

# Research on the Relationship between Investment in Higher Education and Coordinated Economic Development

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**Abstract:** This paper examines the contradiction between the rapid growth of investment in higher education and the slow growth of economic benefits, aiming to uncover its underlying mechanisms and practical dilemmas. The challenges include quantifying the dynamic relationship between investment and economic output, evaluating the impact of regional disparities, and balancing the demands of education and the economy. By collecting relevant literature, this study lays a foundation and defines the core concept of coordinated development as the dynamic balance and mutual adaptation of the quantity and quality of elements, thus fostering a positive interaction. Taking the Guangdong-Hong Kong-Macao Greater Bay Area as an example for empirical research, Guangdong has over 60,000 high-tech enterprises and national-level scientific research platforms. However, it also faces challenges such as technological dependence, a shortage of talent, and weak innovation capabilities. It is necessary to enhance the precision and efficiency of resource allocation, accelerate knowledge transformation, optimize talent cultivation, deepen the integration of science, education, and industry, and strengthen the institutional response capacity to cultivate a virtuous cycle. These findings are crucial for coordinated development, as they can achieve synergistic effects, promote the construction of an innovation system, and facilitate high-quality economic development.

**Keywords:** Investment in Higher Education, Economic Coordination, Practical Reference.

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## 1. Introduction

In the late 19th century, as the United States expanded its western territories and developed its nation, it forged an evolutionary path for higher education and regional coordination: To meet state economic needs, numerous state universities emerged; the rise of land-grant colleges significantly boosted local industrial and agricultural progress; while the establishment of community college systems marked the refinement of regional higher education structures. In the mid-19th century, Britain established urban universities through the New University Movement, which not only strengthened the linkage between higher education and local industries, technology, and economic development but also accelerated the modernization of higher education. In the 1960s, West Germany implemented reforms such as decentralized regional management of higher education and autonomous program/curriculum design, playing a crucial role in regional economic revitalization. Additionally, institutions like Japan's Junior Colleges and Australia's Technical Institutes have played vital roles in the interactive development of higher education and regional growth. Historical evidence demonstrates that education and economic development are closely interconnected—a principle validated by social development practices across multiple nations.

In the context of deep integration between globalization and knowledge-based economy, higher education, as the core vehicle of national innovation systems, has profound impacts on economic development quality through its scale and structure of investment. While China's higher education funding continues to grow, emerging challenges such as regional disparities in investment, inefficient resource allocation, and delayed achievement of research outcomes

have increasingly constrained coordinated development. In October 2020, the Chinese government formally proposed strategic goals of "advancing the construction of an education powerhouse" and "building a new development paradigm," requiring high-level synergy between the education system and economic systems. Against this backdrop, this study examines the compatibility between higher education investment and economic coordination, employing a multidimensional analytical framework to reveal their internal mechanisms and practical dilemmas, thereby proposing optimization pathways. The research not only focuses on quantitative relationships between investment scale and output but also emphasizes dynamic adaptability and policy coordination, providing theoretical frameworks and practical references for resolving the structural contradiction of "high growth in educational investment lagging behind economic returns."

## 2. Literature Review and Research Methods

### 2.1. Theoretical Basis

The industrial economy and higher education exhibit a mutually influential relationship through external environmental factors. As early as 1961, Schultz et al.[1] demonstrated that higher education positively impacts the industrial economy through continuous human capital input. Conversely, the rapid development of higher education is influenced by regional economic conditions. Breneman et al.[2] found in 1982 that inflation rates negatively affect higher education development. Lane (2015)[3] indicated that economic downturns reduce non-teaching organizational functions in higher education. Zhao Ran et al.[4] emphasized in their analysis of education's role in China's economic

growth that research heterogeneity and potential biases must be considered, requiring rigorous identification of causal effects through improved measurement and estimation methods. Li Fengliang et al.[5] investigated education's impact on economic growth measured by labor productivity, highlighting how enhanced innovation capabilities indirectly drive economic growth. Li Liguang et al.[6] applied the translogistic production function to calculate regional contribution rates and driving shares of graduate education, revealing regional disparities. Zhang Tonggong et al.[7] utilized dynamic spatial econometric models and fixed effects models to analyze the spatial spillover effects of provincial education expenditure on regional economic growth, suggesting regions should adopt localized strategies balancing educational policies with resource allocation.

