The Impact of Place-Based Policy: Evidence from a Multiple Synthetic Control Analysis of the Northeastern Revitalization Program in China

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Abstract

We examine the effect of a well-known 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 investments, and restructuring state-owned enterprises (SOEs) in the region. Using a budding case-study approach (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 well as Heilongjiang (albeit to a less 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 SOEs 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. While there are studies that argue that it is necessary for the government to facilitate those policies to fix market failures in impoverished regions (for example, see Murphy et al., 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 from a well-known place-based policy in China, 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 of Inner Mongolia.[1] Once the "cradle of the Republic's industry," the northeastern region became the largest rustbelt in China ever since the economic reform. Because of marketization, the region's planned economy had 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 and state-holding sectors started to become less competitive than the non-state sector because of the high cost of production, the ambiguous ownership structure, the absence of proper managerial incentives, and the 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 had experienced the fastest economic growth in the 21st century.

[1] We exclude Inner Mongolia in our analysis since only the northeastern part of Inner Mongolia received the revitalization program. We discuss this in detail in Section 3

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

A budding literature is attempting to assess the effectiveness of place-based policies within countries. Our paper contributes to this ongoing discussion. 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 rather than total factor productivity growth. Koster et al. (2019) find that the opening of science parks in Shenzhen greatly improved firm productivity, as well as an increase in local wages. Falck et al. (2019) evaluates the impact of the Innovative Regional Growth Cores (ICRG) program. Their results suggest that any positive influence on research and development was quite localized, but found little the overall effectiveness. Albanese et al. (2021) finds 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 the special economic zones (SEZs) in China (see Demurger et al., 2002; Wang, 2013; Alder et al., 2016; Zheng et al., 2017). Those studies have largely reached positive conclusions about the effectiveness of the SEZs policies. Within India, Chaurey (2017) and Shenoy (2018) find that placed-based policies improved regional economic conditions. Even within a rich country like the United States, place based revitilizations programs have become an increasingly popular research agenda (e.g., Morin & Partridge 2021; Spencer & Ong 2004; Van Leuven 2021).

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

The rest of the paper is organized as follows. Section 2 gives the historical background of the regional economy. Section 3 discusses the synthetic control method. Section 4 describes that data. Section 5 reports the results. We conclude with Section 6.

2. Historical Background

2.1 The Rise

After the Manchus' conquest of China, the imperial court erected a willow palisade to restrict movement to the northeastern region (formerly known as Manchuria) in the 17th century. It forbade any Han Chinese to settle in the area. The throne claimed that such a restriction was to protect the legacy of Manchurian tradition. It was not until the 1860s that when the emperor lifted the restriction, 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. Coupled with the abundance of natural resources, like coal and iron ore, the region established a Japanese industrial base after the Japanese invasion of Manchuria. By the mid-1930s, the output per capita in Manchuria was estimated to be at least 50 percent higher than the rest of China under the Japanese occupation (Lardy, 1987: 147).

After the Communist Party of China's (CPC) takeover, 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 the successive years of wars, the northeast had benefited immensely from the legacy of the Japanese industrial base. 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 proximity to the Soviet Union and the advanced railroad network, the northeast had easy access to Soviet aid and economic influence. Lastly, by being the first region that the CPC liberated,

the 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 an aid program from the Soviet Union. The program consisted of 156 projects in which the Soviet Union provided machinery and equipment, advised on construction and installation, and supplied design and technical assistance (Lardy, 1987: 177). The northeast received about one-third of those projects and significantly contributed to the national industrial output during the first FYP.[2] Upon the completion of the first FYP, industrial output rose 130 percent, exceeding the planned target by 30 percent. Since then, the region continued to be the country's major industrial base and was recognized as the "cradle of the Republic's industry." Some of the largest state-owned enterprises were established in the region.[3]

Since the 1950s, the focus on the northeast's economic growth has been at the forefront in the country. Liaoning once had the highest regional GDP growth at the beginning of the 2nd FYP in 1958. Liaoning's GDP growth also remained the second-highest in the final three years of the 2nd FYP. Both Heilongjiang and Jilin experience rapid economic growth. Heilongjiang's GDP remained top ten in the nation before the 1980s. Jilin also had an average annual growth rate of 7.1 percent from the 1950s to 1980.

2.2 The Decline

As economic reforms started to take place, the disadvantages of the northeastern economy started to become more obvious. The northeast's economic activity had taken the back seat to the

[2] 24 projects in Liaoning, 8 projects in Jilin, and 22 projects in Heilongjiang
[3] These include Anshan Iron and Steel Group Corporation, First Automobile Works Group Corporation, and Daqing Oilfield Company Limited.

eastern and coastal regions in the last quarter of the 20th century. The dominance of SOEs in the region gradually became a liability. Due to incentive issues and declining efficiency in the use of resources, most of the SOEs had performed quite poorly in the long run (Lardy, 1998). Other problems, such as outdated facilities and the heavy burden of pension distribution to retired workers, further exacerbated the performance of the SOEs and the overall regional economy. [4] These factors were deeply embedded in the centralized economic planning system.[5] There was little change in the state-owned or state-holding sector's share of the region's industrial output value between 1998 and 2001.[6]

The industrial output share of the northeastern region had also 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, Heilongjiang had dropped from 2nd, 15th, and 7th to 5th, 18th, and 14th, respectively. At the beginning of the economic reform, industrial output in Liaoning accounted for 8.8 percent of the national level, while Guangdong's industrial output was 4.5 percent of the national level in 1980. In 1996, Guangdong's industrial output was 610 billion yuan, accounting

[4] Since the 1980s, some measures were 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 (Grove et al., 1994; Li, 1997; Xu, 2000). However, the overall performance of the state-owned industry 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 had reduced state ownership, lessened firms' reliance on debt finance, and allowed firms to increase capital expenditure, there was no evidence indicating any significant improvement in the firms' profitability (Wang, Xu, and Zhu, 2004). Wang et al. (2004) suggested that several factors could contribute to such a result, including managerial moral hazard resulting from reduced ownership, and recorded performance in the pre-privatization era was actually exaggerated.

