The impact of place-based policy: evidence from a multiple synthetic control analysis of the northeastern revitalization program in China

Justin T. Callais & Linan Peng

The impact of place-based policy: evidence from a multiple synthetic control analysis of the northeastern revitalization program in China

Justin T. Callais[a] and Linan Peng[b]

[a]Department of Agricultural and Applied Economics, Texas Tech University, Lubbock, TX, USA;
[b]Department of Economics and Management, DePauw University, Greencastle, IN, USA

ABSTRACT

We examine the effect of a place-based policy in China, the Northeastern Revitalization Program. In 2003 the State Council of the People's Republic of China initiated the program in northeastern China by removing an agricultural tax, enhancing the urban social security system, facilitating foreign investment, and restructuring state-owned enterprises in the region. Using the synthetic control method, we find that the program had no significant effect on GDP per capita in all three regions. Liaoning had slightly worse GDP per capita post-treatment, as did Heilongjiang (albeit to a lesser extent). While the multiple synthetic control analysis shows that economic outcomes were worse post-treatment, the impact of this program was heterogeneous across the three regions. We argue the lackluster performance likely comes from the continuing dominance of inefficient state-owned enterprises in the provinces.

1. Introduction

In an attempt to address differences in economic outcomes across regions, many countries have adopted place-based policies. These policies often include subsidies, special regulations, and tax exemptions (Glaeser and Gottlieb 2008). However, the effect of those policies remains ambiguous. Some studies argue that it is necessary for the government to enact those policies to correct market failures in impoverished regions (for example, see Murphy, Shleifer, and Vishny 1989). Other studies show that those policies are ineffective in corrupt and overall weak states (for example, see Bardhan and Mookherjee 2000; Mookherjee 2015).

This paper provides empirical evidence on a place-based policy in China, the Northeast Area Revitalization Program. The northeastern region of China comprises three provinces and a portion of a fourth province: Liaoning, Jilin, Heilongjiang, and the northeastern part of Inner Mongolia.[1] Once the "cradle of the Republic's industry," the northeastern region became the largest rustbelt in China during the

economic reform from the early 1980s to the early 2000s (Li 2004). The region's planned economy started to wither as the central government shifted its focus to a more market-oriented economy. Compared with other regions, the Northeast's economy grew at a slower pace. At the same time, the state-owned sectors started to become less competitive than the nonstate sector because of their high cost of production, their ambiguous ownership structure, the absence of proper managerial incentives, and obsolete equipment. In 2003 the State Council initiated a revitalization program that aimed to improve the northeastern region's economic performance. Under this revitalization program, the three provinces in the region experienced the fastest economic growth in the twenty-first century within China.

This paper uses the synthetic control method (SCM) to examine the revitalization program's effects. The SCM has been widely used in comparative case studies to examine the effect of interventions. We create a counterfactual northeastern China (both separately and combined) to compare post-treatment outcomes with the actual northeastern region. The counterfactual seeks to track what would have happened in the region had it not enacted the revitalization program. Based on our analysis, we observe that the program did not improve GDP per capita in the three provinces when compared with the counterfactuals. The economic performance in Liaoning after the onset of the revitalization program was actually worse than that of the counterfactual. Our results suggest that the program intended to facilitate economic growth in the Northeast, but the region's institutional issues, which began during the planned economy, were still far from being solved. Our explanation for the worse economic performance in Liaoning (and partially in Heilongjiang) is the continuing dominance of inefficient state-owned enterprises (SOEs) there.

A budding literature is attempting to assess the effectiveness of place-based policies. Our paper contributes to this literature. For example, Jia et al. (2020) examine the effects of the Great Western Development regional program. They find the program raised annual GDP growth by 1.6 percentage points. However, they conclude that this growth effect resulted only from physical investment and not from total factor productivity growth. Koster et al. (2019) find that the opening of science parks in Shenzhen greatly improved firm productivity and increased local wages. Falck, Koenen, and Lohse (2019) evaluate the impact of the Innovative Regional Growth Cores program. Their results suggest that any positive influence on research and development was quite localized and the program was not effective overall. Albanese, Ciani, and de Blasio (2021) find similar results in a different place-based policy in Italy. According to their results, local residents were the sole benefactors of urban regeneration, and this policy did not lead to any overall local economic growth. A stream of studies examines special economic zones in China (see Demurger et al. 2002; Wang 2013; Alder, Shao, and Zilibotti 2016; Zheng et al. 2017). Those studies largely conclude in favor of the effectiveness of the special economic zones' policies. Chaurey (2017) and Shenoy (2018) find that place-based policies improved regional economic conditions within India.

Even within a developed country such as the United States, place-based revitalization programs have become an increasingly popular research topic. For example, Spencer and Ong (2004) study the economic effect of the Los Angeles Revitalization

Zone on private sector investment. Their results suggest that placed-based programs might not be effective at stimulating investment. Morin and Partridge (2021) examine the Delta Regional Authority's economic effects on 252 counties in the lower Mississippi valley. They find that while the program is associated with increases in incomes and decreases in unemployment, it has had no effect on poverty or migration. Van Leuven (2021) investigate the impact of the Main Street Program, which was designed to revitalize two historic centers in rural areas of the United States. He concludes that the program has had no significant economic impact on downtown jobs or establishments.

Ren et al. (2020) examine the effect of the Northeast Revitalization Program by using a difference-in-differences method. Their findings suggest that the program significantly improved GDP growth in the region. However, the SCM is arguably a better tool for analyzing the causal impacts of treatments. Much like difference-in-differences, this method allows us to estimate the average treatment effect. However, the SCM allows us to assess the *individual* impact of each province. The impact of the program (perhaps because of historical or cultural unobservables) is likely heterogeneous across the three regions, so being able to assess the disparate effects seems important. The point is similar to that of Van Leuven (2021), who finds that results from rural revitalization programs do not generalize, showing the importance of understanding local context. Furthermore, we are able to generate a synthetic using weighted (or unequal) averages of the donor provinces. These weights are given based on a control province's ability to track different indicators of the Northeast's provinces before the revitalization program. Since the SCM allows for unequal weights, this leads us to find a counterfactual that is systematically created.

The rest of the paper is organized as follows. Section 2 gives the historical background of the regional economy. Section 3 discusses the SCM. Section 4 describes our data. Section 5 reports the results. We conclude in Section 6.

2. Historical background

2.1. The rise

After the Manchus' conquest of China in the seventeenth century, the imperial court erected a willow palisade to restrict migration to the northeastern region (formerly known as Manchuria). The court forbade any Han Chinese to settle in the area. The throne claimed that the restriction would protect the Manchurian legacy and tradition. It was not until the 1860s that the emperor lifted the restriction and the region's economy started to progress.

