errors of all kinds (Henderson et al., 2012).

Pioneered by Holmes (1998) and Black (1999) and widely applied in urban studies (e.g., Bayer et al., 2007; Dell, 2010; Duranton et al., 2011; Gibbons et al., 2013), the BD design involves a discontinuity threshold, which in our case is the county boundary (Lee and Lemieux, 2010). The design rests on the premise that on the opposite sides of the discontinuity threshold, adjacent dislocated and non-dislocated areas share very similar underlying characteristics except for their dislocation status (the regressor of interest). Let y_a denote the outcome (nightlight intensity) of area a , a $1km \times 1km$ grid, and d_a its nearest distance to the boundary where a non-dislocated county and a dislocated one meet. Hahn et al. (2001) show that β can be identified as

$$\beta = \beta_{RD} = \lim_{d \downarrow 0} E[y_a | d_a = d] - \lim_{d \uparrow 0} E[y_a | d_a = d]. \quad (4.4)$$

We estimate β_{RD} using a parametric approach and employ the following BD estimation equation:

$$y_a = \beta \cdot Dislocation_a + f(d) + Dislocation_a \times f(d) + \mathbf{X}_a \gamma + \varepsilon_a, \quad (4.5)$$

where $f(d)$ is a high order polynomial function in d ; $\mathbf{X}_a$ is a set of controls that includes distance to provincial border and provincial fixed effects; and ε_a is the error term. We cluster the standard errors at the county level and treat $f(d)$ as a seventh-order

polynomial function in our estimation.¹²

5 Main Results

5.1 DD Estimates

Table 3 presents the estimation results from the DD specification. In column (a), we only include county and year fixed effects as explanatory variables. The estimated coefficient of $Dislocation_c \times Post_t$ is negative and statistically significant, suggesting that the economic performance of dislocated counties indeed worsened relative to their non-dislocated counterparts after 1991.

To check if geographical factors could have played a role in generating the differential outcomes between non-dislocated and dislocated counties after 1991, in column (b) we control for the interactions between the post-1991 indicator $Post_t$ and $\mathbf{X}_c$, a vector of geographical factors. The estimated coefficient drops slightly in magnitude, but remains negative and significant. In column (c), we further control for two prominent county-level national programs, the revolution county program and the ethnic county program. The results are robust to the addition of these controls. The estimate suggests that, five years after the treatment shock, the income differential between non-dislocated and dislocated counties increased by 14.7 percentage points due to the treatment. This translates to a difference in annual growth rate of approximately 3.1 percentage points. Given that, between 1991 and 1995, the aggregate growth of non-dislocated counties exceeds that of the dislocated counties by 37 percentage points, the treatment effect accounts for a substantive 40% ($= \frac{0.147}{0.37}$) of the actual difference observed.

To examine whether our results are sensitive to the Skinnerian characterization of Chinese internal boundaries, in column (d) we use the spatial distribution of Chinese dialect groups provided by Lavelly and Berman (2012) as an alternative benchmark to distinguish the dislocated counties from others. The estimated coefficient remains negative and statistically significant, suggesting that our findings are not dependent on one particular methodology of classifying Chinese regions.

Appendix 8.2 reports further findings. In line with Table 3, we observe that, relative to other counties, the dislocated counties witnessed an increase in the primary industry's weight and a decline in the secondary industry's weight after 1991.

¹²The results (available upon request) are similar when we use other orders such as sixth or eighth.

Table 3: Dislocation Effect 1986–95

	Log (GDP Per Capita)			
	(a)	(b)	(c)	(d)
Dislocation×Post	-0.174*** (0.018)	-0.144*** (0.016)	-0.147*** (0.017)	
DislocationAlt×Post				-0.040*** (0.014)
County dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Latitude×Post		Yes	Yes	Yes
Longitude×Post		Yes	Yes	Yes
HillyRatio×Post		Yes	Yes	Yes
DrainageDensity×Post		Yes	Yes	Yes
DistanceToProv×Post		Yes	Yes	Yes
RevolutionCnty×Post			Yes	Yes
EthnicCnty×Post			Yes	Yes
Adjusted R-squared	0.90	0.91	0.91	0.91
No. of clusters	1,514	1,503	1,503	1,503
No. of observations	15,083	14,975	14,975	14,975

Robust standard errors clustered by counties in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

5.2 Validity Checks

The validity of our DD estimates hinges on the identifying assumption that, conditional on the controls (i.e., county and year fixed effects, differential effects of the geographical factors and the two county-level national programs), the non-dislocated and dislocated counties share similar growth trajectories in the absence of the treatment shock (Deng’s campaign in 1991–92). To further verify this identifying assumption, we conduct the following two validity exercises.

