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Research on the Effects of Regional Economic Integration for Urban Economic Development

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Abstract: Since the 1970s, regional integration policies have been implemented across the globe, with examples ranging from the European Union and ASEAN to the North American Free Trade Agreement (NAFTA) and various regional trade agreements in African countries. As part of this global trend, China established the Pearl River Delta regional integration policy, leveraging its proximity to Hong Kong and Macau to attract investment and build a modern economic system. This initiative has significantly contributed to making Guangdong Province the leading economic powerhouse in China today. The purpose of this research is to investigate the impact of regional integration policies on economic growth in urban areas. Using the Pearl River Delta (PRD) cities as the treatment group and non-PRD cities as the control group, this study examines the economic effects of regional integration policies in the Pearl River Delta from 2002 to 2022. By utilizing the natural logarithm of GDP (ln-GDP) as an indicator of economic levels and applying the difference-in-difference (DiD) method for analysis, this research aims to provide comprehensive insights into how regional integration policies drive urban economic growth.

Keywords: Regional integration, Economic growth, Pearl River Delta

1. Introduction

Booming economies often do not just happen in one region, and a region with high economic growth leads to economic development in neighboring regions. The New York and San Francisco Bay Areas in the United States and the Tokyo Bay Area in Japan show that there is no single example of this. The integration of regional economic resources has a positive effect on the economic development of the entire region. Policies for resource integration include urban land expansion, preferential policies for regions and even allowing free movement of labor between countries. After the 1970s, regional integration policies were gradually introduced throughout the world, from the European Union, ASEAN, the North American Free Trade Area (NAFTA), to regional trade agreements in African countries, countries around the world have joined various regional structures and organizations. Among these, the EU has developed a comprehensive system of international policies that have promoted regional integration as a normative and causal concept for achieving peace, wealth and social justice, which has largely driven the regional integration policies of other countries [1].

In China, the Pearl River Delta is a remarkable success story of regional economic integration. Initially, Hong Kong and Macao invested in neighboring areas in the mainland. Later, some cities in Guangdong Province, such as Zhuhai, began to take over Hong Kong's labor-intensive industries.

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Gradually, co-operation and similar production methods and industries were developed in the Pearl River Delta and the region. In addition, the Chinese government has introduced favorable policies to promote synergistic economic growth. As a result, the degree of regional integration has greatly facilitated the economy between the cities. This paper analyses the role of regional economic integration in promoting economic growth by using a historical example (the Pearl River Delta) and data comparison.

2. Research overview

2.1. Review of Chinese literature

2.1.1. Theoretical Level Analysis

According to Lin Geng and Xu Xueqiang, the formation of the PRD and its collaboration with Hong Kong and Macao has gone through a total of four phases, starting from pilot co-operation in the first phase, continuing to expand investment after the Southern Patrol by Deng Xiaoping and finally, the PRD began to take over some of Hong Kong's economic functions, such as the garment and textile industry [2]. In the course of its development, the Pearl River Delta and Hong Kong and Macao have gradually developed into a mode of mutual assistance and reciprocity in many industries, with the processing and manufacturing industries being the mainstay, and there has also been a promotion of industries such as property and gaming. Meanwhile well-developed transport, information and logistics systems have also enhanced economic exchanges. At the specific level, Zhang Mei and Chen Xiqiang suggest that the construction of an innovative system for Guangzhou's industrial clusters must be realized through the development of innovative regional economic integration [3]. Most of the industrial clusters in Guangzhou are seriously lacking in innovativeness because of the lack of leading enterprises and talents indeed. Three paths can be used to improve Guangzhou's urban innovativeness: the integration of production factors, the integration of industrial development, and the integration of urban economy

2.1.2. Empirical Level Analyses

For the measurement of regional economic integration, indices such as industrial structure similarity, interregional trade flows, price convergence and economic cycle synergy are considered to measure the degree of integration [4]. The degree of China's economic integration is deepening, and the impact on China's economy is deepening [5]. Through OLS regression analysis of the economic development model, Mao Yanhua and Yang Siwei concluded that the index of economic integration in the Pearl River Delta (PRD) region, In.teg (which is mainly composed of the degree of inter-city connectivity, the degree of marketisation, the degree of governmental effectiveness, and economic development), is a significance variable of ln (GDP), which indicates that in the regional integration is able to positively contribute to the growth of the regional GDP in the Pearl River Delta (PRD) region[6]. However, according to the change in the elasticity index of economic integration, the effect is not significant.

