



Analysis of the Effect of Economic Growth in the Anhui Free Trade Zone of China-Based on the Synthetic Control Method

Rong Wang¹, Ruijun Xie²

^{1,2}School of Statistics and Applied Mathematics, Anhui University of Finance and Economics, Bengbu 233030, P. R. China

ARTICLE INFO	ABSTRACT
<p>Published Online: 29 July 2022</p>	<p>Based on panel data from January 2017 to November 2021, the article uses the year-on-year growth of industrial value-added as an indicator of economic growth and uses the synthetic control method to analyze the economic growth effects of the Anhui FTA and whether the Hefei Area can drive the economic growth of prefecture-level cities within Anhui Province. In exploring the impact of the FTZ on the economies of prefecture-level cities, the economic gravity model and the radiation theory are applied to study the prefecture-level cities that are only affected by the Hefei Area. The results show that the establishment of the Anhui FTZ could promote the economic growth of Anhui. However, this promotion is not sustainable, and there is no significant promotion impact on the year-on-year growth of import and export volume. The Hefei zone can drive the level of economic development of prefecture-level cities, but this boost is short-lived. Therefore, we should pay more</p>
<p>Corresponding Author: Ruijun Xie</p>	<p>attention to finding the root cause of the positive effect of the FTZ in the long term. In particular, the article is based on Lasso regression synthesis for robustness testing.</p>
<p>KEYWORDS: Synthetic control; Lasso regression synthesis; economic gravity model</p>	

0 INTRODUCTION

Today the world is experiencing a tremendous change unprecedented in a century, and the trend of globalization and economic integration is becoming more and more prominent. To achieve the 2035 vision, China should further implement a high level of opening up to the outside world, build a new development pattern and open up a unique situation of win-win cooperation. The FTZ improves economic growth and deepens reform and opening up by transforming government functions, increasing foreign trade, deepening financial system innovation, and increasing fixed investment growth. In this context, the first

domestic free trade zone, Shanghai Free Trade Experimental Zone, was established in September 2013, followed by Guangdong and Tianjin to expand openness and promote economic development. In September 2020, Anhui Free Trade Experimental Zone (Bengbu, Hefei, and Wuhu) was officially established. Anhui is a central region, and its economic level is inferior to the north. The development of each place is unbalanced, so can the establishment of the Anhui Free Trade Zone drive the economic growth of Anhui to reduce the gap between the economic level of the north and the south? How will the economy of the three significant areas of Anhui FTZ

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be affected? Furthermore, can the three large zones boost the economy of other cities in Anhui? Analyzing the problems of economic development in Anhui Province can be better utilized to bring relevant experience to the development of the central region.

1 THEORETICAL ANALYSIS AND LITERATURE REVIEW

By FTA in this paper, we mainly mean that any goods brought in within a part of a country's territory are considered outside the customs territory for import tariffs and are exempted from applying the daily customs regime (Pen gen xian, 2019^[1]). Foreign scholar Safuan (2017)^[2] argues that establishing a free trade area can eliminate tariff barriers to goods and bring positive effects on the total trade, economic growth, and welfare of both countries. Similarly, domestic scholar Fang Chu (2021)^[3] recognizes that free trade zones bring a higher level of the open economy by promoting trade and investment liberalization and facilitation. Liang Jiangyan (2021)^[4] used the GTAP model to verify the establishment's economic effect China-Pakistan FTA can promote bilateral economic growth by considering the trade effect, welfare effect, the economy of scale effect, and investment effect. Hongxia Zhang (2020)^[5] concluded that the FTA pilot zone could indirectly promote regional economic quality growth. The promotion effect of policy effect has a time lag by the progressive double difference model. The gravity model is mainly used to calculate the interactions between cities and the degree of linkage by constructing potential spatial linkages between cities (Jingxue Wang, 2017^[6]). Reilly (1929)^[7] was the first to propose the retail gravity model, which is used to analyze the mutual influence of cities in the quantitative study of regional linkages. it reflected the mutual radiation and receptivity between the central city and its neighbours. Beronilla (2016)^[8] argues that trade can measure economic activities. Yihuan Zhou (2021)^[9] improved the gravity model into a time-cost distance-based economic linkage degree matrix and combined it with the social network analysis method to analyze the current status of the Wuhan city circle. Jiang and Zhidong (2015)^[10] used the weight of each evaluation index which is determined based on the concept of "growth pole" and global value chain and the fuzzy entropy method, to analyze the comprehensive assessment of the radiation-driven influence of technology parks. Abadie (2015)^[11] used the synthetic control method to study the economic impact of the German

reunification policy on West Germany. Peng Lai (2021)^[12] used the synthetic control method to explore the level of FTA and geo-economy.