Pre-treatment time trends. The first exercise is the widely-used check of pre-treatment trends. If our estimates capture the treatment effect, we should observe the treatment (i.e., dislocated) and control (i.e., non-dislocated) counties exhibiting similar growth trends before the treatment (i.e., shock in 1991) and diverging only after 1991.

Figure 6 plots the growth trends for treatment and control counties from 1986 to 1995. Indeed we find that the two groups were growing at similar rates before 1991. From 1991 onward, the non-dislocated counties grew faster than their dislocated counterparts. The patterns provide strong evidence that the treatment shock generated differential trends in economic performance between the two groups.

Placebo test with random dislocation. The second exercise is a placebo test in which we randomly generate the dislocation status of counties in our sample to construct

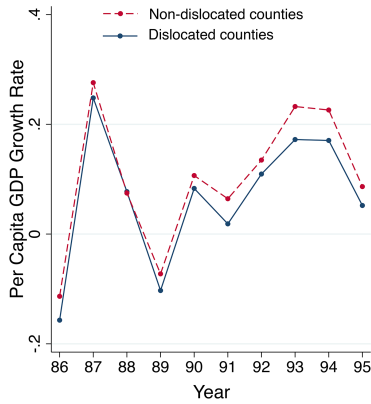


Figure 6: Growth trends

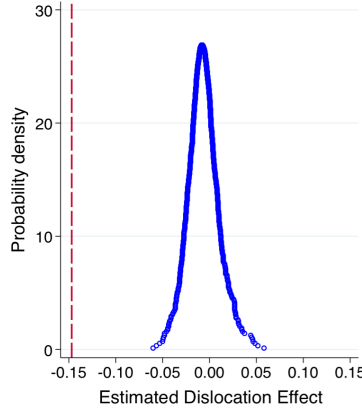


Figure 7: Placebo test

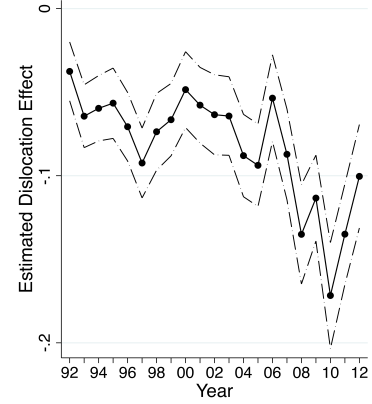


Figure 8: BD Estimation

a *false* regressor of interest, $Dislocation_c^{false} \times Post_t$. For our identifying assumption to be valid, the false regressor of interest should have no effect on economic performance (i.e., $\beta^{false} = 0$). The violation of this necessary condition would indicate the existence of omitted variables. We conduct this random data generating process 1000 times to avoid contamination by rare events and to improve the power of the test. Figure 7 plots the distribution of the 1000 estimated coefficients generated. They are narrowly concentrated around zero with a mean value of -0.007 . Our benchmark estimate of -0.147 (represented by the vertical dashed line) lies far from the distribution of the false estimates. This provides further evidence of the validity of our DD estimates.

5.3 BD Estimates

As Section 4.2.3 explains, we also conduct a BD estimation using luminosity data for each year from 1992 (first year of data collection) to 2012 (most recent year for which data are available) to investigate outcome differences between the non-dislocated and dislocated counties. Although the absence of luminosity data before 1992 prevents us from conducting a combined BD-DD estimation, the BD estimation still offers a useful supplementary empirical approach to the DD estimation.

Figure 8 reports the estimated coefficients along with the 95% confidence intervals. All coefficient estimates are negative, and the overall pattern indicates that they become larger over time, which is consistent with the DD findings.

6 Mechanism

6.1 Resource Allocation

Implication 3 of the model suggests that, when administrative dislocation exists, under decentralization the provincial authorities would channel more effort or resources to the non-dislocated counties at the expense of the dislocated ones. To test this implication, we investigate the patterns of resource allocation using our DD framework.