2.2. Review of foreign studies

2.2.1. Theoretical Level Analysis

Webber and Ford argue that regional integration can be defined as the process by which governments of geographically neighboring countries coordinate public policies (increasingly formally or informally) [7]. From the EU to ASEAN, there is a trend towards integration in the world. But the maintenance of regionalization for the EU is not optimistic as it is challenged by strong local

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nationalism. For East Asia, the development of regional integration is still in its infancy, and ASEAN needs more structure and leadership from the dominant countries [8].

2.2.2. Empirical Level Analyses

Vamvakidis empirically analysed GNP, openness, and market size in regions such as the European Union and Asia and concluded that the presence of an economy around an open and developed economy has a significant positive effect on the development of the economy [9]. Therefore, small developing economies are more likely to have development opportunities by entering trade terms with developed economies. Ejones et al.examined the impact of regionalisation (trade liberalisation) on the economic growth of East African countries by analysing a comprehensive export dataset from 1988 to 2017, and found that RTAs have had a significant positive impact within the East African Community, but the multilateral and wider economic impact is negative [10].

3. Research content and methodology

3.1. Bibliographic Analysis

To address the impact of regional economic integration on urban economy, this paper is divided into three factors affecting urban economic growth for research and discussion, namely information flow, access to talent and product value chain. Lin Geng and Xu Xueqiang suggest that the Pearl River Delta (PRD) region and the Hong Kong-Zhuhai-Macao (HKZM) Greater Bay Area, with their well-developed and interconnected information networks, logistics and transport systems, have a significant positive impact on the region [2]. The three major systems of well-developed transport, logistics and information are essential for economic development. Transport and logistics have enabled the various industrial clusters in the PRD to capitalise on each other's strengths. For example, the development of auto parts and battery products of the same scale for the automobile manufacturing industry has greatly reduced costs and industry barriers. It has also facilitated the movement of staff between different cities, enhancing economic vitality and alleviating the difficulty in recruiting staff for some companies. The well-developed information system has enabled enterprises in the PRD region to liaise more closely with each other, improving the efficiency of co-operation and productivity, as well as facilitating exchanges between traders and customers.

The construction of an innovative system in the PRD industrial clusters faces many problems including the lack of innovative talents and the lack of leading enterprises, which must be realized through the development of innovation through regional economic integration [3]. Regional economic integration can be defined as the process by which governments of geographically neighboring regions or countries coordinate public policies [7]. In this process, the government strengthens the integration of enhanced factor market flows, promoting the full flow of scientific and technological talents between industries and regions, and improving the competitiveness of scientific and technological talents in terms of quantity, quality and structure [11]. For the product value chain, in the process of integration, relying on the integration and expansion of the market and the flow of regional talents, the innovative capacity and product power of enterprises will be strengthened. This will contribute to the progress and upgrading of products and even of the entire industry, increase the added value of products, develop high-end enterprises, and thus promote the economic development of the region.

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3.2. Empirical Analysis

3.2.1. Data Selection

This paper uses data on the Gross domestic Product (GDP) of cities in Guangdong Province as a research sample, which is selected according to the research objectives, and the final sample contains Pearl River Delta (PRD) cities: Guangzhou, Shenzhen, Foshan, Dongguan, Zhongshan, Zhuhai, Huizhou, Jiangmen, and Zhaoqing (the treatment group), and non-Pearl River Delta cities: Chaozhou, Shantou, Jieyang, Shanwei, Meizhou, Zhanjiang, Maoming, Yangjiang, Yunfu, Qingyuan, Heyuan, and Shaoguan (the control group), spanning the period from 2002 to 2022. The data are mainly from the Guangdong Provincial Bureau of Statistics, and some years are missing, so this paper uses the linear interpolation method to supplement the missing data.