From the comprehensive research above, we could speculate that the establishment of FTZ can promote the economic development of each place and drive its growth in many aspects. From the radiation theory. We could assume that the establishment of FTZ may drive the economic development of surrounding areas. Therefore, to ascertain the above speculation, we adopt the synthetic control method to verify the impact of the establishment of the Anhui FTA on the economic growth of Anhui Province and then invoke the gravitational model and radiation theory to analyze whether the FTA in Hefei drives the economic development of Anhui prefecture-level cities. Finally, the synthetic method improved based on the Lasso algorithm is used as the robustness test of the synthetic control to make this paper more convincing.

2. MODEL METHODOLOGY AND DATA SOURCES

2.1 Data sources

The synthetic control method requires that the experimental and control groups which do not have the same events in the period under examination. However, suppose the number of control groups is too small, it will affect the goodness of fit, so the provinces that set up FTAs in 2019 and 2020 are added to the control group for the following reasons: Anhui Province FTA was set up in September 2020, and in January 2019, the epidemic began to break out, which caused a considerable impact on the national economy in the region where the FTZ was established in August 2019 was affected by the national epidemic, and the economic growth of its region would not change much, so we considered that it should be as the control group. The sample period for the variable data is from January 2017 to November 2021, in which the FTA in Anhui Province is established in September 2020, with January 2017 to August 2020 as the period before the establishment of the FTA and September 2020 to November 2021 as the period after the establishment of the FTA. For the empirical analysis, the experimental group is Anhui Province, and the control group is the remaining 19 provinces. This paper selects industrial value-added as a proxy variable for GDP. Since the establishment of Anhui FTZ is relatively short, monthly industrial value-added growth and import/export volume year-on-year growth are selected for the analysis at the provincial level to obtain the smoothness of the data, and their quarterly

data are chosen for the analysis at the prefecture-level to get the smoothness of the data. We used the linear interpolation method to supplement the missing values. At the same time, to simulate the actual development of Anhui in many aspects, we added additional predictor variables to simulate the actual effect of Anhui. The data were obtained from the National Bureau of Statistics, provincial and municipal statistical bureaus, and the WIEGO database.

2.2 Synthetic control method

The synthetic control method, initially proposed by Abadie (2003) [13], is used to assess the effect of a policy or an event and to measure the effect of policy implementation by making a difference between the true value of the policy after its occurrence and its predicted value to obtain the treatment effect. The specific model is: Assuming that the sample has $(1 + J)$ provinces, the periods of the sample study is $T, T = T_0 + T_1, T_0$ and T_1 are the time periods before and after the establishment of the Free Trade Zone in Anhui Province respectively, and the remaining J provinces are those provinces that have not yet established an FTA as a control group. Y_{it}^0 and Y_{it}^1 denote the outcome variables obtained by observing the provinces i in the period t without the FTZ intervention and with the FTZ establishment intervention respectively. Under certain conditions, the synthetic control estimates are unbiased if the weights of the control group can perfectly fit the characteristics of the treatment group and the outcome variables before the intervention of the policy effect and vice versa. The treatment effects of FTA establishment are as follows

$$a_{1t} = Y_{1t} - \sum_{j=2}^{J+1} W_j^* Y_{jt} \tag{1}$$

2.3 Economic gravity model and economic affiliation

Since the only indicator for evaluating the economic growth of FTAs in prefecture-level cities is the cumulative

year-on-year growth rate of GDP, the text adds the economic gravity model and the strength of economic affiliation to increase the credibility of the obtained conclusions. In this paper, after selecting the system of indicators for evaluating the comprehensive quality of cities, we use the entropy weighting method to calculate the indicator weights and then subsequently calculate the comprehensive index of the comprehensive evaluation indicators of city quality. In general, the product of population and GDP is used as the city quality, P is the population and V is the GDP index value (The GDP is replaced by the comprehensive index of city quality to make the economic gravity consistent with the actual situation). Where R_{ij} is the gravitational economic force, K is the gravitational constant, M is the city quality, and D_{ij} is the distance between two cities. The economic gravity model equation is as follows.

$$R_{ij} = K \frac{M_i M_j}{D_{ij}^2} = K \frac{\sqrt{P_i V_i} \sqrt{P_j V_j}}{D_{ij}^2} \tag{2}$$

3. EMPIRICAL RESULTS AND ANALYSIS

This paper verifies the impact of the establishment of Anhui FTZ on the economic growth of Anhui Province based on the synthetic control method at the provincial level and the prefecture level respectively.

3.1 The impact of the Anhui FTA on the province's economy

3.1.1 Synthetic control model results

In this paper, Anhui province is selected as the research object. The intervention group is the year-on-year growth of monthly industrial value-added and the year-on-year growth of total imports and exports in Anhui province. To better observe the policy effect of the Anhui FTA in the current year, the start time of the policy effect is set as August 2020, and the synthetic control method is used to obtain synthetic weights for Anhui province, as shown in Table 1, and only the provinces whose synthetic weights are not zero are shown.

