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The Impact of the Guangdong-Hong Kong-Macao Greater Bay Area Strategy on the Urban Employment

-- The Empirical Analysis based on the Difference-in-Difference Method

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Abstract

Since employment is the foundation of people's livelihood, we should emphasize the assessment of impact that economic integration made on employment in regional development. The Guangdong-Hong Kong-Macao Greater Bay Area (GBA) plays a pivotal role in fostering economic growth and facilitating international openness. Taking the establishment of the GBA in 2017 as the natural experiment, this paper selected the relevant data of 21 prefecture-level cities in Guangdong Province and Hong Kong and Macao Special Administrative regions from 2012 to 2022 with an application of difference-in-difference(DID) and checked the actual impact of regional development strategies on employment. It turned out that the GBA strategy can promote the expansion of urban employment by stimulating entrepreneurial activities, which will promote the sustainable economic and social development of the Guangdong-Hong Kong-Macao region, so as to provide empirical support for the modernization of high-quality development.

Keywords

Guangdong-Hong Kong-Macao Greater Bay Area; Full Employment; DID; Entrepreneurship.

1. Introduction

1.1. Employment is the People's Livelihood

Employment is the people's livelihood and the cornerstone of socio-economic development. Employment and economic development are complementary with each other in a country. Regional economic cooperation and industrial coordinated development are of great significance to coordinate the allocation of labor resources and promote better full employment. Since the late 20th century, China has actively promoted the construction of city clusters and regional economic development, which managed to develop a highly-integrated economy.

During the process, the impact of economic integration on employment should be more thoroughly evaluated, ensuring that employment remains a priority in economic growth and laying the foundation for an employment-friendly development model.

1.2. Bay Area Strategic Development Process

There are three periods in the establishment process of The GBA. The economic cooperation mechanisms, driven by changes in the relative prices of factors, have progressed from general cooperation to institutionalized cooperation, with production factors shifting from

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unidirectional to bidirectional flow, and the cooperation model evolving from informal to formal agreements.

Since the reform and opening up in 1978, the Bay Area implemented the model of "front shop and back factory", making Guangdong as the production base, Hong Kong and Macao as the overseas trade window. Xue promoted a development model of the metropolitan economic area and advance that the industrial upgrading from light industry to service industry should be accelerated[1]. In 2003, governments of Guangdong, Hong Kong and Macao signed the Closer Economic Partnership Arrangement (CEPA), ensuring the bidirectional opening of markets and free trade within the Bay Area, as Hong Kong and Macao had already transitioned to service-led economies, while the Pearl River Delta was undergoing industrial upgrading from secondary to tertiary industries. Liang and Wang analyzed the three stages of economic cooperation mechanism development from the "front shop, back factory" model and the CEPA model to the GBA model, turned out that the development of the GBA own success to the transformation from cooperation to mechanism, and from a light manufacturing focus to comprehensive, bidirectional cooperation involving the full spectrum of production factors[2].

2. Literature Review

2.1. Regional Development Strategy and the Greater Bay Area

Regarding the advantages of regional economic development, Duranton and Puga argue that a larger labor markets attract more enterprises, intensifying market competition and eliminate inefficient enterprises. This "Firm selection" is one of the reasons behind the advantages of regional economic development[3]. Camagni introduced the concept of "territorial capital", suggesting that in an economy characterized by high levels of interaction and cooperation, the flow of capital-such as technology and human capital-and knowledge spillovers will form network externalities for cities in the region and strengthen the depth and concentration of cooperation in the region. Li and Zhang modeled urban clusters and used labor wage premiums as an indicator to demonstrate that urban agglomeration has significant external economic effects on individuals within the region, proposing a theoretical perspective that regional economic development is more inclusive than local economic development[4].