[5] Although there are other explanations such as industry life cycle theory and local cultural aspects, the institutional approach remains dominate.

[6] In 2001, the state-owned or holding sector's share of the industrial output was 73.27 percent of the region's total industrial output, which was 28.84 percent higher than the nation's average.

for 9 percent of the national output level, while the northeastern provinces' total industrial output was 690 billion.

The SOEs had also started to lay off workers in the late 1990s through the early 2000s. These SOEs employed 109.55, 109.49, and 107.66 million in 1995, 1996, and 1997, respectively. However, the number of employees in the SOEs started to drop to 88.09 million and 83.36 million by 1998 and 1999. This reduction continued to 2002, where SOEs employed about 69.24 million workers. More than a quarter of laid-off workers were in the northeastern region each of those years. The wave of layoff induced massive urban poverty in the region.[7]

At the beginning of the economic reform in 1978, Liaoning's GDP was still more than 50 percent higher than Guangdong's GDP. By 2001, the three northeastern provinces' total GDP was only 62 percent of Guangdong's GDP. Between 1980 and 2001, each northeastern province's annual economic growth rate was lower than the national average.[8]

2.3 The Revitalization

In 2003, the CPC decided to make an extensive effort to halt the economic downturn experienced 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.[9] The State Council also established a special Leader Group and the Office for Revitalizing Northeast Old Industrial Base to approve and implement strategies.[10]

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[7] According to the China Industry Economic Yearbook's estimation, workers' average productivity was 32,387, 25,595, and 22,007 yuan in Liaoning, Jilin, and Heilongjiang. In the same year, those numbers were 61,949, 52,320, and 68,227 yuan in Jiangsu, Shandong, and Guangdong.

[8] The three provinces had also experienced negative economic growth in consecutive years in the 1980s.

[9] The other three economic engines are the Beijing-Tianjin Corridor, the Yangtze River Delta, and the Pearl River Delta.

[10] Wen Jiabao, the premier of the State Council, served as the director of the group, and two other vice premiers were the deputy directors

The revitalization program launched a series of policies that favored and gave more benefits to the northeastern region. These policies included removing agricultural tax in the region, enhancing the urban social security system, facilitating foreign investments, and restructuring SOEs in the region.

The central government appropriated 22.84 billion yuan to subsidize the agricultural tax removal in the region in 2004 and 2005. According to the State Council's report, farmers' income in Liaoning, Jilin, and Heilongjiang increased by 12.7 percent, 18.7 percent, and 19.8 percent in 2004. The total grain output in the region was 72.31 million metric tons, which was 15.4 percent from the previous year. The sown area also increased by 1.44 million mu in 2005.

The urban social security program included retirement insurance, unemployment insurance, and minimum-standard living insurance. The central fiscal plan appropriated 5.5 billion yuan to subsidize these social security programs in 2004 and 2005 in the region. By September 2005, 23.62 million people participated in retirement insurance, 12.91 million people claimed unemployment insurance, and 17.2 million people joined the 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 through SOEs found new jobs. By the end of the third quarter of 2005, Liaoning, Jilin, and Heilongjiang's urban unemployment rate was 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 US dollars in the region, an increase of 26.4 percent from the previous year. In the same year, the utilization of foreign direct investments (FDI) was 5.41 billion, 450 million, and 1.45 billion US dollars in Liaoning, Jinlin, and Heilongjiang. Those

were 91.5 percent, 42.3 percent, and 12.2 percent more than the previous year. The total value of the utilization of FDI in the region increased by 83.6 percent.[11]

Under the restructuring of SOEs, the first measure was to magnify the degree of bankrupting SOEs in the region. Under this measure, some SOEs in coal mines, nonferrous mines, and the military industry went bankrupt. Employees of those SOEs received proper settlements after bankruptcy. Between 2004 and 2005, 122 SOEs in those industries were shut down, 327,000 employees were laid off with a settlement from the bankruptcy. In doing so, 22.4 billion yuan of "bad" debt was also canceled.[12]

Another major measure was restructuring ownership of SOEs. In Heilongjiang, 96 large and medium-sized state-owned industrial enterprises finished restructuring, while 117 other SOEs were still in the process. Jilin restructured 696 out of 816 local state-owned or state-holding enterprises. Liaoning also restructured 586 SOEs and bankrupted 102 SOEs. Almost 80 percent of medium or small-sized SOEs completed restructuring. By September of 2005, the number of state-owned and state-holding enterprises was 3013, which was 496 fewer enterprises than in 2003. Under the restructuring of ownership, foreign investors also actively participated in the purchasing and investing of 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.

[11] It is quite rare that the growth rate of the utilization is higher than the national average growth rate

[12] In the process of restructuring, the State Council also authorized designated banks to verify their non-performing assets, which was a result from lending to SOEs, with the discretionary power to cancel bad debts. By the end of August 2005, Bank of China, Construction Bank, and Industrial and Commercial Bank canceled 46.5 billion yuan of debts and verified 317.5 billion yuan of non-performing asset.

Since the revitalization program, the northeastern region had experienced higher economic growth than in previous years. In 2004, the total GDPs were 687.27, 295.821, and 530.3 billion yuan in Liaoning, Jinlin, 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 was above the national average growth rate. By the end of 2007, the GDP in Liaoning surpassed 1.1 trillion yuan, which was more than double the GDP in 2002. Several major economic indicators of the province also outperformed the eastern region for the first time. In the same year, Jilin also experienced the highest growth in the past two decades, which was 16.1 percent. In Heilongjiang, the growth rate of fiscal revenue, foreign trade, and industrial value also reached a historical high. At first glance, it appears that the provinces were better off with this program. However, we need a proper comparison to see how these provinces compared to the rest of the country, which was experiencing an overall increase in well-being.

