



Has the Construction of the Guangdong-Hong Kong-Macao Greater Bay Area Promoted Outward FDI from Provinces Along the Route?—Empirical Analysis Based on the DID Method

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Abstract. The introduction of the Outline of the Guangdong-Hong Kong-Macao Greater Bay Area Development Plan signifies that the Greater Bay Area has become the “new fulcrum” of China’s new round of opening up to the outside world, and the construction of it will have a direct and significant impact on the development of outward investment in the regions along the route. With this background, this paper empirically examines the policy effects of the construction on the development of outward foreign direct investment in the provinces along the route using provincial panel data from 2011 to 2017 using the double difference model (DID model). The empirical test results show that the Guangdong-Hong Kong-Macao Greater Bay Area construction initiative has significantly contributed to the growth and development of outward FDI from the provinces along the route, and is an important driving force for the growth of outward FDI. Regions along the GBA construction should strengthen outward investment cooperation, integrate outward investment resources and implement outward investment projects, and the state should increase corresponding support for going global in order to build a high-level open economy.

Keywords: The Guangdong-Hong Kong-Macao Greater Bay area · Outward foreign direct investment · DID · Effect assessment

1 Introduction

As an important step in the “One Belt, One Road” initiative, the concept of the Guangdong-Hong Kong-Macao Greater Bay Area has aroused much attention and discussion among academics, politicians, businessmen and ordinary people at home and abroad since its formal introduction in 2015. The Greater Bay Area has strong economic strength, a complete industrial system, obvious cluster advantages and strong economic complementarities, and is China’s external financial hub. In the past 40 years, its local

economic and trade cooperation has evolved through three stages, namely the “front shop and back factory”, CEPA and the innovative cooperation in the Pilot Free Trade Zone. Substantial strategies, the Bay Area cooperation is also facing critical transformation and great challenges.

The construction of the GBA has brought tremendous development opportunities for OFDI. OFDI has integrated investment resources along the Greater Bay Area, promoted the interconnection of its financial markets and economic factors, facilitated the flow of goods and capital with the provinces along the area, and enhanced international competitiveness. China has always advocated the “going out” positioning of the GBA, and outward direct investment along the provinces is an inevitable choice for enterprises to “go out”. With the continuous construction of the Greater Bay Area, outward investment from provinces along the area has developed rapidly. According to provincial-level panel data from 2011 to 2017, the amount of outward direct investment from 30 provinces and cities across China has been increasing during this period, especially in Guangdong, Shenzhen and other provinces along the Greater Bay Area, where the growth rate of outward direct investment has accelerated and the structure has gradually become more diversified. Therefore, it is important to empirically examine the impact of the construction of the GBA on the development level of outward foreign direct investment in China’s trade in the provinces along the area, and the findings of the study are of reference significance for improving the outward investment of the provinces along the area, improving the quality of foreign economic cooperation, and building a higher level of open economy and going global. The specific research path of this article is as follows:

1. First analyze the current research status;
2. Secondly, the 2011–2017 provincial panel data used the double-difference model to empirically test the policy effect of construction on the development of foreign direct investment in provinces along the route;
3. Finally, an empirical analysis shows that the construction of the Guangdong-Hong Kong-Macao Greater Bay Area has made significant contributions to the growth and development of foreign direct investment in provinces along the route, and is an important driving force for the growth of foreign direct investment.

2 Review of the Literature

Under the new normal of economic development, OFDI development is an urgent requirement to promote structural reform on the supply side, make full use of international markets and resources to promote industrial restructuring, and accelerate the cultivation of new advantages in international economic cooperation and competition. After sorting through previous literature, it is found that the factors affecting OFDI development include economic factors, institutional policy factors and other factors. At the economic level, Li Yang et al. (2013), based on a panel data econometric model of Jiangsu province’s investment in other countries or regions, concluded that the GDP, market size and natural resource endowment of the host country have a significant impact on OFDI in the province, and the greater the demand of the host country, the more enterprises are inclined to make direct investment in it. In addition, some scholars have also