Specifically, we look at three types of resource allocation: investments in power plants and provincial roads (infrastructure), FDI (physical capital), and university admission (human capital). In China's context, the provincial authority has considerable influence over the first two types of resource allocation. By contrast, there is considerably less scope for it to discriminate between the non-dislocated and dislocated counties in university admission as national policy requires university programs to impose the same admission criteria for students from the same province.

Infrastructure investment. Poor infrastructure such as inadequate power plants and roads constituted a severe barrier to China's economic development in the 1980s. The problem was mitigated in the 1990s by the infrastructure boom witnessed in the aftermath of Deng's campaign. In China, power plants were state-owned. As one plant would typically serve several counties, the provincial authority had the say over the locations of these plants. Similarly, the provincial authority determined the paths of the provincial-level roads and was also responsible for building them. Hence, the spatial patterns of power plants and provincial roads provide direct evidence on whether the provinces exercised discrimination in disfavor of the dislocated counties.

Table 4 presents the estimation results. In columns (a) and (b), we examine the stock of power plants in 1986–95 (excluding 1987 due to data unavailability) using two different measures: total plant number and (log) power generation capacity per capita. In columns (c) and (d), we examine the stock of provincial-level roads, again using two measures: (log) total road length and (log) road length per capita.¹³

In each of the four specifications, we obtain a negative and statistically significant estimated coefficient for the interaction term $Dislocation_c \times Post_t$, which indicates

¹³To address the issue of zero investment in some counties, for the regression in (b) we add 1 (watt) to the power generation capacity per capita before taking log. Likewise, we add 0.001(km) and 0.0001(m) to the dependent variables in (c) and (d) before taking log.

Table 4: Resource Allocation

	Power Plants		Roads		Foreign Firms		College Enrol.
	Plant#	Log(capacity per capita)	Log(length)	Log(length per capita)	Firm#	Log(Firm# per capita)	Log(students per 10'000)
	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Dislocation $\times$ Post	-0.123*** (0.023)	-0.299*** (0.097)	-0.408* (0.232)	-0.372* (0.216)	-4.66*** (1.70)	-0.276*** (0.037)	-0.088 (0.062)
County dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Latitude $\times$ Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Longitude $\times$ Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HillyRatio $\times$ Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DrainageDensity $\times$ Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DistanceToProv $\times$ Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RevolutionCnty $\times$ Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes
EthnicCnty $\times$ Post	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coverage	86, 88–95	86, 88–95	90, 00	90, 00	87, 96	87, 96	90, 00
Adjusted R-squared	0.79	0.84	0.58	0.57	0.30	0.64	0.55
No. of clusters	1,506	1,503	1,506	1,503	1,506	1,490	1,504
No. of observations	13,554	13,485	3,012	3,006	3,012	2,980	3,008

Robust standard errors clustered by counties in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

that the spatial distribution of power plants and provincial roads shifted in favor of the non-dislocated counties after Deng’s campaign. This provides direct evidence that the provincial authority exercised discrimination in its resource allocation decisions.

The result is in line with impressionistic observations made by the political scientist Cheng Li. Writing in 1995 about his field trip to Subei, the dislocated northern half of Jiangsu province, Li noted that “[t]he economic growth of Subei has been constrained by the lack of power, railways, and roads. Subei’s Pei Xian county, for example, can produce 5 million kg of peaches annually, for a potential total of 20 million yuan in profit. But because of the poor condition of transportation, most of these peaches cannot be conveyed to markets in other regions promptly. As a result, many peaches spoil unsold” (Li, 1997, 214). He also noted that compared with neighboring Sunan (the non-dislocated southern half of Jiangsu province), Subei had very few highways, and those it had were of lower grade and quality.

Investment of foreign multinationals. For a developing country like China, inward foreign direct investment (FDI) is an important source of capital and technology. During the 1990s, foreign multinationals required the approval of the provincial authority to invest in local projects in China. Hence, we investigate if and how the spatial distribution of FDI projects altered after Deng’s campaign.

In Table 4 columns (e) and (f), we use two different measures to quantify county-level FDI exposure: the absolute number of foreign firms and the log number of foreign firms per capita.¹⁴ In both specifications, we find that the coefficient of the interaction term

¹⁴For column (f), we add 0.1 to the dependent variable before taking log to deal with the problem

$Dislocation_c \times Post_t$ is negative and statistically significant, which indicates that the dislocated counties received fewer approved foreign investment projects after 1991. The result provides further evidence of regional favoritism and helps explain the negative dislocation effect that we have uncovered.