2.4 The Problems of the Planning Legacy

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. While there were rapid developments in the non-state sector, SOEs in the region still play a major role in the economy. SOEs "crowded out" non-state-owned sectors by draining away productive resources in inefficient ways that lead to a lower return.[13] SOEs also had the priority to receive loans and contracts from the government, which further shrunk the size of the non-state sector. In 2006, SOEs contributed to 53.4 percent, 63 percent, and 86 percent of the value-added of the industry in

[13] Dollar and Wei's (2007) finds that SOEs have significantly lower returns to capital than domestic private or foreign-owned firms, even despite the reforms of SOEs.

Liaoning, Jilin, and Heilongjiang. These figures were much higher than the national average (Zhang, 2008: 115). At the same time, the non-state sector was less competitive than SOEs in the market and was only concentrated in the traditional service sector such as catering, retailing, and transportation.

The debt issue of SOEs also remained a significant burden in the region. The region tended to cancel SOEs' debts after they went bankrupt or take no further step regarding the occurring non-performing asset. Moreover, the Ministry of Finance and the State Taxation Administration exempted any taxes owed by SOEs before 1998 in the region.[14] These measures would further exacerbate the fiscal condition of the central and provincial governments.

While the region had experienced increases in foreign trade, the total foreign trade volume remained low compared with other regions. In 2006, the northeastern region's total foreign trade volume was only 3.9 percent of the nation, comparing with 20.7 percent in the Pearl River Delta and 49.9 percent in the Yangzte River Delta. This figure is also less than one-third of Guangdong's. The actual utilization of FDI in the region was 12.2 percent of the national level. However, the distribution of FDI was uneven in the region as Liaoning had 70.5 percent of those investments, while Jilin and Heilongjiang only had 9 and 20.5 percent, respectively.

The revitalization program did not significantly improve, if not deteriorated, the conditions of resource-dependent cities in the region. The economy of these resource-dependent cities had relied on one type of natural resource. The right to exploit the natural resource typically had belonged to SOEs in the cities. As the resources were exhausted after the revitalization program, the resource-dependent areas experienced a hard time transforming into cities with diverse economies. The reforms of SOEs also led to a large number of workers being laid off in these

[14] Notification on the Tax Exemption of Enterprises of the Northeastern Industrial Base

cities. Because workers employed by resource-based SOEs had nonsubstitutable skillsets, further pressure was added to these workers' reemployment opportunities.[15] The high unemployment rate in these cities contributed to poor economic conditions, which dampened the northeastern region's overall economic performance (Wang and Wei, 2006).[16]

These issues were reflected in the development gap between the northeast and the other regions. Although the three provinces' GDP growth rates were higher than the previous decade, the regional growth was still behind the nation as a whole. The share of the regional GDP in the national economy still 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 and Heilongjiang's economic growth was still below.

3. Multiple Synthetic Control Method

We test our analysis by employing the synthetic control method (SCM), which was developed by Abadie and Gardeazabal (2003). Ideally, we would want to know what happened in the Northeast region both with and without the revitalization plan. Clearly, however, we cannot observe both scenarios. However, synthetic control can allow 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 Northeast provinces. We create the synthetics by matching *only* on pre-treatment predictor data so that we can compare post-treatment outcomes. Similar to how control provinces are given weights based on their ability to match the treated units,

[15] The average urban employment rate in the seven resource-dependent cities in Heilongjiang was 41.4 percent in 2006.
[16] There are 36 perfecture-level cities in the three provinces, 15 of those are resource-dependent cities.

predictor variables are also weighted based on their ability to predict the three pre-treatment provinces.

While most studies use the synthetic control method on just one treated unit, it is possible to use this method when there are multiple treated units as well. Cavallo et al. (2013) first used this methodology to measure the causal impacts of natural disasters on economic growth.[17] 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 the actual outcomes and the synthetics. The difference between these averages is the calculated average treatment effect. An advantage to examining *both* the overall average treatment effect as well the individual effects is that we can see how the revitalization plan impacted each region. Due to a variety of reasons, there will likely be different impacts on each of the three provinces; simply put, the treatment effect is likely not homogenous for each of the three treated units. For example, Liaoning has a much higher foreign trade volume than the other provinces; Jilin has the least presence of state-owned enterprises in the northeast region in terms of the absolute number of SOEs; Heilongjiang has a higher secondary industry share among the three provinces.

A crucial preliminary step in running the synthetic control is to find a donor pool that could contribute weight to the counterfactual. The most important step to note here is that these units did not receive the same (or similar) treatment since doing so would bias our results. In our case, Inner Mongolia partially received the policies of the revitalization program, so we drop this province. Following two previous province-level studies using the synthetic control (Peng & Callais 2020;

[17] This methodology has also been used to explain the economic and health impact of authoritarian, left-populist leaders in Latin America (Absher et al. 2020).

Zhou 2018), we use the comprehensive list of each of the remaining 27 provinces in Mainland China (excluding Inner Mongolia). This donor pool can be found in **Table A1**.

We make a few key assumptions in our empirical methodology. Absher et al. (2020) point out that two assumptions about the Multiple SCM 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, a provincial-level region that partially received some of the impacts of this revitalization plan. Second, the effects are only due to the treatment and not another simultaneous treatment. While this is not testable, we find one confounding impact that also affected one of our units: Heilongjiang. Batinti et al. (2021) examine the causal effect that an anti-corruption campaign had on the province in the same year as our treatment date. We deal with this potential problem in two ways. First, we soften the implications we get from this analysis in the province more than we will for the other two provinces. Second, though, we point out that since this treatment is conflating with the anti-corruption 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 give some sort of statistical significance in this analysis as well. Following Cavallo et al. (2013), we use an in-place placebo test to find p-values. The p-values in each post-treatment period is the percentage of regions with a higher ratio of pre-treatment RMSPE divided by post-treatment RMSPE. We (falsely) give each unit in our donor pool the treatment and then compare post-estimation 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 meaningful causal impact.