The development of a railroad network and the rising international demand for soybeans stimulated rapid agricultural growth in the region. These events coupled with the abundance of natural resources, such as coal and iron ore, allowed the region to establish an industrial base after the Japanese invaded it. By the mid-1930s, output per capita in Manchuria was at least 50 percent higher than the rest of China (Lardy 1987, 147).

By the Communist Party of China's (CPC's) takeover in 1949, the Northeast was the most advanced region and a "bellwether for the rest of the country" for several

reasons (Teiwes 1987, 82). First, even after years of destruction caused by war, the region's industrial base continued to benefit immensely from the legacy of the Japanese occupation. It was the most industrialized region in the country and produced 34 percent and 50 percent of China's industrial output in 1949 and 1950. Second, because of its advanced railroad network and proximity to the Soviet Union, the Northeast had easy access to Soviet aid and Soviet economic influence. Last, since it was the first region that the CPC liberated, its leadership could quickly implement regional planning policy at a larger scale relative to other regions (Teiwes 1987, 82).

During the first Five Year Plan (FYP), which started in 1953, China received aid from the Soviet Union. The aid program consisted of 156 projects in which the Soviet Union provided machinery and equipment. These Soviet-led programs also advised on construction and installation, and supplied design and technical assistance (Lardy 1987, 177). The Northeast was home to about one-third of those projects and significantly contributed to national industrial output during the first FYP.[2] By the time the first FYP was completed, industrial output had risen 130 percent, exceeding the target by 30 percent. Since then, the region has been the country's major industrial base, and it was recognized as the "cradle of the Republic's industry"by the central government (Li 2004). Some of the largest SOEs were established in the region. These include Anshan Iron and Steel Group Corporation, First Automobile Works Group Corporation, and Daqing Oilfield Company Limited.

Since the 1950s, the Northeast has led the country in economic growth. Liaoning had the highest regional GDP growth at the beginning of the second FYP in 1958. Its GDP growth was the second highest in the final three years of that FYP. Both Heilongjiang and Jilin also experienced rapid economic growth during the same period. Heilongjiang's GDP was among the top ten in the nation before the 1980s since the 1950s while Jilin saw an average annual growth rate of 7.1 percent from the 1950s to 1980.

2.2. The decline

When economic reforms began, the disadvantages of the northeastern economy started to become obvious. The Northeast's economic activity had taken a back seat to the eastern and coastal regions in the last quarter of the twentieth century. The dominance of SOEs in the region gradually became a liability. Because of incentive issues and declining efficiency in their use of resources, most SOEs performed quite poorly in the long run (Lardy 1998). Other problems, such as outdated facilities and the heavy burden of pensions to retired workers, further exacerbated the performance of the SOEs and the overall regional economy.

Since the 1980s some measures have been proposed and implemented to improve the productivity of SOEs. These measures included enhancing managers' decision-making power, introducing financial incentives, and establishing performance contracts between the state and SOEs (Shirley and Xu 2001). These reform measures did improve the productivity of SOEs in the 1980s (Groves et al. 1994; Li 1997; Xu 2000). However, the overall performance of the SOE sector started to deteriorate (Lardy 1998).

In the 1990s the central government initiated another round of reforms. It focused on privatizing small SOEs and corporatizing larger ones (Cao, Qian, and Weingast 1999; Lin and Zhu 2001). While privatization reduced state ownership in the economy, lessened privatized firms' reliance on debt finance, and allowed the firms to increase capital expenditure, the firms' profitability did not improve significantly (Wang, Xu, and Zhu 2004). Wang, Xu, and Zhu (2004) suggest that several factors may have contributed to that result, including managerial moral hazard resulting from reduced ownership stakes and the fact that recorded performance in the pre-privatization era was exaggerated.

These factors began during in the centralized economic planning system.[3] The state-owned sector's share of the region's industrial output value changed little between 1998 and 2001. In 2001 the state-owned sector's share of the region's total industrial output was 73.27 percent—28.84 percent higher than the nation's average. Meanwhile, the industrial-output share of the region had declined from 16.5 percent in 1978 to 9.3 percent in the early 2000s. During the same period, the rankings of industrial output in Liaoning, Jilin, and Heilongjiang had dropped from second, fifteenth, and seventh to fifth, eighteenth, and fourteenth. At the beginning of the economic reform, industrial output in Liaoning accounted for 8.8 percent of the national total and industrial output in Guangdong's was 4.5 percent in 1980. In 1996 Guangdong's industrial output was 610 billion yuan, accounting for 9 percent of the national total, while the northeastern provinces' total industrial output was 690 billion yuan.

The SOEs laid off workers from the late 1990s through the early 2000s. They employed 109.55, 109.49, and 107.66 million workers in 1995, 1996, and 1997 and then only 88.09 and 83.36 million in 1998 and 1999. This reduction continued till 2002, when SOEs employed 69.24 million workers. More than a quarter of laid-off workers were in the northeastern region each of those years. The wave of layoffs induced massive urban poverty.

At the beginning of the economic reforms (in 1978), Liaoning's GDP was more than 50 percent higher than Guangdong's. By 2001 the three northeastern provinces' total GDP was only 62 percent of Guangdong's. Between 1980 and 2001 each northeastern province's annual economic growth rate was lower than the national average; economic growth was negative in the 1980s.

2.3. The revitalization program

In 2003 the CPC decided to make an extensive effort to halt the economic downturn in the northeastern region. The Central Committee of the CPC and the State Council jointly initiated the revitalization program to transform the rustbelt into the country's fourth economic engine.[4] The State Council also established a special Leader Group and an Office for Revitalizing Northeast Old Industrial Base to approve and implement strategies. Wen Jiabao, then premier of the State Council, served as the director of the Leader Group, and two vice premiers served as deputy directors.

The revitalization program comprised policies that favored the northeastern region. These policies included removing the agricultural tax, enhancing the urban social security system, facilitating foreign investment, and restructuring SOEs.

The central government appropriated 22.84 billion yuan to subsidize the agricultural tax reform in 2004 and 2005. According to a State Council report, farmers' income in Liaoning, Jilin, and Heilongjiang increased by 12.7 percent, 18.7 percent, and 19.8 percent in 2004. Total grain output in the region was 72.31 million metric tons, 15.4 percent higher than the previous year.