Human Capital. Unlike infrastructural investments and FDI, there is little scope for the provincial authority to discriminate against residents of particular counties in college admissions. This is because as a national policy, Chinese universities were allowed to implement admission quotas only at the provincial-level. Hence, while students from different provinces may have faced different admission standards to enter a particular program, students from the same province had to meet the same cutoff score. In Table 4 column (g), we use the DD framework to investigate changes in the spatial distribution of university students (per 10,000 population). Unsurprisingly, the coefficient of the interaction term $Dislocation_c \times Post_t$ is small and insignificant.

6.2 Provincial Leader’s Home Bias

In the literature on artificial national boundaries, social identity plays a salient role and is responsible for the discrimination that confronts partitioned minority groups (Michalopoulos and Papaioannou, 2016). Relatedly, Hodler and Raschky (2014) use a large and diverse sample of countries to show that national leaders favor their birth regions and consequently these regions are brighter than others at night.

Implications 3 and 4 of the model predict that the identity of the provincial leader would affect the growth gap between the non-dislocated and dislocated counties. The gap should be wider if the provincial leader came from (and therefore favors) the non-dislocated counties, but narrower otherwise. We now investigate these implications.

Following Hodler and Raschky (2014), we collect information on the birth county of every provincial leader (i.e., provincial communist party secretary and governor) in our sample period and classify these leaders into three categories: (A) those born in the non-dislocated part of the province; (B) those born in the dislocated part of the province; and (C) those born outside the province. We then use the information to create two indicators: $LeaderNonDislocated_c$ (1 if the provincial leader is of Type A; 0 otherwise) and $LeaderDislocated_c$ (1 if the provincial leader is of Type B; 0 otherwise).

of zero foreign firms in some counties.

Table 5: Effect of Provincial Leader's Home Bias

	Log (GDP Per Capita)	
	Governor (a)	Secretary (b)
LeaderNonDislocated $\times$ Dislocation $\times$ Post	-0.279*** (0.036)	-0.158*** (0.036)
LeaderDislocated $\times$ Dislocation $\times$ Post	0.009 (0.044)	-0.034 (0.055)
Dislocation $\times$ Post	-0.070*** (0.038)	-0.046* (0.026)
Dislocation $\times$ LeaderNonDislocated	-0.048 (0.033)	0.034 (0.025)
Dislocation $\times$ LeaderDislocated	0.021 (0.044)	-0.038 (0.049)
LeaderNonDislocated $\times$ Post	0.020 (0.044)	0.004 (0.014)
LeaderDislocated $\times$ Post	0.016 (0.023)	-0.103*** (0.032)
LeaderNonDislocated	0.059*** (0.012)	-0.072*** (0.013)
LeaderDislocated	0.117*** (0.028)	0.178*** (0.033)
County dummies	Yes	Yes
Year dummies	Yes	Yes
Geographical vector $\mathbf{X} \times$ Post	Yes	Yes
Adjusted R-squared	0.92	0.92
No. of clusters	1,503	1,503
No. of observations	14,975	14,975

Robust standard errors clustered by counties in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

By interacting the two indicators with our regressor of interest, we generate two triple interaction terms and estimate their coefficients using the DD framework.

Table 5 presents the estimation results. As columns (a) and (b) illustrate, the estimated coefficients of the triple interaction term $LeaderNonDislocated_c \times Dislocated_c \times Post_t$ are negative and statistically significant. Hence, relative to having an outsider (who would presumably be impartial) as provincial governor (secretary), the dislocation effect would be stronger if the provincial governor (secretary) was born in the non-dislocated part of the province. This suggests that appointing a local from the non-dislocated area as the provincial leader would indeed worsen regional inequality.

Meanwhile, in columns (c) and (d) the coefficient estimates of the triple interaction term $LeaderDislocated_c \times Dislocated_c \times Post_t$ are small and statistically insignificant, which seems to suggest that provincial leaders born in the dislocated part of the province do not show favoritism toward their home areas when compared to provincial leaders born outside the province. One possible explanation is that provincial leaders from outside might take a national perspective and exert extra effort on the dislocated counties to keep regional inequality under control. Another explanation, which is more plausi-

ble in our view, is that our sample includes few provincial leaders from the dislocated counties. Of the 107 provincial leaders in our dataset, 40 of them were locals born in the non-dislocated area, 60 were outsiders, and only 7 were locals born in the dislocated area. This reduces the power of the statistical test.