3.2.2. Choice of method - double difference method

Double difference analysis is an economic research methodology used primarily to assess the effects of policies or other interventions. It works in a similar way to a natural experiment. It treats the implementation of a policy as a natural experiment intervention, and examines the net effect of the policy on the subject of the analysis by including a control group that is not affected by the policy in a comparative analysis with the intervention group that would have been affected by the policy.

3.2.3. Research Hypothesis

Regional integration is a trend that China and the world have experienced since the 1970s and 1980s. From the establishment of the European Community to the synergistic development of the PRD economy, regionalisation policies of different sizes and functions have followed one another in the world. The economic impact during the period of regional development has been considerable, with the economic development of the PRD far outstripping that of other provinces and even other cities in Guangdong Province. Regional economic integration has greatly facilitated the movement of people in the region, which in turn has lowered the cost of movement of people and the cost of labour for enterprises, as well as facilitating the movement of talents and enhancing the innovative nature of enterprises. Moreover, regional integration is often accompanied by a more developed transport system, which promotes the construction of intra-regional logistics systems, reduces the cost of cooperation between enterprises, and strengthens the impact of external economic effects.

Therefore, this paper proposes this hypothesis.

Hypothesis 1: Policies of regional integration contribute to the economic development of cities and their regions.

3.2.4. Model setup

In order to study the impact of regional integration on urban economic development, this paper establishes the model as following equation (1):

$$Ln_{gdp} = \alpha + \beta\ treat_i * post_t + \gamma\ X_{it} + \varepsilon_{it} \quad (1)$$

Where, Ln_gdp represents the city GDP data index; α is the intercept term, β is the coefficient of the impact of regional economic integration on the city economy; γ is the coefficient of the control variable. In the empirical regression results, if the policy dummy variable interaction term treated *post coefficient β is greater than 0, it represents that the regional integration policy has a facilitating effect on the urban economy, and vice versa, it represents that the regional integration policy has a

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negative effect on the urban economy. X_{it} denotes a series of control variables, and ε_{it} denotes the disturbance term.

3.2.5. Variable Selection and Descriptive Statistics

This paper uses the logarithm of the gross domestic product (ln-gdp) of each city to measure the scale of urban economic development. For the treatment variable treated, the cities in Guangdong Province are divided according to whether they are under the regional integration policy (Pearl River Delta region). If the sample belongs to the Pearl River Delta region, treated is assigned a value of 1; otherwise, treated is assigned a value of 0. For the policy shock dummy variable post, according to the "Outline of the Reform and Development Plan for the Pearl River Delta Region (2008-2020)" issued by the State Council in 2008, if the pilot city is in 2008 or later, it is assigned a value of 1, otherwise it is assigned a value of 0.

The following variables are selected as control variables in this paper: government size, the ratio of government expenditures to GDP; level of financial development, the ratio of the balance of RMB loans of financial institutions to GDP; industrial structure, the ratio of the value of secondary industry to GDP; and the level of human capital, the logarithm of the number of college students in school. Data are missing for some years, and this paper uses linear interpolation to supplement the missing data.

The following table 1 is descriptive statistics of the variables.

Table 1: Descriptive Data

Variable	obs	mean	Std.dev.	Min	Max
lnGDP	441	7.287133	1.14875	4.697133	10.38553
Gov~e	441	.0727412	.0390048	.0029386	.2160329
Industrial~e	441	50.60775	8.738276	24.43111	73.41
Financial~e	441	.8026088	.4265105	-.8446182	2.41035
Humancapital~e	441	10.17141	1.255769	6.336826	14.1158

3.2.6. Empirical analysis

As shown in the Table 2 below, the coefficient of did is 0.60, greater than 0, which proves that the regional integration policy is conducive to urban economic development. The P value is less than 0.05 and the t value is larger, which proves that the data is significant. Hypothesis one was confirmed.