## 2.2. Literature Review

Numerous studies have explored the relationship between higher education disciplines and industrial economies, with scholars primarily employing quantitative and qualitative approaches. Tu Yuhui et al. (2020)[8] and colleagues utilized Moore's method and grey relational analysis to evaluate the dynamic changes in disciplinary structures of Jiangxi Province's higher education institutions relative to industrial development, revealing a time lag effect between the two. Liu Hongdou et al. (2020)[9] applied the Delphi method to identify key disciplines for development based on Shenzhen's current academic landscape. Qu Tao et al. (2020)[10] conducted an empirical analysis using linear regression to examine the correlation between educational disciplinary structures and industrial development in Hainan Province, demonstrating that disciplinary structure exerts bidirectional, multidimensional, and non-equilibrium influences on industrial transformation. The study further analyzed the impact of different disciplinary groups on the three major industries through separate examinations.

Collins et al. (1996) [11] et al. selected time series data to calculate the contribution rate of per capita education to economic growth, and their research pointed out that the disciplinary structure of higher education was a key factor in the vigorous economic development of Southeast Asia. Pual Doyon (2001) [12], from the perspective of the scale of higher education disciplines, found that an appropriate increase in population size contributed to Japan's economic growth.

Through systematic review and synthesis of existing literature, scholars worldwide have significantly enriched their analyses of the relationship between higher education and economic development. Their research methodologies have diversified, with studies becoming increasingly detailed. The academic community has progressed from initial qualitative approaches to subsequent quantitative analyses, achieving notable progress in exploring synergistic relationships between the two domains. Notably, researchers have reached consensus on several key points: both sectors leverage talent development as a springboard to explore mutually reinforcing dynamics between higher education and economic growth.

## 2.3. Research Methods

Literature Research Method: This approach systematically gathers relevant literature and materials, which are then organized and analyzed to establish a solid foundation for exploring the intrinsic connection between higher education and economic development. The core concept of coordinated

development between higher education and the economy is defined as maintaining dynamic equilibrium and mutual adaptation in both quantity and quality among elements within the higher education system and economic system. This ensures that the two systems form a mutually reinforcing and synergistic operational state through coordinated development.

## 3. Theoretical Analysis of the Coordinated Development of Higher Education and the Economy

Human capital theory elucidates the role of human capital in personal income and economic growth, clarifying the economic value of education. As a quality-oriented input factor, education enhances productivity and drives growth. Economic growth theories have shifted from quantity to quality, emphasizing endogenous human capital and R&D as sustainable growth drivers. These two theories jointly analyze the importance of education for economic development. In practice, human capital (education) and economic output mutually reinforce each other, indicating that higher education should maintain close ties with growth.

### 3.1. The Economic Function of Higher Education

Research has confirmed that education serves as a pivotal driver of socioeconomic development. Studies conducted between 1960 and 1985 across 58 countries revealed that each additional year of average educational attainment for workers could boost annual GDP growth by approximately 3 percentage points. In the knowledge economy era, higher education demonstrates particularly significant economic functions, primarily manifested through four core dimensions: labor resource allocation, capital accumulation, labor productivity enhancement, and technological advancement.

#### 3.1.1. Ideological Guidance and Value Navigation Function

Higher education provides ideological support and spiritual motivation for economic development, effectively avoids moral risks by improving social moral standards and humanistic literacy, and establishes value orientation for the process of modernization.

#### 3.1.2. Talent Supply and Quality Improvement Function

Higher education provides core talent support for economic development, significantly improving the quality of labor resources. T.W. Schultz pointed out that four-fifths of U.S. production growth stems from improvements in technological methods and workforce quality. R. Solow's empirical research further demonstrates that 90% of economic growth can be attributed to technological progress and human capital enhancement. The higher education system systematically promotes the upgrading of societal cultural literacy and productive capacity by cultivating specialized scientific researchers, technical experts, and management teams.

#### 3.1.3. Function of Scientific and Technological Innovation and Transformation

Higher education institutions provide technological innovation support for economic development, spearheading the creation and application of cutting-edge technologies while accelerating industrial innovation. Universities undertake numerous national-level major research projects (such as key technology development for the Shenzhou

spacecraft series), and through industry-academia-research collaborative innovation models, they foster high-tech industrial parks and joint research centers, significantly enhancing enterprises' independent innovation capabilities.