Against the backdrop of the coming introduction of the reform and development Program of the Pearl River Delta region, Chen et al. proposed that Guangdong has formed two production cycles and should promote the "dual-core" model, with Hong Kong towards the international market and Guangzhou towards the mainland market[5]. Comparing the GBA with the three major Bay areas in the world, Zhong and Hu pointed out that the differences between Hong Kong, Macao and Guangdong are key factors restricting development[6]. They emphasized the importance of building a functional relationship network and set the goal of establishing an urban cluster, using institutional integration and innovation to overcome bottlenecks and achieve integrated economic development. Shi and Chen believe that the GBA aims achieving the innovation of urban coordination mechanism within the Bay Area. They point out that the Bay Area should place greater emphasis on constructing urban agglomerations, guiding the flow of factors, and implementing joint construction and shared use of infrastructure[7].

2.2. Regional Economic Development and Labor Market Allocation

Considering that urban agglomeration promoting high-quality full employment, Lu et al. used instrumental variables to verify that urban expansion creates new job opportunities[8]. Urban agglomeration not only improves labor productivity, but also significantly enhances individual employment rates. Niu, Y et al. analyzed the agglomeration economy of the Baltimore-Washington metropolitan area and found multiple employment centers within the region. They helped foster both localized and urbanized economic development[9].

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Additionally, Qi and Zhang mentioned that the flexible resource flow within the region created a flavorable environment for entrepreneurship[10]. Doran, J et al. established a fixed effect regression model for NUTS 2 in Europe, finding that regional entrepreneurial activities stimulated employment growth in the pan-European region, playing a significant role in post-crisis economic recovery[11].

3. Research Significance and Hypothesis

3.1. Research Significance

The practical results are innovative economic development strategies with leading significance. This paper evaluates the policy effect of integrated the GBA's economic development and analyzes the pathways through which these policies impact labor resource allocation, aiming to emphasize the impact of economic integration development on optimizing employment conditions. Prioritizing high-quality and full employment as a key goal of economic development is crucial for achieving modernized high-quality development and shared prosperity for all.

3.2. Research Hypothesis

H1: The regional development strategy of the GBA can promote the expansion of employment scale.

H2: The impact of the GBA on urban employment scale is more pronounced in cities with smaller populations.

H3: The regional development strategy of the GBA can provide more job opportunities by stimulating entrepreneurial activities, thus promoting the expansion of urban employment scale.

4. Research Design

4.1. Model Setting

To analyze the impact of the GBA regional strategy on the employment scale of each city, a model estimated is as follows:

$$\ln employed_{it} = \alpha + \beta treat_i \times post_{it} + \gamma X_{it} + \mu_i + \nu_t + \varepsilon_{it} \quad (1)$$

where $\ln employed_{it}$ represents the scale of employment, measured by the logarithm of the employment figure at the end of the year in various cities; α is the intercept term, and β is the influence coefficient of the regional development strategy of the Greater Bay Area on the increase of employment scale; γ is the control variable coefficient; X_{it} is a matrix of control variables; μ_i represents the region-fixed effect; ν_t represents the time-fixed effect; and ε_{it} indicates the random disturbance term.

4.2. Variable Selection and Descriptive Statistics

The dummy variable $treat_i \times post_{it}$ is the main explanatory variable of the model. The subscript i indicates region and t indicates time. For the variable treat, based on the “Arrangement for Closer Economic and Trade Relations”, cities within the Greater Bay Area are assigned a value of 1. For the policy shock variable post, a value of 1 is assigned if the year corresponds to the strategy’s announcement.

Based on the practice of Zhang et al. and Bian et al., the following variables are selected as control variables: Economic development level (eco), measured by the logarithm of the per capita GDP of urban areas; Labor cost (wage), measured by the proportion of total wages of

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employees to GDP; Government intervention (gov), measured by the proportion of expenditure in the general budget of local finance to GDP; Population size (pop), measured by the city's permanent resident population at the end of the year[12,13].