suggested other influencing factors such as government intervention, industrial structure, human capital, level of investment, and level of openness to the outside world. For the institutional policy level, Yang Dongxu et al. (2019) point out that domestic macroeconomic policy uncertainty plays a facilitating role in the development of China's OFDI, and economic policy uncertainty is significantly and positively related to the probability of firms' OFDI. Not only that, the institutional quality of the host country (Yao Fengge 2021), institutional factors of the home country (Li Shusheng 2012) and corporate system (Wu Xianming 2011) also affect OFDI performance by influencing market entry, resource allocation and exit mechanisms, and thus OFDI performance. At the political level, bilateral political-diplomatic relations (Yang Lianxing et al. 2019) and political risk (Yang Ming and Sun Yufeng 2021) can also promote or inhibit the efficiency and scale of OFDI to some extent.

As a policy that promotes the orderly and free flow of economic factors, efficient allocation of resources and deep market integration, the Greater Bay Area has brought about a huge impact on both China and countries along the route. For the domestic level, Li and Affirmation (2017) points out that the Guangdong-Hong Kong-Macao Greater Bay Area has boosted the overall economic level of the Pearl River Delta region, thus contributing to China's crossing of the middle-income trap, enhancing the status and functions of Hong Kong and Macao in the country's economic development and opening up to the outside world, and deepening the cooperation between the Mainland and Hong Kong and Macao. Qin Chenglin and Liu Liling et al. (2017) argue that the Greater Bay Area city cluster has a strong innovation drive and considerable innovation resources, contributing to the formation of a new mechanism for economic development with the interaction of innovation, reform and openness in China. For foreign countries along the route, Qiu Suan (2017) believes that the Greater Bay Area is expected to help developing countries along the route to establish operational standards, set up economic and trade offices, reduce duplication of locations along the route, save costs, and jointly carry out infrastructure investment and capacity expansion. Deng Zhixin (2017) outlines that it has led to the synergistic development of the surrounding regions, promoted economic and trade cooperation with ASEAN countries, and become a bridgehead of the "Belt and Road".

Outward FDI and the construction of the Guangdong-Hong Kong-Macao Greater Bay Area are both important initiatives to promote international financial development and financial market interoperability, and are key steps in the implementation of the country's "going out" strategy, but from the existing literature, few scholars have paid attention to the link between the two. Based on this, this paper will consider both the GBA policy and outward foreign direct investment, providing new empirical evidence with certain theoretical significance for understanding the impact of construction on outward foreign direct investment in China's provinces along the route; secondly, this paper adopts the propensity score matching-dual difference method to evaluate the impact of the GBA policy on outward foreign direct investment. Through empirical testing, the paper analyses the new prospects for OFDI development in the context of the GBA policy in the provinces along the route, and provides a reference for OFDI work in the provinces along the route, which has certain practical significance.

3 Research Design

3.1 Model Setting: Double Difference Method

This paper considers the GBA policy as a ‘quasi-natural experiment’ conducted in the provinces along the route (Shuai Liu 2019). As the double difference method has been commonly used in recent years to assess policy effects, this paper proposes to adopt the double difference method to assess the impact of the Great Bay Area policy initiative on the development of OFDI in the provinces along the route. This paper divides China’s 30 provinces and cities into two groups according to the status of the GBA policy (due to the incompleteness of the Tibetan data, the sample of provinces along this route is excluded from this paper), using du as the grouping dummy variable, with the treatment group being Guangdong Province, which is covered by the GBA policy, and the control group being the remaining 29 provinces and cities, whose $du = 0$ (Shuai Liu et al. 2021). The time dummy variable is dt , before the initiative $dt = 0$, and $dt = 1$ after the initiative; as the GBA policy was proposed at the end of 2015, this paper takes 2015 as the policy node. Based on the above analysis, the baseline regression model of the double difference model is as follows.

$$OFDI_{it} = \beta_0 + \beta_1 du_{it} + \beta_2 dt_{it} + \beta_3 du_{it} \times dt_{it} + \beta_4 X_{it} + \varepsilon_{it} \tag{1}$$

where the subscripts i and t represent the i th province and city and year t respectively, OFDI denotes the outward direct investment of each province, X denotes a series of control variables, which are random disturbance terms, and the product denotes the estimated amount of the effect of the Guangdong-Hong Kong-Macao Greater Bay Area initiative on the outward direct investment of the provinces along the route, which is also the variable of focus in this paper (Shuai Liu 2019).