The region's urban social security program included retirement insurance, unemployment insurance, and minimum standard-of-living insurance. The central fiscal plan appropriated 5.5 billion yuan to subsidize the program in 2004 and 2005. By September 2005, 23.62 million people held retirement insurance, 12.91 million held unemployment insurance, and 17.2 million held medical insurance. At the same time, the region aimed to create more job opportunities for laid-off workers. In the first three quarters of 2005, 930,000 laid-off workers previously employed by SOEs found new jobs. By the end of the third quarter, Liaoning's, Jilin's, and Heilongjiang's urban unemployment rates were 6.15 percent, 4.02 percent, and 4.24 percent. Those figures were 0.35, 0.18, and 0.26 percentage points lower than the previous year.

Foreign trade in the region also quickly expanded under the revitalization program. In 2004 foreign trade's total value was $48.02 billion, an increase of 26.4 percent from the previous year. Foreign direct investment (FDI) was $5.41 billion, $450 million, and $1.45 billion in Liaoning, Jilin, and Heilongjiang—91.5 percent, 42.3 percent, and 12.2 percent more than the previous year. The total value of FDI utilized in the region increased by 83.6 percent.[5]

The first measure undertaken to restructure SOEs was to bankrupt some SOEs in the region. Under this measure, many SOEs in the coal-mine, nonferrous-mine, and military industries went bankrupted. Employees of those SOEs then received settlements. Between 2004 and 2005, the region shut down 122 SOEs in those industries. 327,000 employees were also laid off with settlements, and 22.4 billion yuan of bad debt of SOEs was canceled. The State Council also authorized designated banks to liquidate their nonperforming assets, which was a result of their lending to SOEs, and gave them the discretionary power to cancel bad debts. By the end of August 2005, the Bank of China, Construction Bank, and Industrial and Commercial Bank collectively canceled 46.5 billion yuan of debt and verified 317.5 billion yuan of nonperforming assets.

The second major SOE measure restructured their ownership. In Heilongjiang, 96 large and medium-sized industrial SOEs finished restructuring, while 117 other SOEs were still in the process in 2005. Jilin restructured 696 out of its 816 state-owned enterprises. Liaoning restructured 586 SOEs and bankrupted 102. Almost 80 percent of medium-sized or small SOEs completed restructuring in 2005. In September 2005, the number of state-owned enterprises was 3,013, 496 fewer than in 2003. Under the ownership-restructuring measure, foreign investors purchased and invested in SOEs. For example, Anheuser-Busch purchased Harbin Brewery in 2004. Pohang Iron and Steel Company of South Korea and Itochu Corporation of Japan became shareholders of one of the largest state-owned coal-mining companies in Heilongjiang. Siemens established a turbomachinery factory in Liaoning under a strategic contract with the provincial government. It was a joint venture between Siemens and the local commission for supervising and administering state-owned assets, with Siemens owning 90 percent of the venture and the commission owning 10 percent.

After the revitalization program, the northeastern region experienced higher economic growth. In 2004 total GDP was 687.27, 295.821, and 530.3 billion yuan in Liaoning, Jilin, and Heilongjiang, a 12.8, 12.2, and 11.7 percent increase from 2003. The growth rate of 2004 was the highest in each province since 2000. In the following years, each province's growth rate remained high and exceeded the national average growth rate. By the end of 2007 GDP in Liaoning surpassed 1.1 trillion yuan, more than double GDP in 2002. The province also outperformed the eastern region on several major economic indicators for the first time. In 2007, Jilin also experienced the highest growth in two decades, at 16.1 percent. In Heilongjiang, the growth rates of fiscal revenue, foreign trade, and industrial value also reached a historical high. At first glance, it appears that the provinces were better off under the program. However, we need to compare these provinces with the rest of the country, which was also improving.

2.4. The legacy of planning

While the revitalization program intended to facilitate economic growth in the Northeast, the region's institutional issues, a legacy of the planned economy were still far from being completely solved. The economic structure in the region was quite rigid. While the nonstate sector developed rapidly, SOEs still play a major role in the economy. SOEs crowded out non-SOEs by attracting productive resources and using them in inefficient ways.[6] SOEs also had priority to receive loans and contracts from the government, which further shrunk the nonstate sector. In 2006 SOEs contributed 53.4 percent, 63 percent, and 86 percent of the value-added of the industrial sector in Liaoning, Jilin, and Heilongjiang. These figures were much higher than the national average (Zhang 2008, 115). At the same time, the nonstate sector was less competitive than SOEs and was concentrated in traditional service industries such as catering, retailing, and transportation.

SOEs' debt issuance imposed a significant burden on the region. The region tended to cancel SOEs' debts after the enterprises went bankrupt. Neither did the region take further steps regarding occurring nonperforming assets, such as liquidation of those assets. Moreover, the Ministry of Finance and the State Taxation Administration exempted SOEs from tax liabilities incurred before 1998 in the region.[7] These measures exacerbated the fiscal condition of the central and provincial governments.

While the region had experienced increases in foreign trade relative to the pre-2003 period, the total volume of foreign trade remained low compared with other regions. In 2006, that volume was only 3.9 percent of the nation's, compared to 20.7 percent in the Pearl River Delta and 49.9 percent in the Yangtze River Delta. The 3.9 percent figure is also less than one-third of Guangdong's. Use of FDI in the region was 12.2 percent of the national total. However, distribution of FDI was uneven in the region, as Liaoning attracted 70.5 percent of it while Jilin and Heilongjiang only attracted 9 and 20.5 percent.

The revitalization program did not significantly improve and may have exacerbated conditions of resource-dependent cities in the region, such as urban unemployment. These are cities whose economic development depends on the mining and processing

of natural resources. The economy of these cities had usually relied on one type of natural resource before the exhaustion of that type of natural resource. The right to exploit the natural resource typically had belonged to SOEs in the cities. When the resources were exhausted by the end of the revitalization program, the resource-dependent areas had a hard time diversifying. The reforms of SOEs also led to a large number of layoffs in these cities. Because workers employed by resource-based SOEs had nonsubstitutable skillsets, pressure was added to these workers' reemployment opportunities.[8] The high unemployment rate in these cities contributed to poor economic conditions, which dampened the region's overall economic performance (Wang and Wei 2006).[9]

These issues were reflected in the development gap between the Northeast and other regions. Although the three provinces' GDP growth rates were higher than the previous decade, regional growth was still behind the nation as a whole. The region's share of national GDP decreased from 11.1 percent in 2002 to 9.38 percent in 2008. In 2006 only Liaoning's growth was (slightly) better than the national average, while Jilin's and Heilongjiang's growth remained below it.