Table 1. Descriptive statistics of variables

Variables	Definition	Obs	Mean	Std.	Min	Max
lnemployed	Employment scale	253	5.445	0.759	3.536	7.163
Post	Time variable	253	0.545	0.499	0.000	1.000
Treat	Policy variable	253	0.478	0.501	0.000	1.000
Economy	Economic level	253	11.033	0.751	9.774	13.239
Wage	Labor cost	253	0.164	0.069	0.028	0.548
Gov	Government intervention	253	0.175	0.076	0.065	0.576
Pop	Population size	253	15.294	0.690	13.250	16.750

4.3. Data Sources

We used data from all cities in Guangdong Province, as well as Hong Kong and Macao, from 2012 to 2022 as samples. Data for Guangdong Province is sourced from Guangdong Statistical Yearbook(2013-2023) available on the Guangdong Statistical Information Network. Data for Hong Kong comes from the Hong Kong Statistical Yearbook(2013-2023) published by the Census and Statistics Department, while data for Macao is obtained from the Statistical Yearbook(2013-2023) by the Statistics and Census Service. 1% and 99% tailing of the data were applied to eliminate the influence of outlier samples according to the measures took in the existed papers.

5. Empirical Analysis

5.1. Baseline Regression Results

Based on equation (1), table 2 presents the baseline regression results. Column (1) controls the time-fixed effect, column (2) controls the region-fixed effect, column (3) controls the time-region-fixed effect. The treat*post coefficients are both significantly positive at the level of 1%. Column (4) controls time and city fixation effects and adds control variables, the treat*post coefficient is significantly positive at the 5% level. On this basis, the robust standard error in Column (5) is changed according to the standard error of clustering to cities, and the treat*post coefficient is significantly positive at the level of 10%. Based on above results, the GBA strategy is beneficial for increasing urban employment scale, supporting Hypothesis 1.

Table 2. Estimates of equation(1)

Variables	(1)	(2)	(3)	(4)	(5)
Treat*post	0.678***	0.099***	0.151***	0.036**	0.036*
	(0.127)	(0.014)	(0.017)	(0.016)	(0.018)
Constant	Yes	Yes	Yes	Yes	Yes
Time-fixed effect	Yes	No	No	Yes	Yes
Region-fixed effect	No	Yes	No	Yes	Yes
Control variables	No	No	No	Yes	Yes
Obs	253	253	253	253	253

Notes: ***, ** and * Significance at the 1%, 5% and 10% level respectively. (1)-(4) are robust standard error; (5) cluster to region standard error.

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5.2. Robustness Check

5.2.1. Parallel Trend Test

Parallel trend test is a prerequisite for difference-indifference method. To ensure the validity of the empirical results, the explained variables must have a parallel trend between treatment group and control group before the policy occurs. To verify the parallel trend assumption, this study uses the year prior to the strategy as the base year and constructs interaction terms between each period and the dummy variables of processing group, following the approach of Shi et al.[14].

Fig.1 shows the result. The confidence intervals for each period before the policy implementation include zero, indicating no significant difference in trends between Bay Area and non-Bay Area cities.