Table 1. Control group weights of synthetic Anhui

Control group	Weighting (Industry)	Weighting (import and export)	Control group	Weighting (Industry)	Weighting (import and export)
Yunnan	0.384	0.069	Jiangsu	0.001	0
Inner Mongolia	0	0.131	Jiangxi	0.002	0.136
Shandong	0.086	0	Hebei	0.001	0

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Jilin	0.111	0	Hainan	0.001	0
Shanxi	0.001	0.187	Hunan	0.212	0.291
Tibet	0.001	0			

(1) Analysis of year-on-year growth of industrial value-added
 When analyzed at the level of industrial value-added, Table 1 shows that in the cumulative year-on-year growth of

synthetic Anhui industrial value-added, Yunnan has the highest weight of 38.4%, followed by Hunan Province with 21.2%, Guizhou with 16.3%, and the rest are below 12%.

Table 2. Comparison of predictor variables for Anhui and synthetic Anhui

(Year-on-year growth)	Anhui (%)	Synthetic Anhui (%)	(Cumulative year-on-year growth)	Anhui (%)	Synthetic Anhui (%)
Cumulative general public budget revenue	4.781395	4.777097	Industrial Accumulation (2020m2)	8.6	8.5846
Import and export accumulation	16.62093	16.59294	Industrial cumulative (2020m3)	8.6	8.5854
Fixed investment amount	7.531395	7.527347	Industrial Accumulation (2020m4)	8.4	8.3867

Comparing the values of predictor variables between synthetic Anhui and Anhui in Table 2 shows that the values of predictor variables between them are very close, so it is considered that synthetic Anhui fits well the substantial year-on-year growth of industrial value-added in Anhui. The empirical results of the synthetic control method are shown in Figure 1, where the dashed and solid lines represent the year-on-year growth of industrial value-added of synthetic Anhui and real Anhui respectively. It can be seen from the figure that before establishing the FTZ, the year-on-year growth of industrial value-added of synthetic Anhui and real Anhui were similar, and the trend is about the same, so the model fits the year-on-year growth of industrial value-added of real Anhui better. After establishing the FTZ, there is a difference between the real Anhui and the synthetic Anhui starts to appear, with the real Anhui being higher than the synthetic Anhui, and the difference between the two gradually increases. Hence we agree the policy effect of the FTZ starts to show and strengthen gradually. The change in the Anhui FTA policy effect can be

seen in Figure 2. Until September 2020, we can see that the policy effect curve is flat (but there is a significant downward trend in the policy effect near September 2020, which this paper conjecture is due to the national epidemic, which has caused severe damage to various aspects of our economy). The difference between its synthetic Anhui and real Anhui industrial value-added growth year-on-year has been fluctuating around 0, which shows that the synthetic Anhui can better predict the values after establishing Anhui FTZ. Starting from September 2020, the policy effects curve rises significantly, which indicates that the establishment of Anhui FTZ has a positive contribution to its year-on-year industrial value-added growth. After some time, the policy effects curve tends to decrease. However, the overall level is still above the 0 levels, so it is reasonable to assume that the establishment of Anhui FTZ can promote economic growth in Anhui province, still, this policy effect is maintained for a short period and positively impacts overall.

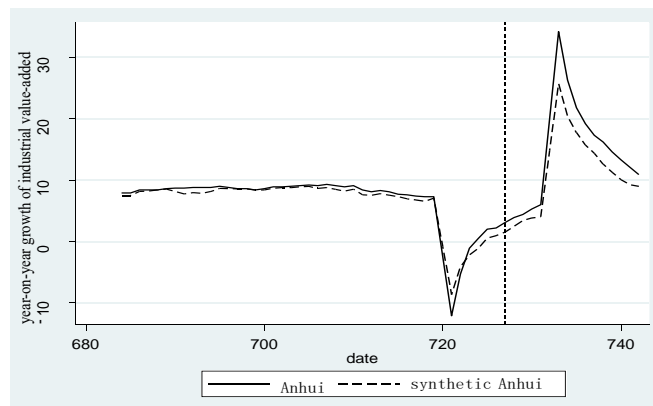


Figure 1. Year-on-year growth of industrial value-added between Anhui and synthetic Anhui