Table 2: Descriptive Analysis

LnGDP	Coefficient	Std.err.	t	p>(t)	[95% conf.	Interval]
did	.06019853	.0928945	6.48	0.000	.4194075	.7845631
Gov~e	2.904757	1.057623	2.75	0.006	.8260703	4.983443
Industrial~e	.0029766	.0040495	0.74	0.463	-.0049825	.0109357
Financial~e	.5942295	.1224411	4.85	0.000	.3535797	.9348792
Humancapital~e	.3947898	.0356778	11.07	0.000	.3246674	.4649122
_cons	2.248412	.4388108	5.12	0.000	1.385959	3.110865

3.2.7. Parallel trend test

In the study of policy effects using the double difference model, the validity of the empirical results presupposes that the treatment and control groups must satisfy the parallel trend assumption, i.e.,

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there should be no significant difference in the level of urban economy between the cities in the PRD and the cities in Guangdong Province before the reforms of the Outline of the Plan for the Reform and Development of the Pearl River Delta (2008-2020) were carried out, which was issued by the State Council in 2008. In order to verify whether the parallel trend assumption is valid.

This paper uses Stata to conduct parallel trend analysis. The dotted lines of pre_1, 2 and 3 in the picture of the dynamic effect of the policy cross the zero-value horizontal line before the policy is released, indicating that there is no significant difference in the level of the urban economy of the PRD cities and the other cities in Guangdong Province prior to the PRD regional integration policy in 2008, which passes the parallel trend test (Figure 1).

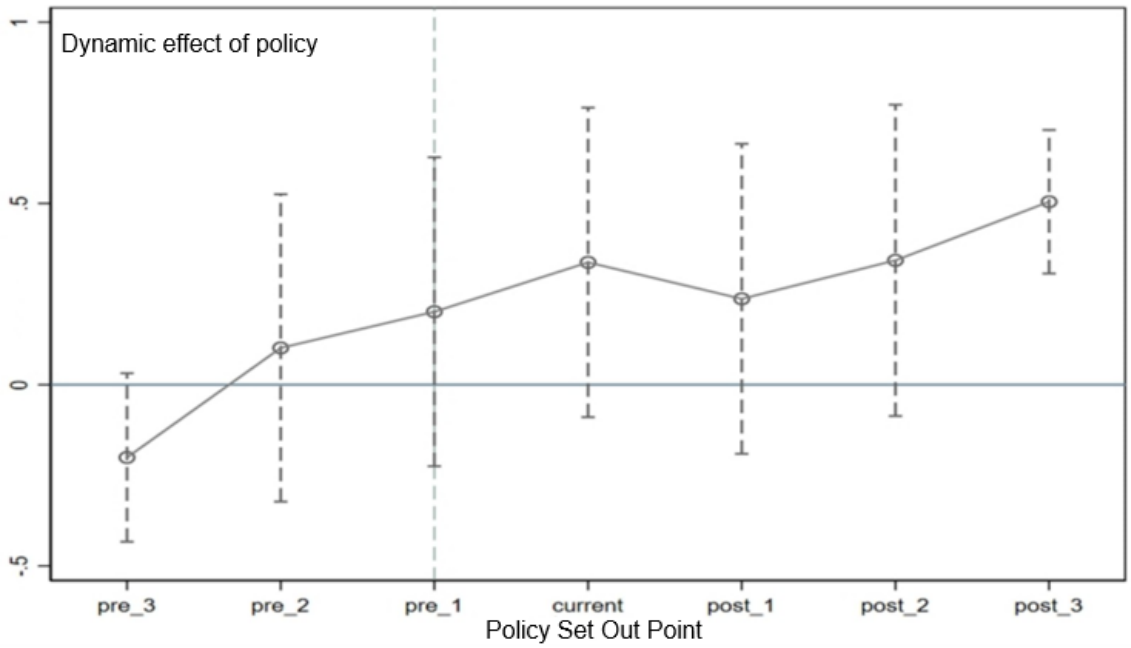

Figure 1: Parallel trend test

3.2.8. Stability Testing-Placebo Testing

In order to exclude that the empirical results are generated by randomness, this paper randomly selects the sample data 500 times as a false policy disposal group, which can get the coefficient estimate of the implementation of the placebo regional integration policy on the economic development of the city, and repeats the process 123 times to get 123 regression coefficients, which is used to carry out the placebo test.