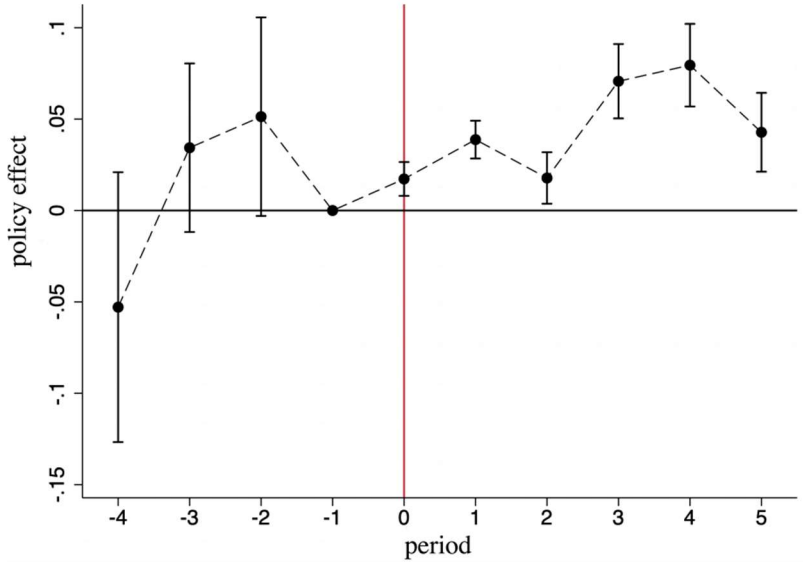

Fig. 1 Parallel trend test

5.2.2. Placebo Test

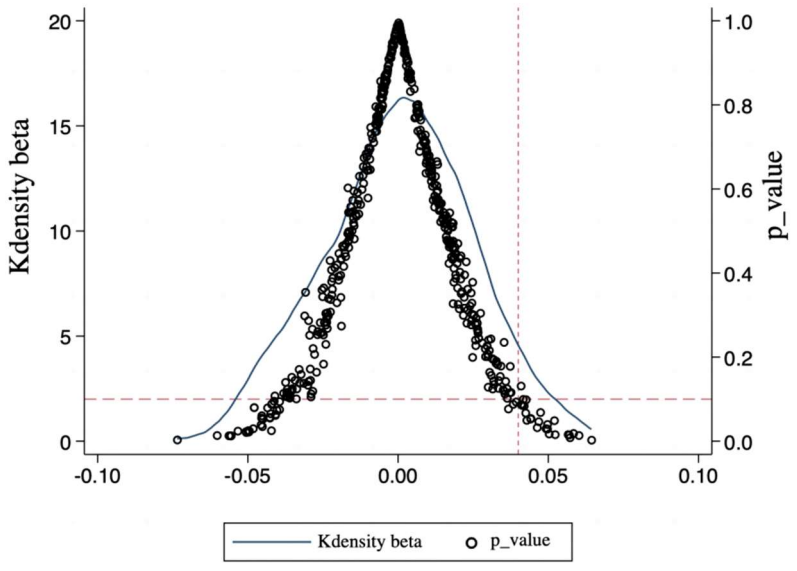

Fig. 2 Placebo test

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This study adopts a placebo test approach similar to that used by Ye et al., creating a fictitious treatment group at a single point in time[15]. The Greater Bay Area contains 11 cities, and the sample covers 23 cities. Therefore, 11 of the 23 groups were randomly selected as the false treatment group. A city-level randomized experiment was constructed and repeated 500 times in order to obtain 500 coefficient estimates.

Fig.2 shows the results of the placebo test. The interaction term treat*post coefficient is centrally distributed around zero. The estimated coefficient from the baseline regression is positioned at the periphery of the distribution of fictitious coefficients, indicating that the baseline regression coefficient passes the placebo test.

5.3. Heterogeneity Analysis

Population size is an important indicator reflecting city size and demand. Wang and Xia argue that cities of different population sizes exhibit varying economies of scale and external costs, leading to different economic growth rates. Classifying cities according to population size and formulating diversified policies and plans for different levels of cities will encourage equitable distribution of resources and balanced the development of regions[16].

To make a deeper analysis on GBA strategy, this study conducts a heterogeneity analysis based on population size. According to the urban hierarchy system of China, megacities are defined as those with populations exceeding 10 million, megalopolises refer to cities with a population of 5-10 million. Cities below 5 million are classified into Type I metropolises, Type II metropolises and medium-sized cities. Guangzhou, Shenzhen, Dongguan, Foshan, Hong Kong, Zhanjiang, Maoming, Jieyang, Huizhou, Shantou were organized as a large-scale group, while the remaining cities constitute the small-scale group. Regression analysis based on equation (1) for both groups yield the following results: the coefficient of treat*post for the small-scale group is significantly higher than the overall regression coefficient, whereas the coefficient of the large-scale group was smaller, validating Hypothesis 2.