Some coefficient-related terms in the DID model are shown in Table 1: the change effect of OFDI in the treatment group before and after the implementation of the Guangdong-Hong Kong-Macao Greater Bay Area policy is $\Delta ofdi_t = \beta_2 + \beta_3$, the change effect of OFDI in the control group is $\Delta ofdi_0 = \beta_2$, the change effect of OFDI in the treatment group minus the change effect of OFDI in the control group is the net policy effect of the GBA policy on the development of OFDI in the provinces along the route. The coefficient of the interaction term of these two dummy variables is β_3 , which is the focus of this paper, and du is the dummy variable for the subgroup, dt is the dummy variable for the time and $du * dt$ is the experimental group of the policy. If the coefficient is positive, it means that the policy has a positive impact on the development of OFDI in the provinces along the route in China; if negative, it means not.

Table 1. Table of interpretations of DID coefficient related terms

	Before the policy implemented ($dt = 0$)	After the policy implemented ($dt = 1$)	Difference
Processing group ($du = 1$)	$\beta_0 + \beta_1$	$\beta_0 + \beta_1 + \beta_2 + \beta_3$	$\Delta ofdi_t = \beta_2 + \beta_3$
Control group ($du = 0$)	β_0	$\beta_0 + \beta_2$	$\Delta ofdi_0 = \beta_2$
Difference	—	—	$\Delta \Delta ofdi_0 = \beta_3$

Data Description

This paper uses Chinese provincial data, including panel data from 2011–2017 for 30 provinces and cities across China (except Tibet) to measure the level of provincial OFDI development and the policy effects of the Greater Bay Area policy on OFDI development, with all data collated and calculated through the China Statistical Yearbook, the China Foreign Investment Statistics Bulletin, the National Bureau of Statistics and provincial statistical yearbooks.

Variable Selection

The explanatory variable is OFDI, i.e. outward foreign direct investment by province, sourced from the China Outward Investment Statistics Bulletin. As for the key explanatory variables, for the background that this paper considers the policy effects of the Greater Bay Area, the dummy variables for the subgroups du and the time dt at which the policy was proposed and the interaction term between the two $du * dt$ are used as the core explanatory variables, with the coefficient of the interaction term being the main variable of interest in the study.

As for the control variables, a series of other factors affecting the development of provincial OFDI are selected as control variables, specifically GDP per capita, industrial structure, level of urbanization, financial development, level of openness to the outside world, technological progress and foreign direct investment, with the specific variables defined and interpreted in the following table (Table 2).

Table 2. Variable definition table

Variable name	Variable meaning	Variable calculation method
$ofdi$	Foreign direct investment	Outward foreign direct investment by province
du	Grouping variables	1 for the experimental group and 0 for the control group
dt	Policy variables	1 before policy implementation, 0 after policy implementation

(continued)

Table 2. (continued)

Variable name	Variable meaning	Variable calculation method
du × dt	Net policy effect	Product of sub-group variables, policy variables
pergdp	GDP per capita	Real value of GDP per capita by region
industry	Industrial structure	Value added of tertiary sector by region/regional GDP
urban	Level of urbanization	Number of urban population by region/total regional population
open	Level of external openness	Total imports and exports by region/regional GDP
fin	Financial Development	Deposit and loan balances of financial institutions by province/regional GDP
Tec	Technological advances	Technology market turnover per capita
FDI	Foreign Direct Investment	Foreign direct investment by province

4 Results of the Empirical Analysis

Results of Descriptive Statistics for Variables

The time dimension selected for this paper is 2011–2017, with data on GDP per capita, the number of urban population in each region, and the total amount of imports and exports in each region sourced from the China Statistical Yearbook, the China Foreign Investment Statistical Bulletin, the National Bureau of Statistics, and provincial statistical yearbooks in previous years, and descriptive statistics for the relevant variables are shown in Table 3.

As can be seen from the following descriptive statistics, there are large individual differences in OFDI, GDP per capita, industrial structure, urbanization level, opening-up level and financial development among the 30 provincial administrative regions in China from 2011–2017. The large standard deviation of OFDI in different provinces, cities or regions indicates that there are large fluctuations and strong heterogeneity in the sample data.