3. Multiple synthetic control method

We test the impact of the revitalization plan by employing the SCM, which was developed by Abadie and Gardeazabal (2003). Ideally, we would observe what happened in the Northeast both with and without the revitalization plan. Clearly, however, we cannot observe both scenarios. However, the SCM allows us to get quite close by creating a weighted average of the areas that were not directly impacted by the treatment. This weighted-average synthetic is our counterfactual to the three northeastern provinces. We create the synthetic by matching only on pretreatment predictor data so that we can compare post-treatment outcomes. Similarly to how control provinces are given weights based on their ability to match the treated units, predictor variables are weighted based on their ability to predict the three pretreatment provinces.

While most studies use SCM on just one treated unit, it is possible to use this method with multiple treated units. Cavallo et al. (2013) first used this methodology to measure the causal impacts of natural disasters on economic growth.[10] The average treatment effect is estimated by running a synthetic on each of the treated units (in our case, Heilongjiang, Jilin, and Liaoning) and then averaging both the actual outcomes and the synthetics' outcomes. The difference between these averages is the calculated average treatment effect. An advantage to examining both the overall average treatment effect and the individual effects is that we can see how the revitalization plan impacted each region. For a variety of reasons, there will likely be different impacts on each of the three provinces; put differently, the treatment effect is likely not homogenous. For example, Liaoning has a much higher foreign-trade volume than the other provinces; Jilin has the fewest SOES in the Northeast; and Heilongjiang has the highest secondary-industry share among the three provinces.

A crucial preliminary step in running the synthetic control is to find a donor pool to contribute weights to the counterfactual. Note that these donor units must not

receive the same (or similar) treatment since our results would be biased otherwise. Because the revitalization program's policies partially applied to Inner Mongolia, we drop this province. Following two previous province-level studies using SCM (Peng and Callais 2020; Zhou 2018), we use all of the remaining twenty-seven provinces in mainland China. This donor pool can be found in table A1.

We make a few key assumptions in our empirical methodology. Absher, Grier, and Grier (2020) point out that two assumptions about the multiple synthetic control method (MSCM) are needed to claim the estimates to be causal. First, the treatment cannot affect any of our control provinces. We address this by dropping Inner Mongolia, as noted above. Second, the effects must be due only to the treatment and not a simultaneous treatment. While this assumption is not testable, we find one confounding factor that also affected one of our treatment units: Heilongjiang. Batinti, Zhou, and Bologna Pavlik (2021) examine the causal effect that an anticorruption campaign had on the province in the same year as our treatment date. Given this potential problem, we weaken our inferences from the analysis about this province more than those about the other two provinces. We also point out that since our treatment is conflated with the anticorruption campaign, the reverse is true as well. Perhaps some of the results found in the aforementioned study are partially due to the revitalization plan.

We want to be able to determine statistical significance as well. Following Cavallo et al. (2013), we use an in-place placebo test to find p-values. The p-value in each post-treatment period is the percentage of regions with a higher ratio of pretreatment RMSPE to post-treatment RMSPE. We (falsely) give each unit in our donor pool the treatment and then compare postestimation results. Because these regions did not receive the treatment, the results in our three treated provinces should be higher if the industrialization plan had a causal impact.

Ren et al. (2020) address the impact of the revitalization program on incomes using difference-in-differences. They find that the program had a large and significant impact on GDP per capita in northeastern China. While difference-in-differences is a great method for addressing causal impacts, especially when the treatment date is the same year for all treated units, we argue that MSCM is a better option. This method allows us to estimate the average treatment effect (much like difference-in-differences) but also the impact on each unit. As noted above, this may be important because the impact of the plan is likely heterogeneous.

4. Data

Our data come from China's National Bureau of Statistics from 1997 to 2008 (Regional Annual Data 2020). Our outcome variable of interest is GDP per capita.

Other than lagged outcome variables, we use nine predictor variables in the analysis. In each synthetic, we include the investment share of GDP, construction share of GDP, consumer price index, foreign trade per capita, household consumption per capita, government expenditure as a share of GDP, government revenue as a share of GDP, the dependency ratio, and college education. The summary statistics for our outcome and predictor variables can be found in the appendix (table A2).

As mentioned above, we include lagged outcome variables. Since we care about pretreatment fit, this could be easily achieved by including every lagged year in order to achieve a close-to-perfect fit. As shown in Kaul et al. (2021), however, doing so would leave nearly zero weight for the other predictor variables. We care about matching on variables other than the outcome. There is a trade-off between pretreatment fit and having weights assigned to other variables, so we include only two lagged outcome variables (GDP per capita in 1997 and 2002).[11]

5. Results

5.1. Separate synthetic control

We first run the synthetic on the three provinces individually to find the effect of the revitalization program on each province. Figure 1 reports the comparison between Liaoning and the generated synthetic. It appears that the synthetic Liaoning slightly outperforms the actual province. As shown in Table 1, the synthetic largely consists of Hunan (64.8 percent) and Tianjin (22.1 percent). Beijing and Shanghai contribute a combined 4.1 percent to the synthetic. While our figure shows a close pretreatment fit for the outcome variable of interest (Table 2), we do not achieve a great fit with two of the other indicator variables: foreign trade per capita and household consumption per capita. We report the results from the placebo tests in Figure 2. The divergence in effects between Liaoning and the counterfactual are not significantly different.

We next run the same analysis on Jilin. For a couple of reasons, it appears that there is no meaningful difference between Jilin and the synthetic until five years after the treatment (Figure 3). First, it could be that the industrial policies took a few years to have any sort of effect. However, it might also be that something else led to the difference that did appear in 2006 and beyond. Both are plausible stories that we cannot decide between using only this analysis.[12] Four provinces contribute weights to the synthetic (Hubei, 61.8 percent; Chongqing, 20.3 percent; Xinjiang, 13.4 percent;
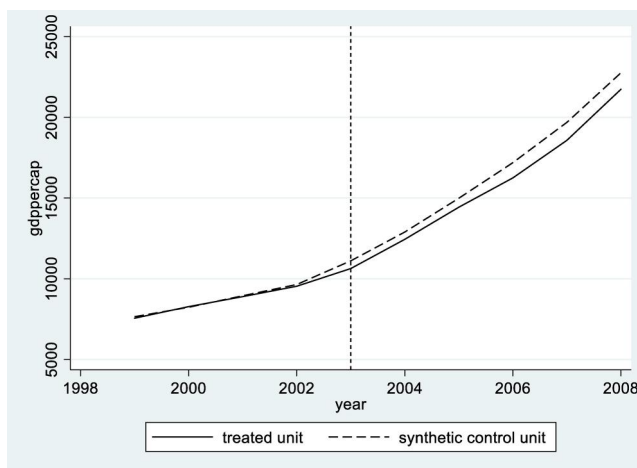

Figure 1. Liaoning synthetic.