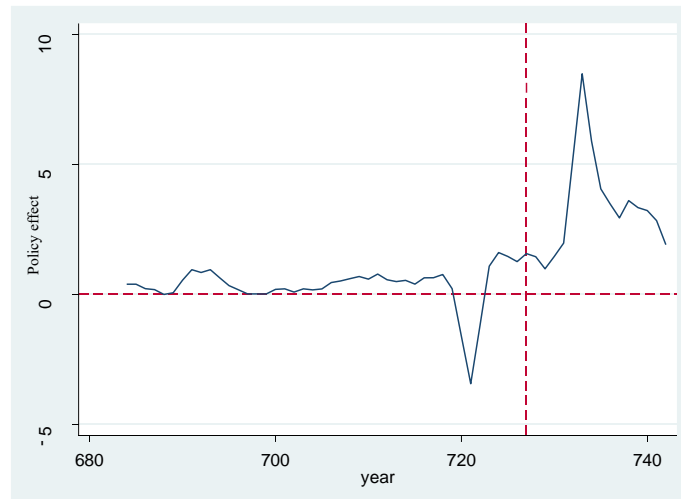


Fig. 2. Policy effect: Anhui vs. synthetic Anhui difference

(2) Analysis of the year-on-year growth of imports and exports
 When analyzing the trade import and export value, the weights of synthetic Anhui are mainly composed of Yunnan, Inner Mongolia, Shanxi, Jiangxi, Hunan, and Guizhou, whose

weights are 6.9%, 13.1%, 18.7%, 13.6%, 29.1%, and 18.6%, respectively, as can be seen from Table 1. Comparing predictor variables between real Anhui and synthetic Anhui in Table 3 shows that synthetic Anhui can fit real Anhui better.

Table 3. Comparison of predictor variables for real Anhui and synthetic Anhui

(Year-on-year growth)	Anhui (%)	Synthetic Anhui (%)	(Cumulative year-on-year growth)	Anhui (%)	Synthetic Anhui (%)
Fixed investment amount	8.529167	7.98445	Consumer Price Index	102.045	102.1294
Cumulative general public budget revenue	6.083333	6.086524	Import and export (2020m2)	-8.5	-10.4083
Industrial Accumulation	8.108333	8.108325	Import and export (2020m3)	-4.2	-2.3706
The retail commodity price index	101.8508	101.8576	Import/export (2020m4)	3.3	2.1214

The empirical results of the synthetic control model are shown in Figure 3, where the dashed and solid lines represent the year-on-year growth of import and export value between the synthetic Anhui and the real Anhui, respectively. Before establishing the FTZ, the difference between the synthetic Anhui and the actual Anhui’s import and export growth values is small, and their trends are the same. So we conclude that the synthetic Anhui can better fit the actual Anhui import and export growth values before the establishment of the FTZ. After establishing the FTZ, the curve differs from the original curve of real Anhui being higher than synthetic Anhui to synthetic Anhui being higher than real Anhui. In the policy effect graph in Figure 4, the policy effect curve is relatively flat before establishing the FTZ. After implementing the policy, the policy effects curve starts to rise and then falls rapidly, which indicates

that the establishment of the FTZ has a weak promotion effect and then a powerfully negative effect on the year-on-year growth of import and export value. After reviewing relevant information, it is because Anhui Province is a less developed region, and its foreign trade development is relatively lagging. According to the statistics of Anhui customs, the total imports and export of Anhui province in recent years have shown a slightly decreasing trend. The reasons for this are that the product structure of Anhui province is still facing a few problems, the unbalanced development of the composition of foreign trade subjects, the monotonous way of trading export commodities, the over-reliance of the import and export market on Asian regions and the impact of the new crown pneumonia epidemic. On the other hand, since most of the exported goods in Anhui Province are labour-intensive, and the proportion of

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primary products in import transactions is also high, the development of processing trade lags considerably behind the cities in eastern China, and also the prices lag behind the domestic level in China. Such a commodity structure is not conducive to the harmonious development of production and

long-term foreign trade. In addition, since most of the import and export transactions in Anhui province are concentrated in the southern and central parts of Anhui, northern Anhui's overall economic development level is still relatively backward despite a large amount of foreign trade.

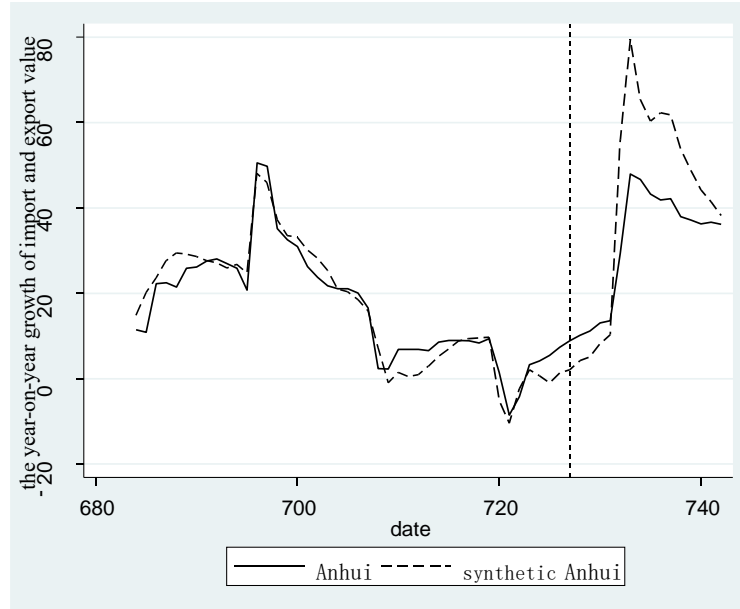


Figure 3. Year-on-year growth of import and export volume between Anhui and synthetic Anhui