Table 3. Descriptive statistics table

Variables	Number of samples	Average	Standard deviation	Minimum	Maximum
Foreign direct investment	210	1049657.5	2163559.1	1304	18971365
Financial Development	210	3.076	1.15	1.518	8.131
GDP per capita	210	47377.481	21218.442	16413	113051.96

(continued)

Table 3. (continued)

Variables	Number of samples	Average	Standard deviation	Minimum	Maximum
Industrial structure	210	0.448	0.094	0.297	0.806
Level of urbanization	210	0.566	0.124	0.35	0.896
Level of external openness	210	0.279	0.319	0.017	1.548
Technological advances	210	4035093.8	4471476.3	102511.93	20617500
Foreign Direct Investment	210	1417.634	2192.541	28.292	17622.301

Parallel Trend Test

In order to visually examine whether there is an impact of the GBA policy on the development of OFDI in the provinces along the route, this paper intends to draw a control chart of the time trend of OFDI development in the experimental group and the control group to observe the change trend of OFDI development in the two groups of provinces. After calculating the mean value of OFDI development in the two groups, a chart of the change trend of the provinces along the route of the Greater Bay Area policy and the provinces not along the route is drawn as shown in the figure below.

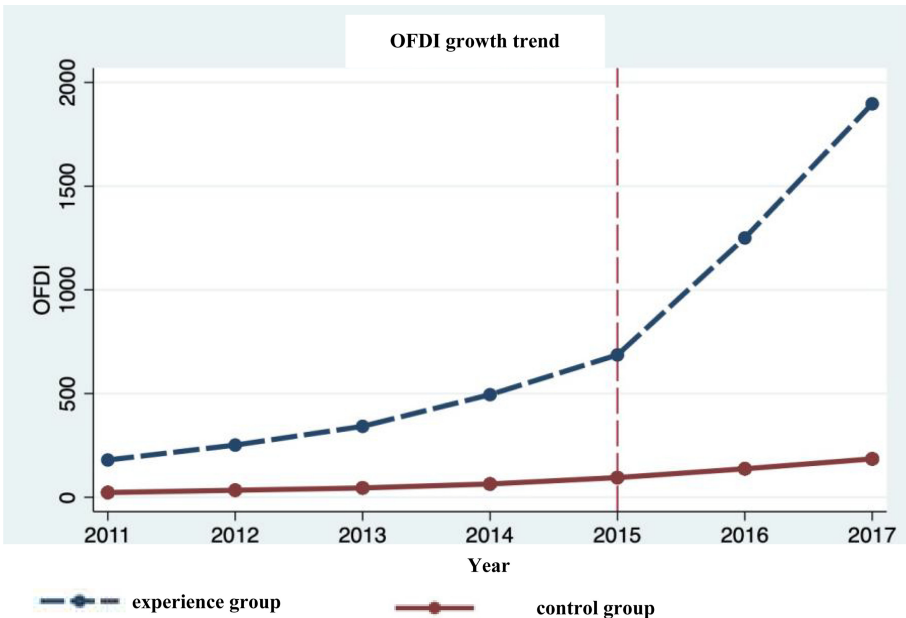


Fig. 1. OFDI growth trends

As can be seen from Fig. 1, before the policy shock, the OFDI growth trends of the experimental and control groups were close, while after the GBA policy was proposed, the OFDI of the experimental group rose significantly more than that of the control group, indicating a significant and positive effect of the policy, and the graph basically satisfies the assumption of parallel trends.

Further, this paper adopts a control time trend approach by doing the hypothetical treatment of participation in the Greater Bay Area for the first two years of 2015 and regressing it on the control variables. As can be seen from Table 4, the regression results for the two variables $du * dt$ 2013 and $du * dt$ 2014 are not significant, indicating that there is no significant difference in the change of OFDI between the experimental and control groups before the policy shock, thus it can be determined that the experimental and control groups satisfy the “parallel trend hypothesis” before the policy is proposed, indicating that this study can adopt a double difference model for regression testing.