We now want to discuss the advantages and disadvantages of this analysis, especially because another study has examined the same question using a different method: difference-in-difference (Ren et al. 2020). They find that the revitalization plan had a large and significant impact on GDP per capita in Northeast China. While difference-in-difference, especially when the treatment date is the same year for all treated units, is a great method at addressing causal impacts, we argue that the multiple synthetic control method is a better option. The synthetic control method allows us to estimate the average treatment effect (much like difference-in-difference) and the *individual* impact for each unit. There is likely a heterogeneous impact of this plan (perhaps due to historical or cultural unobservables) on the three regions, so being able to assess those seem important.

4. Data

Our data come from the National Bureau of Statistics in China (NBSC) from 1997 to 2008. Our outcome variable of interest is gross domestic product (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 (CPI), 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 pre-treatment 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. (2016), however, doing so would leave nearly zero weight for the other predictor variables. We care about matching on variables that are not only the

outcome, so this would be ideal. There is a trade-off between pre-treatment fit and weights being assigned to other variables, so we include only two lagged outcome variables (GDP per capita in 1997 and 2002).[18]

5. Results

5.1 Separate Synthetic Control

We first run the synthetic on the three provinces individually. This way, we examine the heterogeneous effect that this revitalization policy had on each province. We report the results from the Multiple Synthetic Control analysis in the next subsection.

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%) and Tianjin (22.1%). Beijing and Shanghai contribute a combined 4.1% to the synthetic. While our figure finds a really nice pre-treatment fit between 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 also report the results from the placebo tests in **Figure 2**. It appears that the differing effects between Liaoning and the counterfactual are not significantly different.

We next run the same analysis on Jilin. Here, it appears that there is no distinctive difference between Jilin and the synthetic until five years post-treatment (**Figure 3**). There are a few reasons this might be the case. First, it could be that the industrial policies put forth in the region took a few years to have any sort of effect. However, it might also be the case that *something*

[18] We run this analysis with other variables, and the main results do not change substantially. These results are available upon request.

else led to this difference in 2006 and beyond. Both are quite plausible results that cannot be revealed using only this analysis.[19] Four provinces contribute weights to the synthetic (Hubei, 61.8%; Chongqing, 20.3%; Xinjiang, 13.4%; Beijing, 4.5%). The predictor variables match up nicely, aside from (again) foreign trade per capita and household consumption per capita (**Table 3**). Since the divergence between Jilin and the counterfactual is quite small, it is unsurprising that our results seem to be insignificant in the account of the placebo tests (**Figure 4**).

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%), followed by Guangdong (17.9%), Guangxi (5.8%), and Shanghai (0.6%). We find two variables that have a poor pre-treatment 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 treatment effects in the region, we also are not confident that these results are very statistically significant (**Table 5**). The overall significance for Liaoning is 0.60, 0.56 for Jilin, and 0.92 for Heilongjiang.

5.2 Multiple Synthetic Control

[19] However, we are unaware of any policies or events occurring in the region that would lead us to believe the latter is true.

As the last test, we run a multiple synthetic control (MSC) analysis. Here, 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 from the MSC. We find small differences post-treatment between the treated unit and the synthetic. **Table 6** reveals that under no year (or in whole) are the results statistically significant. Overall, it appears that the revitalization program put in place in the Northeast region did not have a significant impact. However, the results *are* different for each of the three provinces.

6. Conclusion

We evaluate a well-known place-based policy in China by using SCM in this paper. In 2003, the State Council initiated the Northeast Area Revitalization Program, removing an agricultural tax, enhancing the urban social security system, facilitating foreign investments, and restructuring SOEs in the region. We find, overall, that the revitalization program had a little systematic impact on the provinces. The impacts within the three regions were heterogeneous, and this is likely explained by the differences in the institutional environments of the three regions. Our results suggest that place-based policies that do not account for the embedded institutional environments within the area 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 in a more market-oriented economy. The debt issue of SOEs also remained a significant fiscal burden in the region, as both the central and regional governments take no further steps regarding the occurring non-performing asset. The revitalization

program did not significantly improve the economic conditions of resource-dependent cities in the region, as the high unemployment rate persisted. By the 2010s, the three provinces' economic growth has become 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 the second round of revitalization in 2016. The State Council acknowledged that the regional planning economy remains problematic after the first revitalization program and emphasizes the need to reform the state-owned and state-holding sectors. While it is similar to the 2003 program, the 2016 revitalization highlights the importance of incorporating the Belt and Road Initiative and focuses more on regional cooperations (Li et al. 2016). We view the examination of the second round of revitalization as promising avenues for future research.

References

Abadie, A. & Gardeazabal, J. (2003). The economic costs of conflict: a case study of the Basque Country. *American Economic Review*, 93(1), 113–132.

Abadie, A., Diamond, A. & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. *Journal of the American Statistical Association*, 105(490), 493–505.

Absher, S., Grier, K., & Grier, R. (2020). The economic consequences of durable left-populist regimes in Latin America. *Journal of Economic Behavior & Organization* 177, 787–817.

Albanese, G., Ciani, E., & de Blasio, G. (2021). Anything new in town? The local effects of urban regeneration policies in Italy. *Regional Science and Urban Economics*, 86.

Alder, S., Shao, L., & Zilibotti, F. (2016). Economic Reforms and Industrial Policy in a Panel of Chinese Cities. *Journal of Economic Growth*, 21, 305–349.