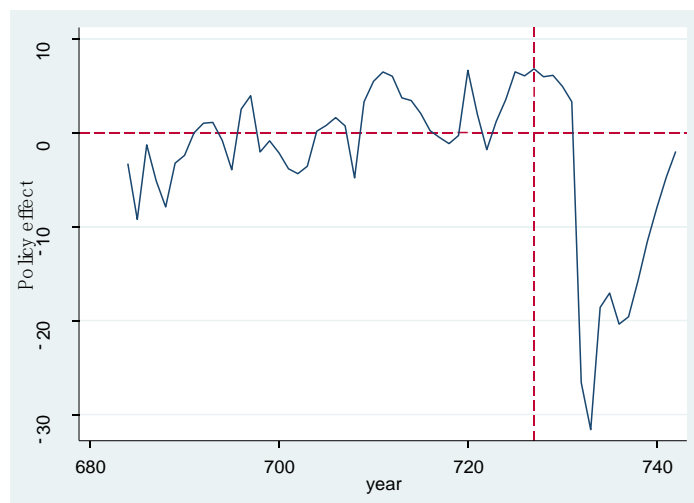


Fig. 4. Policy effect: Anhui vs. synthetic Anhui difference

3.2 Impact of the Hefei Free Trade Zone on the economy of prefecture-level cities

3.2.1 Comparison of prefecture-level cities

Now we start to study the impact of Anhui FTZ on the economic growth of prefecture-level cities in Anhui province. In order to increase the credibility of the empirical results at this

level, we introduce the economic gravity values of Anhui FTZ territory and other prefecture-level cities in the province and calculate the results of the weights of each indicator of city quality according to the entropy weight method as shown in Table 4.

Table 4. Evaluation index system and index weights of urban development quality

Dimensionality	Indicators	Weights	Dimensionality	Indicators	Weights
Economic benefits	GDP per capita	0.0528	Resident Life	Number of books in public library collections	0.1327
	Share of tertiary sector in GDP	0.0223		Number of buses operating at the end of the year	0.0988
	Total retail sales of social consumer goods	0.0995		Number of hospital beds	0.0707
	Total import and export	0.2104		Salary of in-service personnel	0.0317
Green Innovation	Park green area	0.0766	Urban per capita disposable income	0.0413	
	Number of patents granted	0.1632			

Firstly, a comprehensive and positive index of city quality is calculated according to this weighting. Then the economic gravity of Hefei’s dependency on Anhui FTZ and other cities in the province is calculated. Finally, the influence of Hefei on the city economy of prefecture-level cities in the province is studied. Considering that there are three zones in Anhui FTZ— Hefei, Wuhu, and Bengbu Free Trade Pilot Zone, there will be great deviations if the synthetic control method is directly applied to evaluate the influence of Hefei's dependency on the prefecture-level cities in the province. The two free trade pilot zones in Wuhu and Bengbu will also impact the economic growth of the prefecture-level cities in the province. We introduce the concept of the hinterland, the affiliation degree is more than 6% for the close hinterland, then between 3%-6% for the sub-close hinterland, between 1%-3% for the competitive hinterland, and less than 1% is the marginal hinterland. Then we eliminated cities that the affiliation degree of the competitive hinterland is between 1%-3% with Bengbu City and Wuhu City

by calculating the gravitational economic force between the three zones and other cities. We analyzed the impact of the Hefei Free Trade Zone on the Huangshan economy, which is the quarterly GDP data of Chizhou and Tongling is missing. The calculations in Table 5 are presented as a supplement to the analysis at the prefecture-level city level. The higher the economic gravity value with the Hefei zone, the frequent and stronger the economic ties between the two cities. When a policy change occurs in one region, another region is more likely to receive the radiating effect of the policy from the FTA, thus promoting the growth of the regional economy. (Gu, J. N., 2021^[14]). The gravitational model calculated the gravitational economic values of Bengbu, Wuhu, Hefei, and each prefecture-level city from 2014 to 2020 (only the average gravitational values and affiliation are shown in the space limitation). Based on this, the impact effect evaluation is performed using synthetic control.