Table 1. Donor weights.

Liaoning	Weight
Beijing	3.1%
Hunan	64.8%
Tianjin	22.1%
Shanghai	1.0%
Jilin	**Weight**
Beijing	4.5%
Chongqing	20.3%
Hubei	61.8%
Xinjiang	13.4%
Heilongjiang	**Weight**
Guangdong	17.9%
Guangxi	5.8%
Shanghai	0.6%
Xinjiang	75.7%

Table 2. Predictor balance (Liaoning).

Predictor variable	Liaoning	Baseline synthetic
GDP per capita (1997)	8657.47	8668.01
GDP per capita (2002)	12986.49	13069.83
Industry (% of GDP)	43.534	35.477
Investment (% of GDP)	27.585	32.661
Construction (% of GDP)	4.960	5.410
CPI	99.967	100.637
Foreign trade per capita	406.676	763.268
Household consumption	419.333	4455.424
Government expenditure (% of GDP)	11.153	10.724
Government revenue (% of GDP)	6.817	6.553
Dependency ratio	33.098	35.917
College education	5.577	5.415
RMPSE		114.456
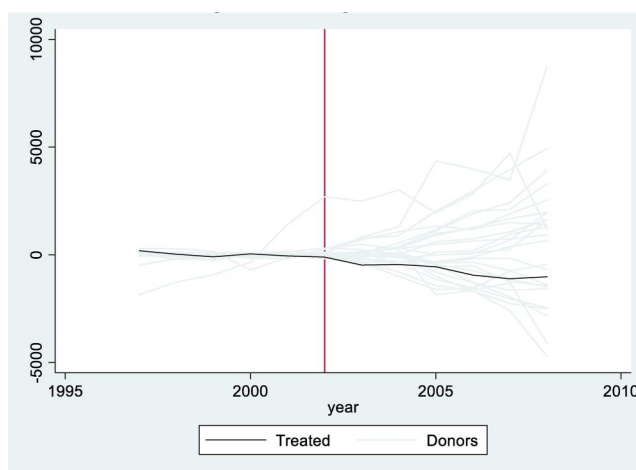
Figure 2. Liaoning placebo test.

Beijing, 4.5 percent). The predictor variables match well, aside from (again) foreign trade per capita and household consumption per capita (table 3). Since the divergence between Jilin and the counterfactual is small, it is unsurprising that our results seem to be insignificant when examining the placebo tests (Figure 4).
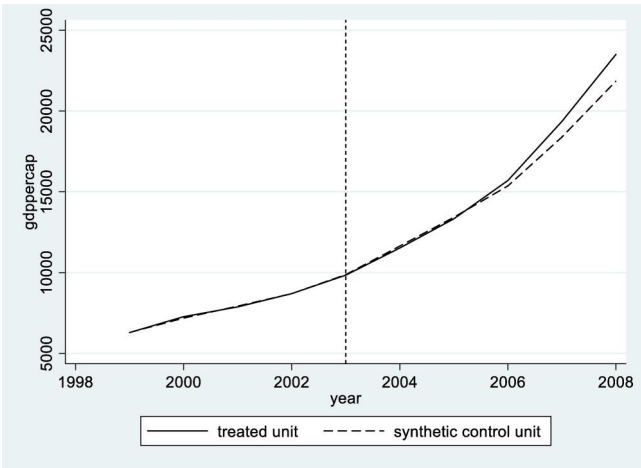
Figure 3. Jilin synthetic.

Table 3. Predictor balance (Jilin).

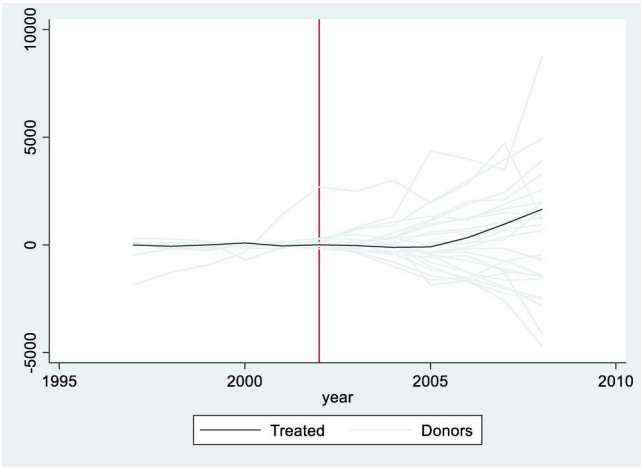| Predictor variable	Jilin	Baseline
GDP per capita (1997)	5572.07	5578.12
GDP per capita (2002)	8701.52	8699.81
Industry (% of GDP)	33.464	33.586
Investment (% of GDP)	30.283	38.150
Construction (% of GDP)	5.662	6.110
CPI	100.050	99.906
Foreign Trade per capita	94.739	199.310
Household Consumption	3325.500	3000.887
Government Expenditure (% of GDP)	13.621	11.139
Government Revenue (% of GDP)	5.713	5.860
Dependency Ratio	32.390	42.868
College Education	5.307	4.504
RMPSE		48.486

Figure 4. Jilin placebo test.
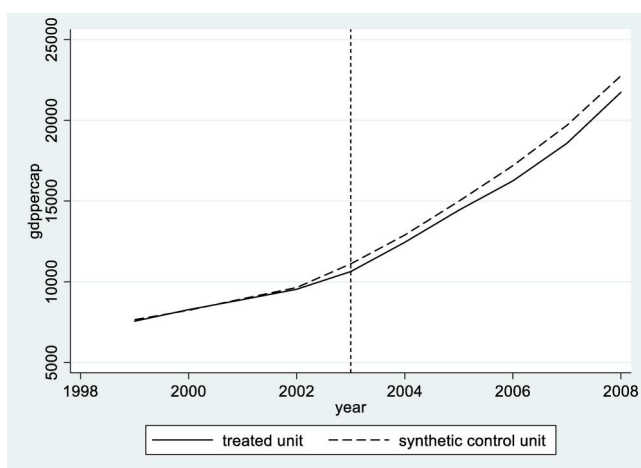
Figure 5. Heilongjiang synthetic.

Table 4. Predictor balance (Heilongjiang).