Table 4. Parallel inspection

Variables	OFDI
$du \times dt$	228.517* (0.082)
$du * dt$ 2014	20.666 (0.773)
$du * dt$ 2013	-19.839 (0.72)
GDP per capita	0 (0.121)
Industrial structure	-356.382 (0.288)
Level of urbanization	-3281.794** (0.048)
Level of external openness	45.829 (0.792)
Financial development	-7.038 (0.871)
Foreign direct investment	0.077 (0.000)
Provincial fixed effects	Yes
Year fixed effects	Yes
Constant term	1730.647 (0.049)
Sample size	210

Note: *, **, *** denote significant at the 10%, 5% and 1% levels respectively

Baseline Regression Results

The results of the double difference model regressions are presented in Table 4, where we focus on the regression coefficients, as they reflect the interaction between the provinces affected by the policy and the provinces not affected by the policy in terms of OFDI development. Column (1) of the table shows the results of the double-difference regression without the inclusion of control variables. We can see that the regression coefficient is positive and significant at the 1% level without the inclusion of control variables; the regression coefficient is still positive and significant at the 1% level after the inclusion of control variables such as GDP per capita, industrial structure, urbanization level and openness level. This indicates that the policy of the Greater Bay Area has a positive effect on the outward foreign direct investment of the provinces along the route, and the policy effect in pulling up the level of opening up of the provinces along the route has come to the fore (Table 5).

Table 5. Double difference baseline regression table

Variables	(1)	(2)	(3)	(4)
du × dt	960.8619*** (0.000)	416.185*** (0.004)	392.69*** (0.007)	208.157* (0.067)
GDP per capita		0*** (0.000)	0*** (0.005)	0*** (0.108)
Industrial structure		966.942* (0.053)	393.113 (0.274)	358.4717 (0.159)
Level of urbanization		-2272.623** (0.042)	-2080.775 (0.046)	-1137.378 (0.146)
Level of external openness			-297.176** (0.031)	-184.8778 (0.110)
Financial development			64.314 (0.224)	17.8405 (0.676)
Foreign direct investment				0.0856*** (0.000)
Provincial fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Constant term	91.239	563.58	643.827*	303.0527
Sample size	210	210	210	210

Note: *, **, *** denote significant at the 10%, 5% and 1% levels respectively

Excluding Other Events

In order to exclude the interference of other events, this paper selects the study period in which the policy is advanced by one year and two years for the temporal counterfactual test, resetting the temporal dummy variables year 2013 and year 2014, i.e. the policy is proposed in 2013 and 2014: where year 2013 indicates a value of 1 after 2013 and 0

otherwise. The results of the test are shown in the table below. in the two counterfactual scenarios where the policy is assumed to be one year earlier and two years earlier, the development of OFDI in the experimental group of provinces shows a significant negative correlation compared to the control group of provinces, whereby the factor before the policy was proposed can be ruled out as triggering the growth of OFDI. The possibility that factors prior to the introduction of the policy triggered OFDI growth can be ruled out. Therefore, it can be argued that the proposed policy has had a policy effect on the development of OFDI in the provinces along the route.

In order to exclude the shock effect of other events on provincial OFDI development levels during the period when the policy was proposed, and because the construction of the Yangtze River Economic Belt was elevated to a national strategy in 2014, very close to the time when the policy was proposed, and thus to exclude the exogenous shock results, this paper considers excluding the eleven provinces along the Greater Bay Area in the Yangtze River Economic Belt (Shanghai, Jiangsu, Zhejiang, Anhui, Jiangxi, Hubei, Hunan, Chongqing, Sichuan, Yunnan, Guizhou). The excluded samples are then regressed on a double-difference model again. According to the test results, it is found that the regression results are still robust after proposing the eleven provinces in the Yangtze River Economic Zone, and the policy effect is still reflected as the policy promotes the level of OFDI development in the provinces along the zone at the 1% significance level (Table 6).