Table 5. Economic gravity and affiliation of Bengbu, Hefei and Wuhu cities with each prefecture-level city

Region	Gravit y	Affiliati on		Gravity	Affiliati on		Gravit y	Affiliati on	
Bozhou	9.65	0.0335	sub-close	13.56	0.0211	Competitio n	3.22	0.0053	Edge
Lu'an	15.41	0.0548	sub-close	138.38	0.2206	close	12.19	0.0206	Competition
Anqing	5.95	0.0212	Competition	57	0.091	close	19.52	0.033	sub-close
Xuancheng	3.48	0.0125	Competition	23.49	0.0378	sub-close	49.59	0.0843	close
Cebu	31.1	0.1071	close	22.26	0.0345	sub-close	5.21	0.0086	Edge
Chizhou	2.05	0.0072	Edge	20.96	0.033	sub-close	8.86	0.0148	Competition
Huaipei	9.06	0.0322	sub-close	7.8	0.0124	Competitio n	1.92	0.0032	Edge
Huainan	66.67	0.2325	close	60.85	0.0954	close	7.53	0.0125	Competition

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Chuzhou	32.21	0.111	close	62.53	0.0968	close	31.68	0.052	sub-close
Tongling	2.54	0.0089	Edge	28.91	0.0458	close	15.22	0.0255	Competition
Fuyang	22.95	0.0788	close	43.98	0.0678	close	7.98	0.0131	Competition
Ma On Shan	7.95	0.0279	Competition	51.46	0.0812	close	328.3 1	0.5487	close
Huangshan	1.01	0.0036	Edge	5.77	0.0092	Edge	4.05	0.0068	Edge
Hefei	65.55	0.2283	close	-	-	-	92.01	0.1525	close
Bengbu	-	-	-	65.55	0.1028	close	11.53	0.0192	Competition
Wuhu	11.53	0.0404	sub-close	32.15	0.0505	close	-	-	-

In this paper, the prefecture-level cities in the provinces where FTZs are established are selected as the control group, and quarterly data are adopted because monthly industrial data are difficult to obtain for each city and to ensure data integrity and a sufficient number of analysis periods, so nine prefecture-level cities were screened as control groups. Each prefecture-level city's cumulative year-on-year GDP growth rate is selected to analyze the economic growth of prefecture-level

cities because statistics vary widely and are missing from prefecture-level cities. The weights of each prefecture-level city's cumulative year-on-year GDP growth rate are calculated by the synthetic control method (the weights of Linfen, Lanzhou, Hohhot, Taiyuan, Yuncheng, Xinzhou, and Jincheng synthetic Huangshan and Hefei are all 0), as shown in the following table.

Table 6. Control group weights for cumulative year-on-year GDP growth rate by prefecture-level city

Control group	Huangshan Weights	Hefei weights
Jinzhong City	0.281	0.191
Jinan City	0.719	0.188
Changsha	0	0.621

From Figure 5 of the Hefei policy effect, we can see that Hefei Area has a short and obvious driving effect on the local city and promotes the year-on-year GDP growth rate of Hefei. From Figure 6 of the Huangshan policy effect graph, we can observe that after establishing the Hefei Area, the year-on-year GDP growth rate of Huangshan has an obvious rise. However, this rising effect lasts for a while and then starts to decline, and overall, we conclude that the Hefei Area can drive the year-on-year GDP growth rate of Huangshan City, but this driving effect

lasts for a short period. From Table 5 of the Economic gravitational value and affiliation of Hefei with prefecture-level cities in the province, we can see that the economic gravity and affiliation of Hefei and Huangshan are the lowest. Huangshan is in the edge hinterland, so we concluded that Huangshan has a strong driving effect on the edge hinterland and a stronger radiation driving effect on the areas with frequent economic exchanges and close hinterland.