The following figure shows the results of the placebo test, and the results show that the did coefficients are consistent with the normal distribution, and most of the coefficients are distributed near zero, which proves that the regression results in this paper are caused by other unmeasurable factors with a small probability and pass the placebo test (Figure 2).

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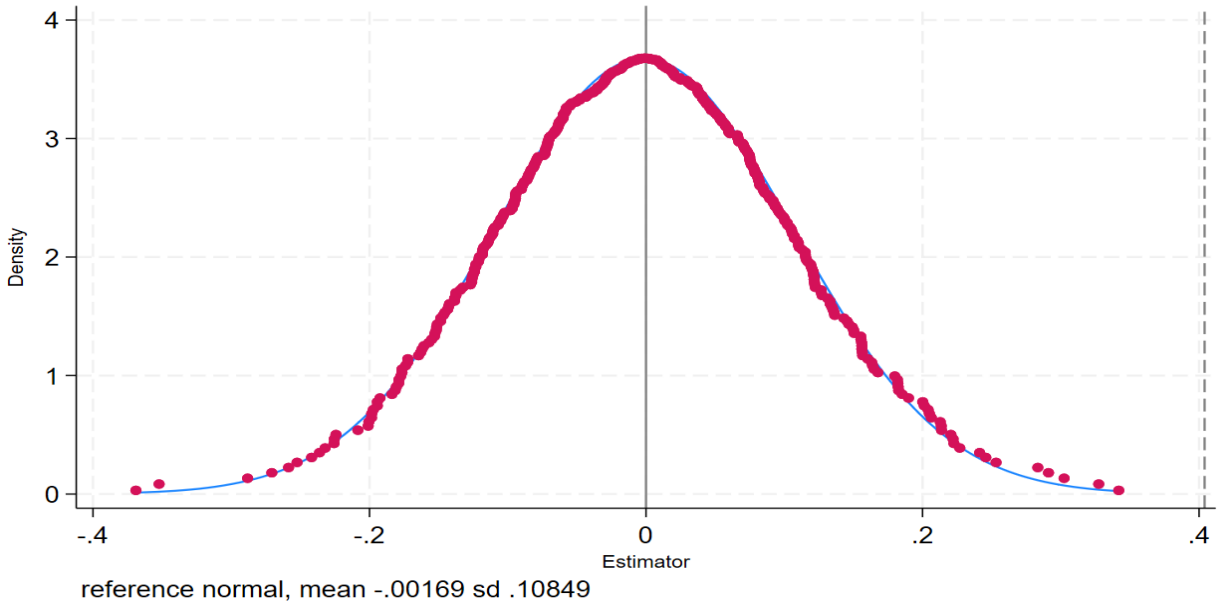

Figure 2: Placebo Testing

4. Conclusion

This paper focuses on the regional integration policy of the Pearl River Delta and, through the application of the difference-in-differences method, concludes that such policies are beneficial to the economic development of cities in the region. Nevertheless, data analysis reveals that, despite the integration policy, significant disparities in GDP among cities within the Pearl River Delta in Guangdong Province remain evident.

Based on these findings, the following policy recommendations are proposed: Firstly, a comprehensive deepening of integration reforms is necessary to facilitate the free flow of urban production factors, thereby encouraging the movement of capital and talent, and ultimately enhancing economic vitality. Secondly, efforts should be made to strengthen the construction of inter-regional transportation, logistics, and information systems. Improving these three aspects will foster inter-city cooperation, mutual economic support, and subsequently boost development efficiency across the region. Lastly, the government should deepen the reform of the public education system to make it more accessible for the children of skilled professionals and high-end laborers to attend local schools. This will enhance the region's appeal to talented individuals, further driving innovation and economic growth.

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