Bardhan, P., & Mookherjee, D. (2000). Capture and Governance at Local and National Levels. *American Economic Review*, 90(2), 135–139.

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

Cao, Y., Qian, Y., & Weingast, B. (1999). From Federalism, Chinese Style to Privatization, Chinese Style. *Economics of Transition* 7(1), 103–131.

Cavallo, E., Galiani, S., Noy, I. & Pantano, J. (2013). Catastrophic natural disasters and economic growth. *The Review of Economics and Statistics*, 95, 1549–1561.

Chaurey, R. (2017). Location-Based Tax Incentives: Evidence from India. *Journal of Public Economics*, 156, 101–120.

Demurger, S., Sachs, J., Woo, W.T., Bao, S., & Chang, G. (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.

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

Falck, O., Koenen, J., & Lohse, T. (2019). Evaluating a place-based innovation policy: Evidence from the innovative Regional Growth Cores Program in East Germany. *Regional Science and Urban Economics*, 79.

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

Groves, T., Hong, Y., McMillan, J., & Naughton, B. (1994). Autonomy and Incentives in Chinese State Enterprises. *The Quarterly Journal of Economics*, 109(1), 183-209.

Kaul, A.,, Klößner, S., Pfeifer, G., & Schieler, M. (2021). Standard Synthetic Control Methods: The Case Of Using All Pre-Intervention Outcomes Together With Covariates. *Journal of Business and Economic Statistics*.

Koster, H. R. A, Cheng, F. D., Gerritse, M., & van Oort, F. G. (2019). Place-based policies, firm productivity, and displacement effects: Evidence from Shenzhen, China. *Journal of Regional Science*, 59(2), 187-213.

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, J., Xu, Y., & Guo, X. (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

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.

Lin, Y., & Zhu, T. (2001). Ownership Restructuring in Chinese State Industry: An Analysis of Evidence on Initial Organizational Changes. *The China Quarterly*, 166, 305–341.

Mookherjee, D. (2015). Political Decentralization. *Annual Review of Economics*, 7, 231–249.

Morin, T., & Partridge, M. (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.

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

Peng, L. & Callais, J.T. (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. National Bureau of Statistics of China, data by the State Council of the People's Republic of China. Accessed 2020

Ren, W., Xue, B., Yang, J., & Lu, C. (2020). Effects of the Northeast China Revitalization Strategy on Regional Economic Growth and Social Development. *Chinese Geographical Science*, 30(5), 791–809.

Shenoy, A. (2018). Regional Development through Place-Based Policies: Evidence from a Spatial Discontinuity. *Journal of Development Economics*, 130, 173–189.
Shirley, M., & Xu, L.C.. (2001). The Empirical Effects of Performance Contracts. *Journal of Law, Economics, and Organization*, 17(1), 168–200.

Spencer, JH., & Ong, P. (2004). An Analysis of the Los Angeles Revitlization Zone: Are Place-Based Investment Strategies Effective Under Moderate Economic Conditions? *Economic Development Quarterly*, 18(4): 368-383.

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, AJ. (2021). The Impact of Main Street Revitalization on the Economic Vitality of Small-Town Business Districts. *Economic Development Quarterly*, forthcoming.

Wang, J. (2013). The Economic Impact of Special Economic Zones: Evidence from Chinese Municipalities. *Journal of Development Economics*, 101, 133–147.

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

Wang, X., Xu, L. C., & Zhu, T. (2004). State-Owned Enterprises Going Public. *Economics of Transition*, 12(3), 467–487.

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

Zhang, P. (2008). Revitalizing Old Industrial Base of Northeast China: Process, Policy and Challenge. *Chinese Geographical Science*, 18(2), 109–118.

Zheng, S., Sun, W., Wu, J., & Kahn, M. (2017). The Birth of Edge Cities in China: Measuring the Effects of Industrial Parks Policy. *Journal of Urban Economics*, 100, 80–103.

TABLES

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

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

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

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

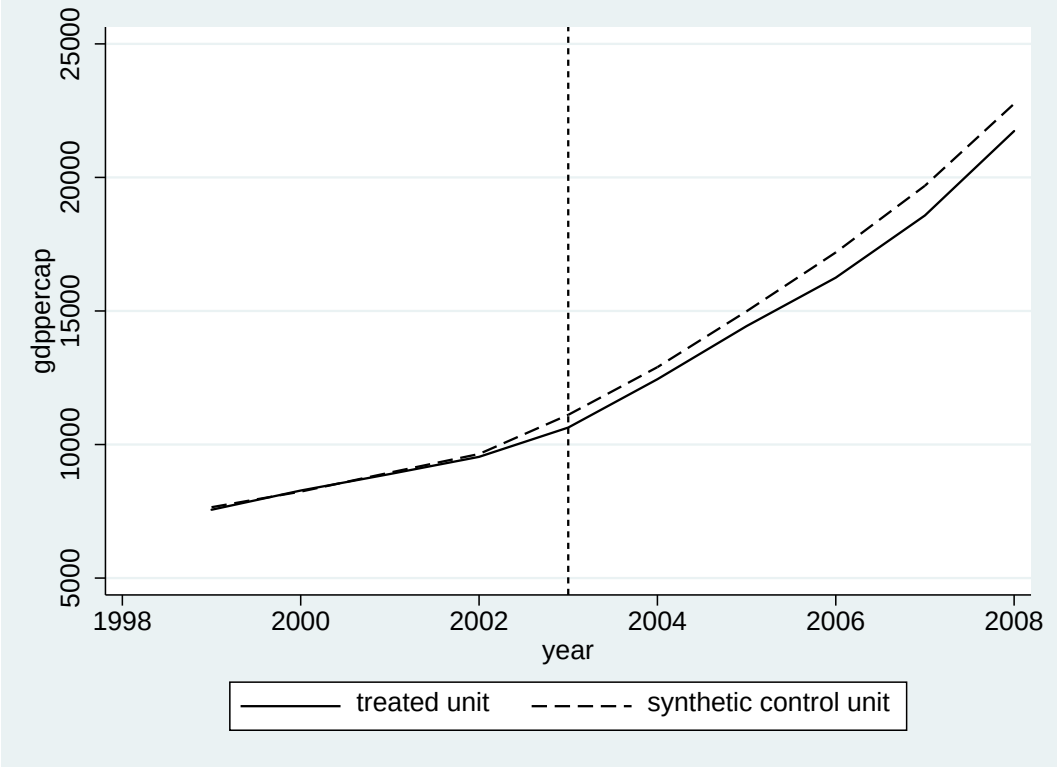
Heilongjiang		
Year	Estimate	P-Value
2003	-476.76	0.28
2004	-450.65	0.48
2005	-555.25	0.72
2006	-943.47	0.60
2007	-1112.93	0.76
2008	-1020.90	0.92
Overall	-	0.92