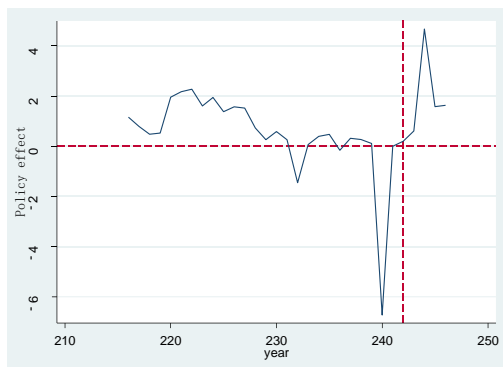


Figure 5. Hefei policy treatment effect

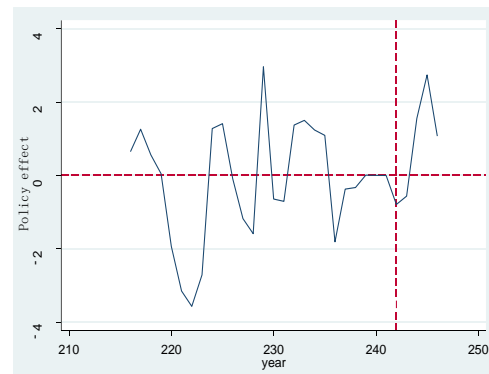


Figure 6. Huangshan policy treatment effect

3.3 Placebo test

3.3.1 Placebo test for year-on-year industrial value-added growth

We use the time placebo test and the regional placebo test to verify the reliability of the results. First, the time placebo and regional placebo tests are conducted for the year-on-year industrial value-added growth. From Figure 7, we can see that the model's curves do not show much change. Assuming that the completion of the FTZ is in January 2020, but the obvious policy effect change still started to show in September 2020, so we concluded that the increase in economic growth in Anhui is caused by the completion of the Anhui FTZ and not other reasons. The regional placebo test is an iterative estimation of the model with the control group that is not affected by the policy effect as the intervention group, thus verifying the validity of the model estimates to increase the article's credibility. However, if a control group is poorly fitted before establishing Anhui FTA, the subsequent prediction of the control group indicators has very little reference value, so the smaller the mean square prediction error indicates a better fit

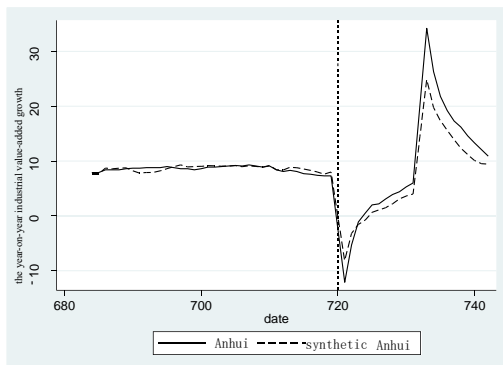


Figure 7. Industrial value-added time placebo test

3.3.2 Year-on-year import and export growth placebo test

We used a placebo test for year-over-year import and export growth, which concluded that establishing the Anhui FTZ did not pass the placebo test. It is also consistent with the above analysis. (Placebo test for imports and exports is not shown for space)

3.4 Results of HCW model based on Lasso's algorithm (robustness check)

The regression synthetic model is more general because it has fewer constraints than the synthetic control. It allows the weights to be negative and adds the constant term to correct the model to modify. We applied the regression synthetic model as

for this model. Based on the former related research results, this paper eliminates the regions with a mean-square prediction error of more than 4 times the standard deviation before establishing Anhui FTZ. It performs synthetic control estimation for the remaining areas, resulting in the regional placebo test shown in Figure 8. The black and dashed lines represent the virtual policy effects of the real Anhui and the regions other than Anhui estimated by synthetic control again. The policy effects of the real Anhui are higher than most of the policy effects for the real Anhui is higher than most of the regions, with a significance level of about 6.6% (the significance level chosen in this paper is 10%) rejecting the original hypothesis that the Anhui FTZ did not enhance economic growth in Anhui. The same method is used to test the robustness of the year-on-year GDP growth rate of the prefecture-level cities. After the empirical analysis, it is found that all of them pass the robustness test, which indicates that the FTA in Hefei can drive the city's economic growth and the economic growth of the prefecture-level cities through the radiation effect.

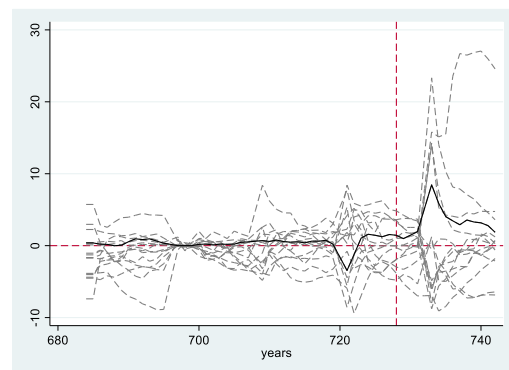


Figure 8. Placebo test for industrial value added region

an effective supplement to the synthetic control model. It performs a robustness check on the synthetic control method to verify that the establishment of Anhui FTZ can effectively enhance the growth of the Anhui economy. The regression synthetic control is only suitable for low-dimensional data, and OLS for high-dimensional data has no way to solve multicollinearity problems in the data. After referring to the former study, the Lasso regression algorithm is used instead of the OLS algorithm to solve these problems well (for space, the Lasso theory is not shown in this paper). The results of the empirical analysis of the regression synthetic of the Lasso algorithm are as follows; the counterfactual Anhui is made of

0.13 Yunnan synthesizes; 0.0503 Jilin; 0.3509 Jiangxi; 0.0474 Hebei; -0.00974 Heilongjiang and was modified by using the constant term 4.3530.