## **3.2. The Role of Economic Development in Higher Education**

Economic activities encompass the production and reproduction of means of production, forming the material foundation for human societal endeavors. As a vital component of society, higher education development is fundamentally shaped by economic foundations. At the macro level, economic development levels, institutional frameworks, and social ideologies determine and shape the developmental trajectory of higher education. Economic conditions directly influence both the scale and quality of resource allocation, providing essential material foundations while profoundly affecting institutional structures, growth rates, policy designs, and operational mechanisms. Different economic stages impose distinct constraints on higher education, specifically manifested through differentiated requirements for talent cultivation scale, educational quality, and disciplinary structures. Consequently, the developmental models and organizational frameworks of higher education must dynamically adapt to economic demands and undergo corresponding adjustments.

In the education system, primary and secondary education focus on the dissemination of science and technology, while higher education emphasizes technological innovation and application transformation. Higher education significantly drives technological innovation and its efficient implementation by optimizing labor tool performance and application efficiency, improving worker-product combinations, thereby enhancing social productivity and driving economic development. Universities gather a large number of experts and scholars with rich research experience and outstanding innovative capabilities, forming the core force of the national scientific and technological innovation system. During the 1996-2000 period of China (the Ninth Five-Year Plan period), universities of China undertook over 70% of general projects and approximately 50% of key projects under the National Natural Science Foundation, as well as about one-third of research tasks under the National 863 Program and 973 Program. For example, in the successful launch of the Shenzhou V manned spacecraft, Harbin Institute of Technology alone contributed five key technologies. By integrating scientific innovation with social service functions, higher education effectively enhances corporate technological innovation capabilities, promotes the formation and iteration of high-tech innovations, and continuously drives economic development. This is specifically manifested in:

1) Higher education institutions serve enterprises, and enterprises make use of their talent advantages to improve the transformation rate of scientific research achievements and the technological innovation ability of enterprises.

2) Higher education institutions attach importance to the transformation of achievements. High-level achievements are the foundation of high-tech industries. The development of university research will give birth to research centers and high-tech zones, such as Boston Research Center for Science and Technology and Silicon Valley.

## **3.3. Economic Development Determines the System and System of Higher Education**

Economic development encompasses multiple dimensions including economic growth, social structural transformation, institutional reforms, systemic evolution, and holistic human development. Within China's current economic framework, where public and private sectors coexist, higher education institutions feature a dual structure of public universities and private colleges. The economic system indirectly shapes higher education through political mechanisms, a dynamic rooted in politics' inherent role as the concentrated embodiment of economic foundations. The economic system refers to the institutional arrangements and operational mechanisms governing national economic activities, with its core lying in resource allocation strategies. The specific configuration patterns are determined by the type of economic system in place.

In summary, economic development exerts a dual driving force on higher education: On one hand, it demands that the higher education system cultivate specialized professionals aligned with economic needs; on the other hand, it requires the provision of essential material foundations for educational advancement. Economic growth forms the bedrock of educational development, not only constraining its scale and structure but also necessitating that educational progress maintain synchronized development with economic growth stages.

## **4. The Interaction between Higher Education and the Coordinated Development of the Economy**

### **4.1. The Positive Role of Higher Education in Adapting to the Needs of Economic Development**

Higher education adapts to and moderately exceeds the needs of economic development, which will have a positive role in promoting economic development.

1) Accelerating the development and accumulation of human resources provides intellectual support for economic growth. In the knowledge economy era, talent plays an increasingly fundamental, strategic, and decisive role in socioeconomic development, becoming the core competitiveness of nations and regions. As higher education cultivates specialized professionals needed by society—these future pillars of progress and economic advancement—the continuous accumulation of talent will inevitably exert a positive influence on sustained economic growth.

2) It has accelerated the creation, production, transformation and application of science and technology, and promoted the rapid development of the economy. As the primary productive force, science and technology plays a decisive role in economic growth, while institutions of higher learning have become the main force in basic research of science and technology, the new force in applied research and an important force in high-tech industries.

3) It has promoted economic restructuring, created more jobs and promoted coordinated economic development. The moderately advanced development of higher education has cultivated a large number of urgently needed talents for economic construction. The higher the knowledge level of talents, the stronger their ability to innovate and start businesses will be, and the industrial structure will transform

toward higher and newer industries.

## 4.2. The Relationship between Higher Education and Economic Dislocation

1) The negative effect of higher education on economic development

The non-coordination between higher education and the economy is mainly manifested in two aspects: talent training and discipline setting.