Predictor variable	Heilongjiang	Baseline
GDP per capita (1997)	7111.44	6924.67
GDP per capita (2002)	9538.95	9646.39
Industry (% of GDP)	47.970	31.107
Investment (% of GDP)	27.117	42.151
Construction (% of GDP)	5.263	7.825
CPI	100.000	100.404
Foreign trade per capita	76.418	458.212
Household consumption	3232.667	3246.689
Government expenditure (% of GDP)	11.798	14.462
Government revenue (% of GDP)	5.968	6.610
Dependency ratio	32.177	46.736
College education	4.451	6.243
RMPSE		100.171
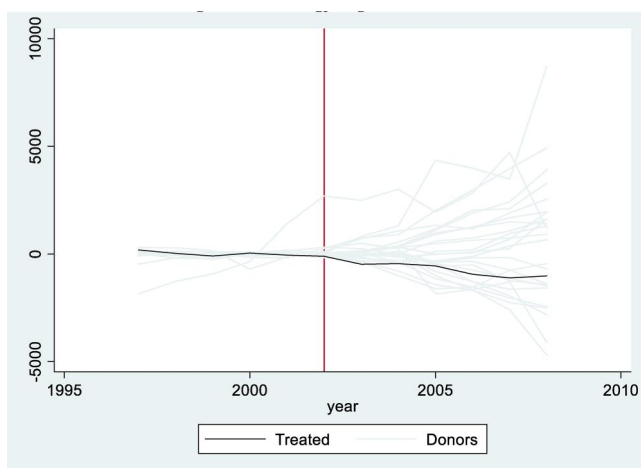
Figure 6. Heilongjiang placebo test.

Table 5. Placebo *p*-values.

Liaoning		
Year	Estimate	*p*-value
2003	−766.36	0.20
2004	−2002.82	0.20
2005	−2265.19	0.28
2006	−2200.04	0.36
2007	−1935.61	0.60
2008	−1203.16	0.92
Overall	–	0.60
Jilin		
Year	Estimate	*p*-value
2003	−32.17	0.84
2004	−117.20	0.68
2005	−94.44	0.88
2006	334.01	0.68
2007	968.45	0.56
2008	1647.70	0.48
Overall	–	0.56
Heilongjiang		
Year	Estimate	*p*-value
2003	−476.76	0.28
2004	−450.65	0.48
2005	−555.25	0.72
2006	−943.47	0.60
2007	−1112.93	0.76
2008	−1020.90	0.92
Overall	–	0.92
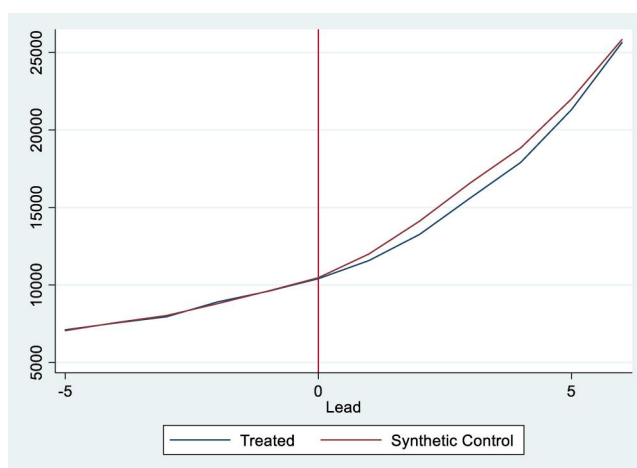
Figure 7. Multiple synthetic control (GDP per capita).

Our final province, Heilongjiang, reveals similar results to that of Liaoning (Figure 5). There appears to be a slight difference in outcomes post-treatment between the synthetic and the province, with the counterfactual outperforming Heilongjiang. Four regions contribute weights to this synthetic, with the vast majority coming from Xinjiang (75.7 percent), followed by Guangdong (17.9 percent), Guangxi (5.8 percent), and Shanghai (0.6 percent). We find two variables that have a poor

Table 6. Placebo *p*-values for multiple synthetic control (baseline).

GDP per capita

Year	Estimate	*p*-value
2003	−425.10	0.25
2004	−856.89	0.34
2005	−971.63	0.52
2006	−936.50	0.66
2007	−693.36	0.90
2007	−192.12	0.90
Overall	−	0.88

pretreatment fit: foreign trade per capita and investment as a share of GDP (table 4). The placebo test reveals largely insignificant results as well (Figure 6).

Overall, our results reveal no significant difference in outcomes between the synthetics and our actual regions. In two cases (Liaoning and Heilongjiang), the synthetic outperforms the provinces. Jilin, however, seems to beat the synthetic. While this reveals potential heterogeneity in treatment effects, these results might not be very statistically significant (Table 5). The overall significance is 0.60 for Liaoning, 0.56 for Jilin, and 0.92 for Heilongjiang.

5.2. Multiple synthetic control

Last, we run an MSCM analysis. We take the average outcomes for the treated units and compare them to the average outcomes of the control units. Figure 7 reports the results. We find small differences post-treatment between the treated unit and the synthetic. Table 6 reveals that in no year (or overall) are the results statistically significant. Overall, it appears that the revitalization program did not have a significant impact.

6. Conclusion

We evaluated a well-known place-based policy in China by using the SCM. In 2003 the State Council initiated the Northeast Area Revitalization Program, removing an agricultural tax, enhancing the urban social security system, facilitating foreign investment, and restructuring SOEs in the region. We find, overall, that the program had little systematic impact on the provinces. The impacts within the three regions were heterogeneous, likely because of differences in the institutional environments of the three provinces. Our results suggest that place-based policies that do not account for the institutional environment could fall short of expectations.

Our results suggest while the revitalization program intended to facilitate economic growth in the Northeast, the region's institutional issues embedded in the planning economy were still far from being completely solved. The economic structure in the northeastern region was quite rigid and still dominated by the state-owned sector. SOEs' debt issuance also created a significant fiscal burden in the region, as both the central and regional governments took no further steps regarding the occurring non-performing asset. The revitalization program did not significantly improve the region's economic conditions of resource-dependent cities, as witnessed the

persistently high unemployment rate. By the 2010s, the three provinces' economic growth became the slowest in the country. Some prefecture-level cities in the region have even experienced negative economic growth.

Despite the revitalization program's ineffectiveness, the State Council initiated a second round of revitalization in 2016. The council acknowledged that the regional planning economy remains problematic and emphasizes the need to reform the state-owned sectors. While it is similar to the 2003 program, the 2016 program highlights the importance of incorporating the Belt and Road Initiative and focuses more on regional cooperation (Li, Xu, and Guo 2016). Examining the second round of revitalization is a promising avenue for future research.