Table 7. Numerical composition of HCW based on LASSO algorithm

Variable Name	Numerical value	Variable Name	Numerical value
Yunnan	0.1232	Hebei	0.0474
Jilin	0.0503	Heilongjiang	-0.0097
Jiangxi	0.3509	cons	4.353

The results of the empirical analysis of the improved synthetic regression model are shown in Figure 9 below. Before establishing Anhui FTZ, the two curves are close to overlapping, so the synthetic Anhui is a good fit with the real Anhui. After establishing Anhui FTZ, the real Anhui is slightly higher than the synthetic Anhui. Then, the gap between the two started to become larger; it proved that the research of FTZ could promote the growth of the Anhui economy is consistent with the synthetic control finding. From figure 10 of the policy

effect, we can see the difference shown after the establishment of Anhui FTZ compared to the counterfactual situation. After establishing Anhui FTZ, the policy effect curve has a significant rise. Still, after a while, the policy effect curve shows a downward trend, then rises and falls again. The overall policy effect curve looks higher than the 0 coordinate by a large margin, which means the establishment of Anhui FTZ, which means that the establishment of Anhui FTZ has a positive processing effect on its economy.

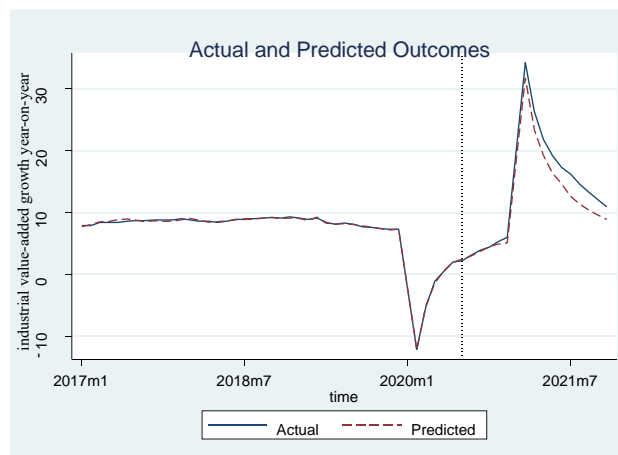


Figure 9. Anhui and synthetic Anhui industrial value-added growth year-on-year

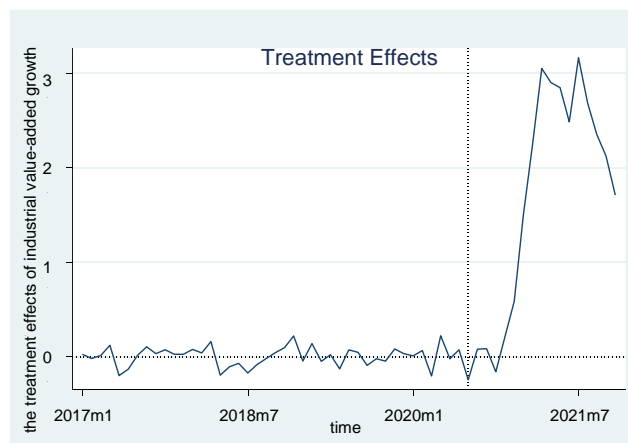


Figure 10. Industrial value-added growth year-on-year Policy effect graph

Subsequently, the empirical analysis based on the regression synthesis of the Lasso algorithm is also conducted on the year-on-year growth of Anhui import and export volume, and the results are still consistent with the previous analysis that the establishment of Anhui FTZ is not able to promote the year-on-year growth of Anhui import and export volume.

4. CONCLUSION AND DISCUSSION

The above study shows that the establishment of Anhui FTZ can promote the economic growth of Anhui, but the promotion effect on import and export trade is not obvious. The Hefei zone promotes the economic development of Hefei city and has a significant positive promotion effect on the economy of other cities at the prefecture-level. Based on the above empirical analysis, we believe that the establishment of Anhui FTZ is of great significance. There are some reasons to explain why the establishment of the FTZ did not promote the level of foreign trade in Anhui: on the one hand, it is due to the recurrent new crown epidemic, and on the other hand, it may be due to the single trade mode, unbalanced development of the main structure and too much dependence on the Asian region in Anhui province. Firstly, we suggest that we should strengthen the training and introduction of talents in Anhui province using policy subsidies. The Anhui provincial government should also encourage enterprises and research institutes and increase investment in innovation fields to improve their independent innovation capacity, find new economic growth points, improve the unbalanced development of the subject structure and reduce the proportion of primary products in exports. Secondly, by changing the government management function, realizing the optimization of the cooperation mechanism between the FTZ and the hinterland area, the hinterland area seizes the opportunity of setting up the FTZ city radiation effect, clarify its positioning, carry out the in-depth cooperation with the FTZ and realize their development. Finally, for the situation where the positive impact of the Anhui FTZ policy lasts for a short period, the investigation and research of FTZ policy should be strengthened. Relevant experts should be invited to conduct regular seminars on the development of FTZ policy to clarify the future development direction of Anhui FTZ and cooperate with the development of the economic level of Anhui Province so that the innovative system policy formulated by the government can meet the demand of economic development of Anhui Province and make the FTZ promote The effect of the FTA will continue to exist.

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