Table 6. Exclusion of other events checklist

Variables	Policy advanced by one year	Policy brought forward two years	Excluding the four provinces of the Yangtze River Economic Belt
du × dt	5757840 (0.000)	4802960 (0.000)	7556788 (0.000)
GDP per capita	181.4813 (0.002)	167.2728 (0.004)	43.58714 (0.469)
Industrial structure	3095485 (0.251)	2204586 (0.459)	3552498 (0.314)
Level of urbanization	-3.63e+07 (0.021)	-3.58e+07 (0.021)	-133940.9 (0.992)
Level of external openness	-1379256 (0.586)	-2575280 (0.458)	-5994806 (0.002)
Financial development	751470.9 (0.220)	583016.8 (0.344)	-474399.2 (0.394)
FE	Yes	Yes	Yes
IYEAR	Yes	Yes	Yes

(continued)

Table 6. (continued)

Variables	Policy advanced by one year	Policy brought forward two years	Excluding the four provinces of the Yangtze River Economic Belt
Constant term	9512935	1.10e+07	307428.8
Sample size	210	210	210

Note: *, **, *** denote significant at the 10%, 5% and 1% levels respectively

5 Conclusions and Insights

Conclusion

Based on the “Vision and Actions for Promoting the Construction of the Silk Road Economic Belt and the 21st Century Maritime Silk Road” jointly released by the National Development and Reform Commission, the Ministry of Foreign Affairs and the Ministry of Commerce in 2015, this paper formally specifies the concept of “the Guangdong-Hong Kong and Macao Greater Bay Area” as a quasi-natural experiment, and uses a panel of data from 30 provinces and cities across China from 2011 to 2017. This quasi-natural experiment uses a panel of 30 provinces and cities from 2011 to 2017 to explore the impact of the Greater Bay Area policy on the development of OFDI in the provinces along the route. After clarifying the basic research idea, this paper empirically examines the impact of the Greater Bay Area policy on the level of OFDI development in the provinces along the route using the double difference method (DID model). It is found that the policy has indeed effectively enhanced the level of OFDI development in the provinces along the route in China. And the robustness of the regression results is further verified by tests that exclude exogenous event shocks, such as advancing the timing of the policy and proposing eleven provinces in the Yangtze River Economic Belt, indicating that the promotion effect of the policy on OFDI in the provinces along the route is neither affected by pre-policy factors nor disturbed by other events.

Revelation

1. The Guangdong-Hong Kong-Macao Greater Bay Area policy has significantly promoted the development of outward foreign direct investment in the provinces and regions along the route, raising the level of opening-up of the provinces and regions along the route, and the Greater Bay Area is capable of acting as the “new pivot point” for the next round of opening-up. Under the influence of the policy, the level of outward FDI from the provinces and cities along the route has increased significantly, which is conducive to accelerating the adjustment and optimization of the industrial structure of the GBA, driving the overall level of China’s industrial development, creating a favourable international environment, raising the overall level of opening-up, and providing experience and institutional framework for promoting the construction of a wider FTA and the next round of opening-up process.

2. China should continue to encourage and strengthen the construction of various forms of open zones, such as “bay areas” and “economic zones”, combining administrative tools and economic instruments to lead the way by achieving a significant increase in the level of openness of local areas, so as to drive and radiate the opening up of a larger area. The opening up of the region to the outside world will be driven and radiated by the significant increase in the level of opening up of local areas. Provinces and cities should also respond positively to the policy call to co-ordinate the opening up and cooperation of city clusters, vigorously promote the integration of industrial and social development, and enhance the development synergy. For cities or regions with a relatively high level of openness to the outside world, they should give full play to the leading, organizing and radiating role of national growth poles, vigorously promote the flow of factors and market interconnection, and realize a higher level of openness to the outside world and a larger region.

3. Strengthen the construction of supporting services and measures in the areas of institutions, education and finance to create an excellent environment for the creation of a new round of distinctive external opening areas and to achieve positive interaction and circulation. China should continue to strengthen the construction of infrastructure platforms in the Greater Bay Area, formulate complementary fiscal policies to provide convenient conditions for the circulation of factors and mutually beneficial cooperation, and strengthen the training and introduction of innovative talents, so as to inject impetus for sustained urban innovation and regional economic development. At the same time, the Greater Bay Area and the provinces along its route should focus on building supporting facilities services and platforms that are in line with international standards, so as to provide the necessary support to create a good international trading environment and a high standard international trade platform.

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