Notes

1. We exclude all of Inner Mongolia in our analysis since only the northeastern part was affected by the revitalization program. We discuss this in detail in section 3.
2. Twenty-four projects in Liaoning, eight projects in Jilin, and twenty-two projects in Heilongjiang.
3. Although other explanations have been posited, such as industry life-cycle theory and local cultural aspects, the institutional approach remains dominant.
4. The other three economic engines are the Beijing-Tianjin Corridor, the Yangtze River Delta, and the Pearl River Delta.
5. It is quite rare that the growth rate of the utilization is higher than the national average growth rate.
6. Dollar and Wei (2007) find that SOEs have significantly lower returns to capital than domestic private or foreign-owned firms, even with the reforms of SOEs.
7. Notification on the Tax Exemption of Enterprises of the Northeastern Industrial Base.
8. The average urban employment rate in the seven resource-dependent cities in Heilongjiang was 41.4 percent in 2006.
9. There are thirty-six prefecture-level cities in the three provinces, fifteen of which are resource-dependent cities.
10. This methodology has also been used to explain the economic and health impact of authoritarian, left-populist leaders in Latin America (Absher, Grier, and Grier 2020).
11. We run this analysis with other variables, and the main results do not change substantially. These results are available upon request.
12. However, we are unaware of any policies or events in the region that would lead us to believe the latter story is true.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes on contributors

Justin Callais is a fourth-year Ph.D. student in Agricultural and Applied Economics at Texas Tech University and a research assistant at the Free Market Institute. He earned his M.S. in Agricultural and Applied Economics from Texas Tech University and his B.B.A. in Economics from Loyola University New Orleans. Justin conducts research in economic development, institutional analysis, and constitutional political economy. His articles have been published in journals such as the *Journal of Institutional Economics*, *Contemporary Economic Policy*, *Independent Review*, and *Journal of Public Finance and Public Choice*.

Linan Peng is an assistant professor of economics at DePauw University. He earned his Ph.D.in Economics from George Mason University. His research interests are development economics, economic history, political economy, and regional economics.

ORCID

Justin T. Callais http://orcid.org/0000-0003-3582-2277

References

Abadie, A., and J. Gardeazabal. 2003. "The Economic Costs of Conflict: A Case Study of the Basque Country." *American Economic Review* 93 (1): 113–132. doi:10.1257/000282803321455188.

Absher, S., K. Grier, and R. Grier. 2020. "The Economic Consequences of Durable Left-Populist Regimes in Latin America." *Journal of Economic Behavior & Organization* 177: 787–817. doi:10.1016/j.jebo.2020.07.001.

Albanese, G., E. Ciani, and G. de Blasio. 2021. "Anything New in Town? The Local Effects of Urban Regeneration Policies in Italy." *Regional Science and Urban Economics* 86: 103623. doi:10.1016/j.regsciurbeco.2020.103623.

Alder, S., L. Shao, and F. Zilibotti. 2016. "Economic Reforms and Industrial Policy in a Panel of Chinese Cities." *Journal of Economic Growth* 21 (4): 305–349. doi:10.1007/s10887-016-9131-x.

Bardhan, P., and D. Mookherjee. 2000. "Capture and Governance at Local and National Levels." *American Economic Review* 90 (2): 135–139. doi:10.1257/aer.90.2.135.

Batinti, A. Y. Zhou, and J. Bologna Pavlik. 2021. The Economic Impact of a Major Corruption Scandal in China: The case of Heilongjiang. SSRN Working paper available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3729592.

Cao, Y., Y. Qian, and B. Weingast. 1999. "From Federalism, Chinese Style to Privatization, Chinese Style." *The Economics of Transition* 7 (1): 103–131. doi:10.1111/1468-0351.00006.

Cavallo, E., S. Galiani, I. Noy, and J. Pantano. 2013. "Catastrophic Natural Disasters and Economic Growth." *The Review of Economics and Statistics* 95 (5): 1549–1561. doi:10.1162/REST_a_00413.

Chaurey, R. 2017. "Location-Based Tax Incentives: Evidence from India." *Journal of Public Economics* 156: 101–120. doi:10.1016/j.jpubeco.2016.08.013.

Demurger, S., J. Sachs, W. T. Woo, S. Bao, and G. Chang. 2002. "The Relative Contributions of Location and Preferential Policies in China's Regional Development: Being in the Right Place and Having the Right Incentives." *China Economic Review* 13 (4): 444–465. doi:10.1016/S1043-951X(02)00102-5.

Dollar, D, and S. Wei. 2007. "Das (Wasted) Kapital: Firm Ownership and Investment Efficiency in China." *NBER Working Paper No. 13103*

Falck, O., J. Koenen, and T. Lohse. 2019. "Evaluating a Place-Based Innovation Policy: Evidence from the Innovative Regional Growth Cores Program in East Germany." *Regional Science and Urban Economics* 79: 103480. doi:10.1016/j.regsciurbeco.2019.103480.

Glaeser, E., and J. Gottlieb. 2008. "The Economics of Place-Making Policies." *Brookings Papers on Economic Activity* 1: 155–239.

Groves, T., Y. Hong, J. McMillan, and B. Naughton. 1994. "Autonomy and Incentives in Chinese State Enterprises." *The Quarterly Journal of Economics* 109 (1): 183–209. doi:10.2307/2118432.

Jia, J., G. Ma, C. Qin, and L. Wang. 2020. "Place-Based Policies, State-Led Industrialisation, and Regional Development: Evidence from China" 's Great Western Development Programme." *European Economic Review* 123: 103321–103398. doi:10.1016/j.euroecorev.2020.103398.

Kaul, A., S. Klößner, G. Pfeifer, and M. Schieler. 2021. "Standard Synthetic Control Methods: The Case of Using All Pre-Intervention Outcomes Together with Covariates." *Journal of Business & Economic Statistics* : 1–15. doi:10.1080/07350015.2021.1930012.

Koster, H. R. A., F. D. Cheng, M. Gerritse, and F. G. van Oort. 2019. "Place-Based Policies, Firm Productivity, and Displacement Effects: Evidence from Shenzhen, China." *Journal of Regional Science* 59 (2): 187–213. doi:10.1111/jors.12415.

Lardy, N. 1987. "Economic Recovery and the 1st Five-Year Plan." In *The Cambridge History of China*, edited by MacFarquhar, R., & Fairbank, J., 144–184. New York, NY: Cambridge University Press.

Lardy, N. R. 1998. *China's Unfinished Economic Revolution*. Washington, DC: Brookings Institution.

Li, C. 2004. "China's Northeast: From Largest Rust Belt to Fourth Economic Engine?" *China Leadership Monitor* 9: 1–15.

Li, W. 1997. "The Impact of Economic Reform on the Performance of Chinese State Enterprises, 1980–1989." *Journal of Political Economy* 105 (5): 1080–1106. doi:10.1086/262106.