7 Conclusion

In this paper, we implement a DD framework based on the last political campaign of the Chinese leader Deng Xiaoping in 1991–92 to investigate the growth consequences of artificial provincial boundaries in China. We find that after provincial authorities were told to make GDP growth their top priority, the development gap between the non-dislocated and dislocated counties widened. Hence, while China recorded two decades of extraordinary economic expansion after Deng’s campaign, the achievement came at the cost of worsening regional inequality. When we apply a BD design as an alternative approach, the findings are similar.

We also uncover evidence that regional discrimination contributed to the widening inequality. After the treatment shock, the provincial authority placed less emphasis on the dislocated counties in terms of resource allocation. The spatial distribution of power plants, provincial roads, and FDI—all of which it had considerable influence over—shifted toward the non-dislocated counties. Dislocated counties performed worst when the province was headed by a leader (party secretary or governor) who was born in the non-dislocated part of the province, as opposed to a leader who was born in the dislocated part of the province or one from outside the province.

This study is a rare attempt to look at domestic administrative boundaries. Despite the fact that they are ubiquitous, they have received relatively little research attention, especially compared to the subject of electoral boundaries. We build on the small but important literature on regional favoritism (Hodler and Raschky, 2014; Burgess et al., 2015) and extend it to investigate favoritism exhibited by subnational leaders. Our findings highlight a salient factor that has been hitherto overlooked in the debate over whether decentralization enhances or reduces welfare (Tiebout, 1956; Keen and Marchand, 1997; Qian and Roland, 1998; Cai and Treisman, 2004): preconditions matter. Where local administrative fault lines exist, decentralization could aggravate the dislocation and discrimination suffered by minority areas or groups. An efficiency-equity

tradeoff potentially exists.

The literature on artificial national borders generally highlights the negative welfare consequences of these borders (Alesina et al., 2011; Michalopoulos and Papaioannou, 2016). While we find that poorly conceived subnational administrative boundaries have potentially large ramifications too, our message is less pessimistic. After all, there exists a sovereign national authority above the subnational units that could facilitate efforts to overcome such distortions. Reorganizing subnational boundaries ought to be less costly than readjusting sovereign boundaries. And if a complete overhaul of subnational boundaries to remove existing inefficiencies is politically unfeasible, the inefficiencies could still be mitigated by well-designed national policies. For example, the national government could build more roads in a dislocated area if the provincial government is not doing enough there.

In this regard, more research on artificial subnational boundaries could help by creating an awareness of their ramifications and shedding light on where they may exist. We see this work as an endeavor in this direction.

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8 Appendix

8.1 County Boundary Changes

Figure 9 compares Chinese county boundaries in 1986 and 1995. The gray lines depict boundaries that were present in both 1986 and 1995. The red lines depict boundaries that existed in 1986 but were dissolved before 1995. The black lines depict boundaries that were present in 1995 but did not exist in 1986. The relative scarcity of the red and black lines highlights the stability of county boundaries during our sample period.