The positive effect of the GBA strategy on employment scale is more pronounced in cities with smaller populations, possibly due to more equally-allocated. Cities with smaller populations have more abundant natural resources and lower construction costs. The GBA strategy reduces trade barriers within the region, facilitating the inflow of capital, equipment and other materials. Establishing production bases and office locations increases job opportunities and fully utilizes the region's surplus labor. In contrast, densely populated cities face high living and production costs, and most land for development has reached saturation. Even if Bay Area promotes resource inflow, it is difficult to create more job opportunities, leading to underutilization of surplus labor.

Table 3. Heterogeneity analysis

Variables	Coefficient	p > | t |	95% conf.
Large-scale Group	0.038	0.241 (0.030)	[-0.028 , 0.054]
Small-scale Group	0.048	0.032** (0.019)	[0.004 , 0.091]
Overall	0.036	0.026** (0.016)	[0.004 , 0.068]

5.4. Mechanism Testing

The above studies show that the GBA strategy significantly promotes high-quality full urban employment. To further analyze the transmission mechanism between the Bay Area strategy and the expansion of urban employment scale, this section will conduct mechanism test based on the approach of Wen and Ye[17].

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The GBA strategy aims at building a classic urban agglomeration with the service industry as the leading industry and an international technological innovation center. Since the beginning of the 21st century, the GBA has make promotion in the construction of the tertiary industry and promoted the transformation of its economic structure into a high-value-added and high-efficiency model. The upgrading of service industry can provide more diversified employment opportunities, attract international resources, and facilitate exchanges with high-quality talent, thereby enhancing the region's international influence and competitiveness. This study uses the logarithm of the number of service enterprises above a designated size (company) as a proxy of entrepreneurial activities. The data of 21 cities in Guangdong Province from 2015 to 2022 is used as a sample. Table 4 shows the results. Column (1) is listed as the baseline regression result, the regression coefficient of company and treat*post in Column (2) is obvious, and the absolute value of treat*post in Column (3) is reduced, which verifies that entrepreneurial activities play an intermediary role in promoting high-quality full employment in the GBA strategy, thus supporting Hypothesis 3.

Table 4. Mechanism testing

Variables	(1) Employed	(2) Company	(3) Employed
Company			0.138*** (0.028)
Treat*post	0.073** (0.026)	0.134** (0.067)	0.061** (0.024)
Control variables	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes
R^2	0.994	0.989	0.995
Obs	168	168	168

6. Research Conclusions and Policy Recommendations

The integrated development strategy of the GBA is an innovative economic development strategy with guiding significance. It aims to achieve high-quality full employment through economic cooperation and inter-industry collaborative development within the region, thereby ensuring a high-quality life of the people and the long-term stability of society. This study uses the establishment of the GBA in 2017 as a quasi-natural experiment and selected the relevant data of Guangdong, Hong Kong and Macao in 2012-2022. Using a traditional difference-in-difference model, the study empirically examines the positive effect of the GBA strategy on the expansion of urban employment and its transmission mechanisms. The findings are as follows: It is still valid after parallel trend and placebo test that the regional development strategy of the GBA can promote the expansion of urban employment scale; Heterogeneity analysis shows the regional development strategy of the GBA has different impact on high-quality full employment in distribution, and the boost effect is more significant in cities with low population size; Mechanism analysis shows that the GBA strategy can promote the expansion of urban employment by stimulating entrepreneurial activities in the region.

Based on our findings, there are some policy implications:

By fully leveraging the advantages of the bidirectional flow of various production factors within the Bay Area, the diversification of the employment market should be promoted to enhance the adaptability and innovation of the labor market, contributing to high-quality modernization and the prosperity of all people.

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Create a favorable entrepreneurial environment, ensuring optimal allocation and maximum utilization of production factors and resources. The government can effectively build an entrepreneurship-friendly economic system by optimizing entrepreneurial regulatory processes, providing favorable tax policies, and establishing diversified financing channels, thereby stimulating the entrepreneurial passion and spirit of society and promoting the sustainable economic and social development of the region.

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