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

FIGURES

Figure 1: Liaoning Synthetic


gdppercap
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10000
15000
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1998
2000
2002
2004
2006
2008
year
treated unit
synthetic control unit

Figure 2: Liaoning Placebo Test

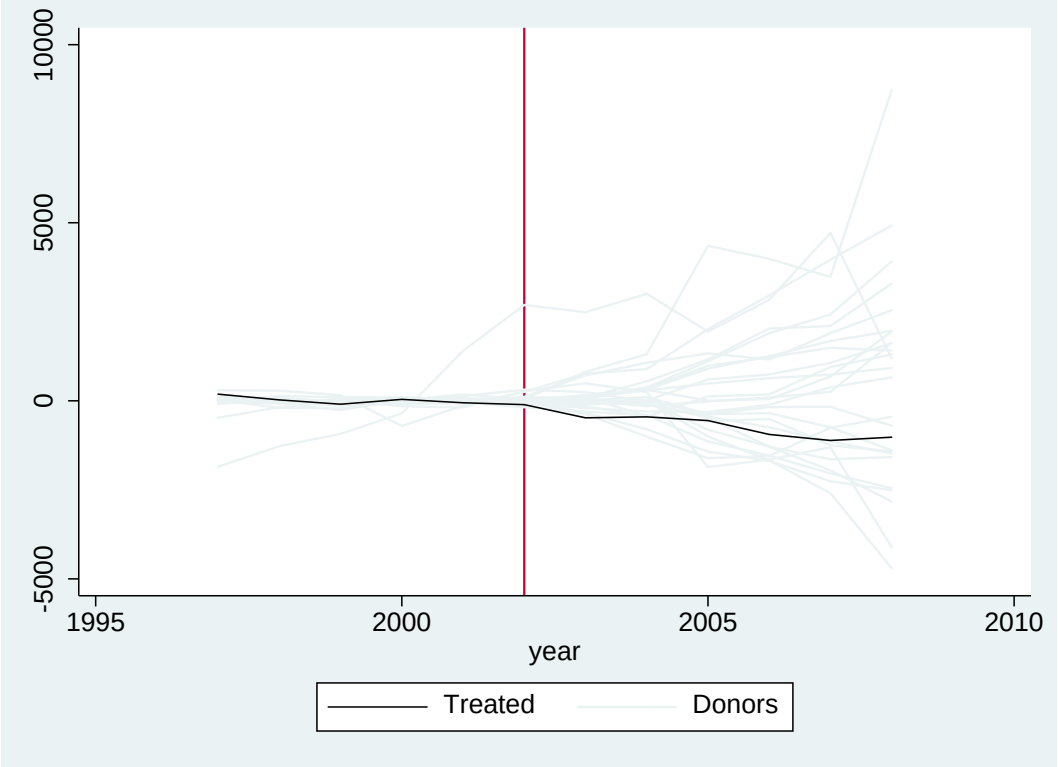


Figure 3: Jilin Synthetic

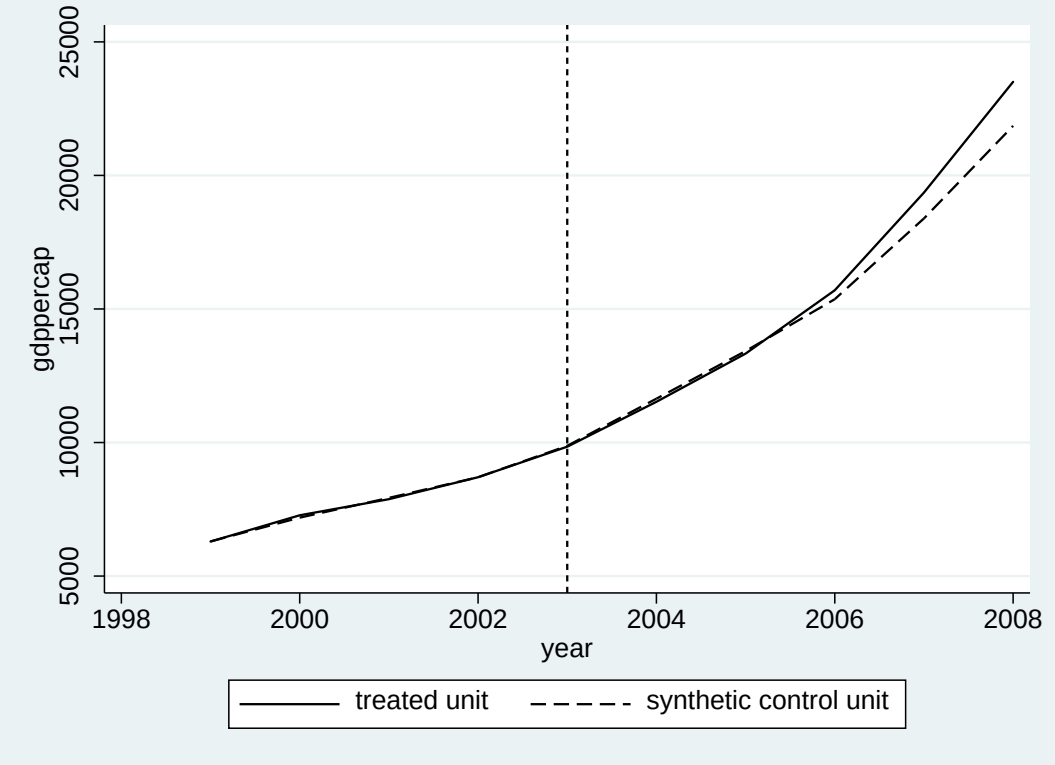


Figure 4: Jilin Placebo Test

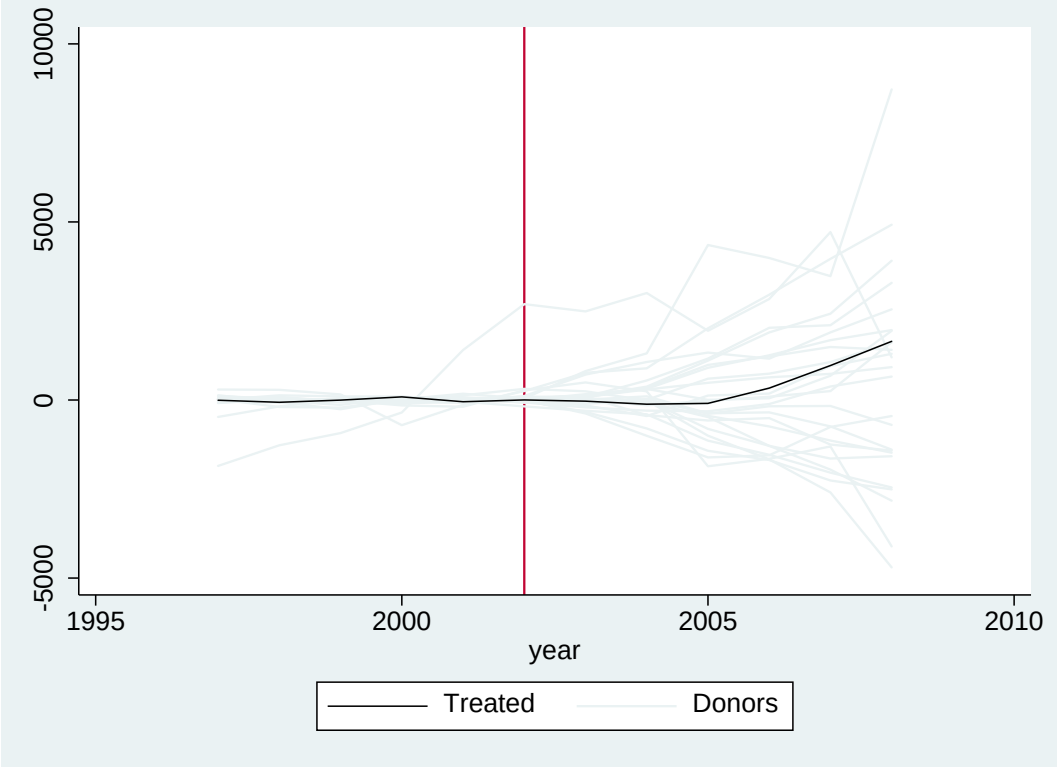


Figure 5: Heilongjiang Synthetic