Lin, Y., and T. Zhu. 2001. "Ownership Restructuring in Chinese State Industry: An Analysis of Evidence on Initial Organizational Changes." *The China Quarterly* 166: 305–341. doi:10.1017/S000944390100016X.

Li, J. Y. Xu, and X. Guo. 2016. One Belt and One Road Facilitate the Revitalization of the Northeast. Xinhua Net. Xinhua News Agency, May 16, 2016. http://www.xinhuanet.com/politics/2016–05/16/c_1118871252.htm

Mookherjee, D. 2015. "Political Decentralization." *Annual Review of Economics* 7 (1): 231–249. doi:10.1146/annurev-economics-080614-115527.

Morin, T., and M. Partridge. 2021. "The Impact of Small Regional Economic Development Commissions: Is There Any Bang after Just a Few Bucks?" *Economic Development Quarterly* 35 (1): 22–39. doi:10.1177/0891242420972475.

Murphy, K. M., A. Shleifer, and R. Vishny. 1989. "Income Distribution, Market Size, and Industrialization." *The Quarterly Journal of Economics* 104 (3): 537–564. doi:10.2307/2937810.

Peng, L, and J. T. Callais. 2020. Did the Policies in Xinjiang Uyghur Autonomous Region Lead to Higher Development and Social Compliance? A Synthetic Control Analysis. SSRN Working paper available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3696884.

Regional Annual Data. 2020. National Bureau of Statistics of China, data by the State Council of the 'People's Republic of China. Accessed 2020.

Ren, W., B. Xue, J. Yang, and C. Lu. 2020. "Effects of the Northeast China Revitalization Strategy on Regional Economic Growth and Social Development." *Chinese Geographical Science* 30 (5): 791–809. doi:10.1007/s11769-020-1149-5.

Shenoy, A. 2018. "Regional Development through Place-Based Policies: Evidence from a Spatial Discontinuity." *Journal of Development Economics* 130: 173–189. doi:10.1016/j.jdeveco.2017.10.001.

Shirley, M., and L. C. Xu. 2001. "The Empirical Effects of Performance Contracts. *Journal of Law*." *Journal of Law, Economics, and Organization* 17 (1): 168–200. doi:10.1093/jleo/17.1.168.

Spencer, J. H., and P. Ong. 2004. "An Analysis of the Los Angeles Revitalization Zone: Are Place-Based Investment Strategies Effective under Moderate Economic Conditions?" *Economic Development Quarterly* 18 (4): 368–383. doi:10.1177/0891242404268967.

Teiwes, F. 1987. "Establishment and Consolidation of the New Regime." In *The Cambridge History of China*, edited by MacFarquhar, R. & Fairbank, J. 51–143. New York, NY: Cambridge University Press.

Van Leuven, A. J. 2021. "The Impact of Main Street Revitalization on the Economic Vitality of Small-Town Business Districts." *Economic Development Quarterly* 089124242110380. forthcoming. doi:10.1177/08912424211038060.

Wang, J. 2013. "The Economic Impact of Special Economic Zones: Evidence from Chinese Municipalities." *Journal of Development Economics* 101: 133–147. doi:10.1016/j.jdeveco.2012.10.009.

Wang, L., and H. Wei. 2006. "Policy Options for the Economics Revival in Northeastern China." *Financial and Trade Economics* 2: 3–10.

Wang, X., L. C. Xu, and T. Zhu. 2004. "State-Owned Enterprises Going Public." *The Economics of Transition* 12 (3): 467–487. doi:10.1111/j.0967-0750.2004.00189.x.

Xu, L. C. 2000. "Control, Incentives, and Competition: The Impact of Reform in Chinese State-Owned Enterprises." *The Economics of Transition* 8 (1): 151–173. doi:10.1111/1468-0351.00039.

Zhang, P. 2008. "Revitalizing Old Industrial Base of Northeast China: Process, Policy and Challenge." *Chinese Geographical Science* 18 (2): 109–118. doi:10.1007/s11769-008-0109-2.

Zheng, S., W. Sun, J. Wu, and M. Kahn. 2017. "The Birth of Edge Cities in China: Measuring the Effects of Industrial Parks Policy." *Journal of Urban Economics* 100: 80–103. doi:10.1016/j.jue.2017.05.002.

Zhou, Y. 2018. "Do Ideology Movements and Legal Intervention Matter: A Synthetic Control Analysis of the Chongqing Model." *European Journal of Political Economy* 51: 44–56. doi:10.1016/j.ejpoleco.2017.03.010.

Appendix

Table A1. Full donor pool.

Anhui	Jiangxi
Beijing	Ningxia
Chongqing	Qinghai
Fujian	Shaanxi
Gansu	Shandong
Guangdong	Shanghai
Guangxi	Shanxi
Guizhou	Sichuan
Hainan	Tianjin
Hebei	Tibet
Henan	Xinjiang
Hubei	Yunnan
Hunan	Zhejiang
Jiangsu	

Table A2. Summary statistics.

Variable	Obs.	Mean	Std Dev	Min	Max
Treated provinces (3)					
GDP per cap	36	13069.130	6226.222	5572.070	31676.890
Industry (% of GDP)	36	42.336	5.358	31.966	49.705
Investment (% of GDP)	36	38.410	15.224	24.892	78.413
Construction (% of GDP)	36	5.487	0.455	4.799	6.361
CPI	36	101.522	2.431	96.800	105.600
Foreign trade per capita	36	386.526	385.576	53.526	1678.652
Household consumption	36	4792.833	1641.389	2735.000	9690.000
Government expenditure (% of GDP)	36	13.972	2.527	8.758	18.550
Government revenue (% of GDP)	36	6.549	1.146	5.320	9.921
Dependency ratio	36	30.778	3.542	24.320	37.130
College education	36	6.241	1.742	3.706	11.005
Donor pool provinces (27)					
GDP per cap	324	13169.310	11275.430	2234.581	65716.300
Industry (% of GDP)	324	36.284	9.691	7.026	52.882
Investment (% of GDP)	324	42.599	11.629	23.292	79.495
Construction (% of GDP)	324	6.931	2.577	3.254	21.801
CPI	324	101.778	2.490	96.400	110.100
Foreign Trade per capita	324	1026.403	2279.249	14.760	15341.210
Household consumption	324	4882.380	3603.587	1473.000	25167.000
Government expenditure (% of GDP)	324	16.468	12.172	5.307	96.406
Government revenue (% of GDP)	324	7.180	2.195	3.357	16.765
Dependency ratio	324	41.794	7.916	15.250	64.490
College education	324	5.537	4.727	0.091	30.127