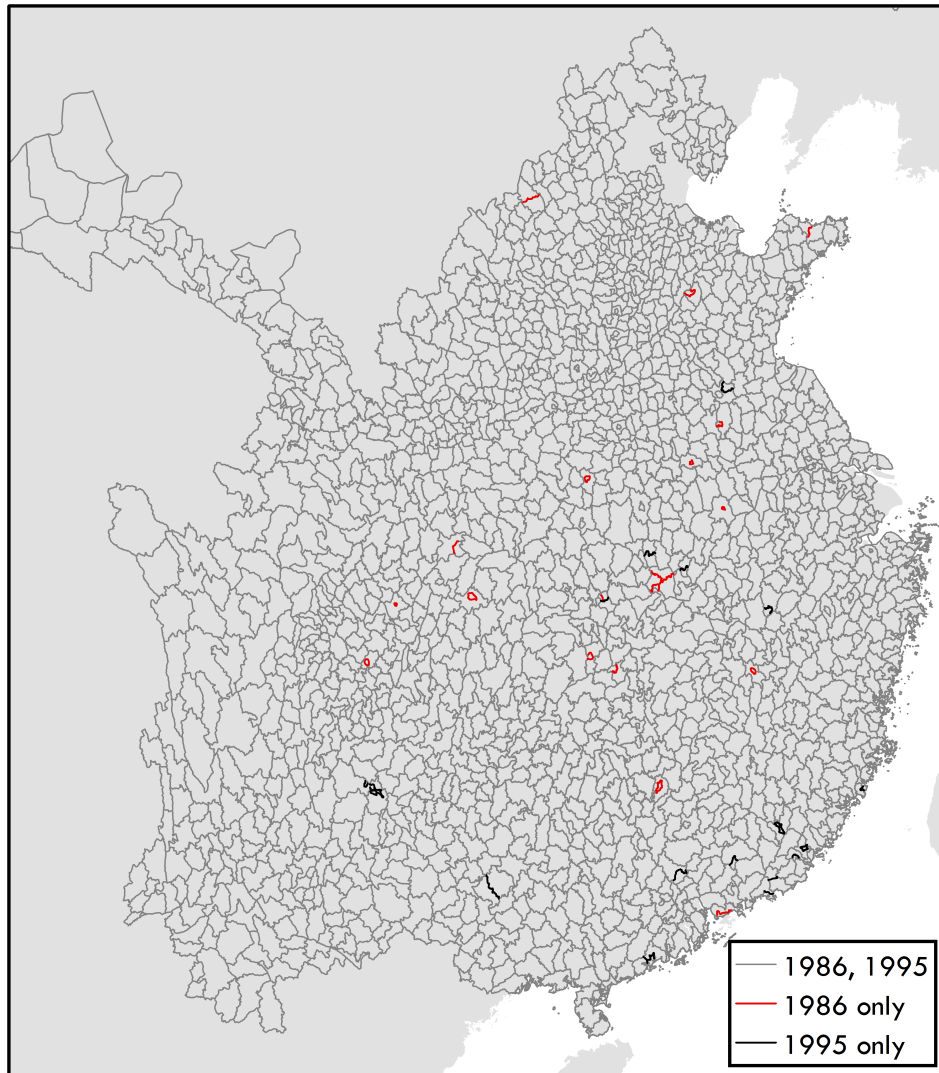


Figure 9: Comparison of County Boundaries between 1986 and 1995

8.2 Other Results

Our main findings in Table 3 indicate that Deng's campaign aggravated the dislocation effect of artificial administrative boundaries, causing the dislocated counties to grow at a slower pace compared with the non-dislocated counties. Here, we further investigate the sectoral composition and performance of the non-dislocated and dislocated counties using the DD framework.

As Table 6 shows, the dislocated counties experienced an increase in the weight of their primary sector (column a) while their secondary sector shrunk as a share of total output (column c) after 1991. Furthermore, in terms of per capita output the dislocated counties fared worse relative to non-dislocated counties in all three (primary, secondary, and tertiary) sectors (columns b, d, and f). Put together, these results reinforce Table 3 in showing that the treatment shock caused regional inequality to widen in disfavor of the dislocated counties.

Table 6: Performance by Economic Sector 1986–1995

	Primary		Secondary		Tertiary	
	Share (a)	Log(output per capita) (b)	Share (c)	Log(output per capita) (d)	Share (e)	Log(output per capita) (f)
Dislocation×Post	0.024*** (0.006)	-0.080*** (0.012)	-0.021*** (0.005)	-0.202*** (0.032)	-0.002 (0.003)	-0.150*** (0.028)
County dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Latitude×Post	Yes	Yes	Yes	Yes	Yes	Yes
Longitude×Post	Yes	Yes	Yes	Yes	Yes	Yes
HillyRatio×Post	Yes	Yes	Yes	Yes	Yes	Yes
DrainageDensity×Post	Yes	Yes	Yes	Yes	Yes	Yes
DistanceToProv×Post	Yes	Yes	Yes	Yes	Yes	Yes
RevolutionCnty×Post	Yes	Yes	Yes	Yes	Yes	Yes
EthnicCnty×Post	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.89	0.87	0.86	0.94	0.53	0.85
No. of clusters	1,503	1,503	1,503	1,503	1,503	1,503
No. of observations	14,975	14,975	14,975	14,888	14,975	14,973

Robust standard errors clustered by counties in parentheses: *** p<0.01, ** p<0.05, * p<0.1.