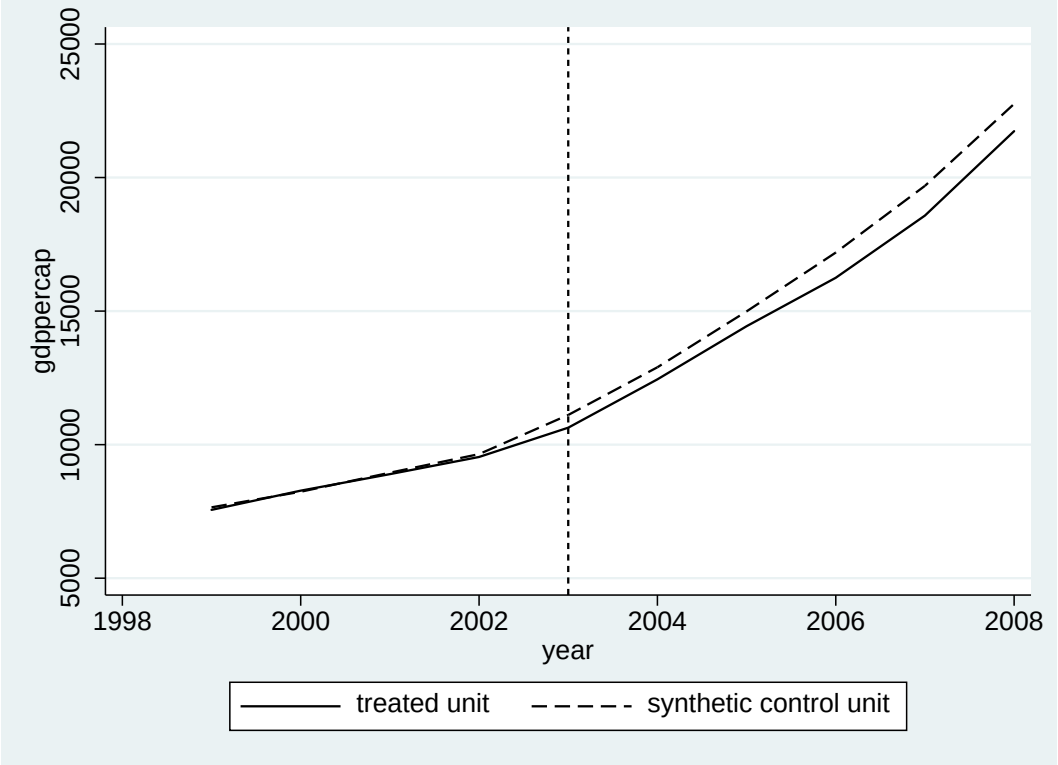


Figure 6: Heilongjiang Placebo Test

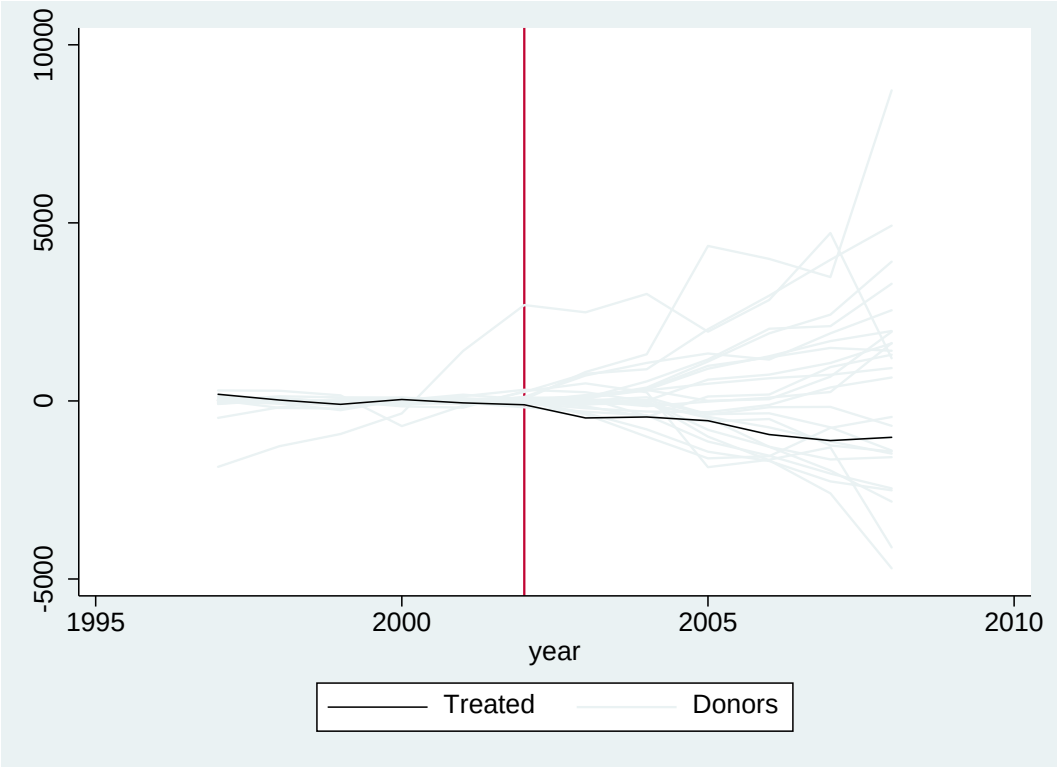
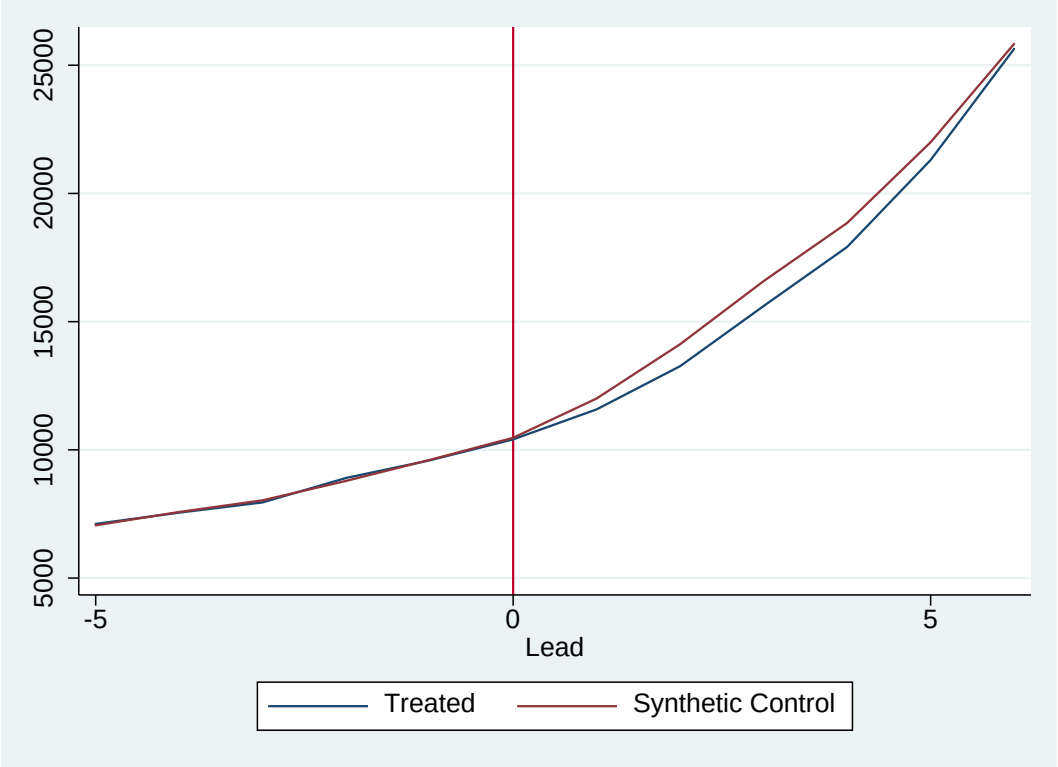


Figure 7: Multiple Synthetic Control (GDP per capita)



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