The issue of talent cultivation involves both quantity and quality. Quantitatively, it manifests as knowledge unemployment caused by insufficient or excessive education - Insufficient education refers to workers' educational levels falling below job requirements, while the shortage of high-level talents constrains economic development. Qualitatively, overexpansion of higher education leads to resource scarcity, while inadequate government investment results in strained school conditions, reduced per-student funding, and mismatches between faculty resources and institutional scale, ultimately compromising educational quality.

In terms of academic program design, this manifests as a coexistence of talent shortages and surpluses at specific levels or in specific fields (such as the shortage of finance and economics professionals during China's reform and opening-up period versus an oversupply of planned economy specialists, or imbalances between talent supply and demand in high-tech industries versus traditional sectors). Such mismatches lead to inefficient allocation of human resources, hindering sustainable development in education, the economy, and society.

2) The negative effect of the economy on the development of higher education

The mismatch between economic development and higher education primarily manifests through structural imbalances in the economy and financial constraints. Regarding economic structure, technological revolutions have accelerated industrial and technological transformations, demanding continuous knowledge updates from workers. However, the relatively static nature of education systems has led to imbalanced talent distribution. In terms of fiscal support, higher education heavily relies on economic foundations. When the economy stagnates, government revenues decline, resulting in reduced funding for higher education institutions.

## 5. Empirical Analysis -- Taking China's Guangdong-Hong Kong-Macao Greater Bay Area as an Example

(1) After the reform and opening-up, Guangdong Province has led the nation in economic development. The Outline Plan incorporates nine cities within the province into the Guangdong-Hong Kong-Macao Greater Bay Area strategy, further accelerating its rapid growth. These nine cities in the mainland region primarily focus on secondary and tertiary industries, demonstrating robust expansion. Taking 2021 as an example, the primary industry's share remains relatively low across most cities (Zhaoqing and Jiangmen stand out with slightly higher proportions, while others remain below 5%), as detailed in Table 1. In contrast, Hong Kong and Macao, influenced by international factors, exhibit more advanced development in secondary and tertiary industries. Looking ahead, the Greater Bay Area's industrial trends will continue to concentrate on these sectors: the secondary industry will be

dominated by high-tech, advanced manufacturing, and equipment production; meanwhile, strategic emerging services and high-tech services within the tertiary sector will see sustained growth. This development urgently requires higher education to cultivate more talent reserves, nurture high-end professionals, and provide quality educational services.[13]

**Table 1.** Proportion of Three Major Industries in Nine Cities of Guangdong Province in 2021

Cites	The proportions of the primary, secondary and tertiary industries
Guangzhou	1.09:27.35:71.56
Shenzhen	0.1:37:62.9
Zhuhai	1.7:43.4:54.9
Foshan	1.7:56.0:42.3
Huizhou	4.7:53.3:42
Zhongshan	2.5:49.4:48.1
Dongguan	0.3:58.2:41.5
Zhaoqing	17.3:41.6:41.1
Jiangmen	8.2:45.6:46.2
"Data source: Compiled based on the 2021 Statistical Bulletin of the National Economic and Social Development of the Nine Cities in the Guangdong-Hong Kong-Macao Greater Bay Area"	

(2) The demand for higher education in the Guangdong-Hong Kong-Macao Greater Bay Area cultural coordination

The Guangdong-Hong Kong-Macao Greater Bay Area is formed by three "9+2" city clusters, sharing a common cultural heritage. Hong Kong, deeply influenced by Western culture and adjacent to Guangdong Province, embodies the essence of Cantonese culture with Cantonese and English as its primary languages, serving as a quintessential example of Sino-Western cultural integration. Macao, building on Portuguese cultural foundations while incorporating mainland elements, has developed a unique multicultural landscape. Despite cultural differences between Hong Kong, Macao, and the mainland, deepening cultural identity - particularly enhancing young people's understanding and appreciation of China's traditional culture - is crucial for the Greater Bay Area's integration. The nine mainland cities in the region, all part of Guangdong Province, have been profoundly shaped by Lingnan culture, with Cantonese opera standing as its iconic cultural symbol. Post-reform migration of northern talents has enriched Guangdong's cultural tapestry through diverse cultural elements. The development of the bay area should respect cultural diversity while promoting collaborative cultural growth, where higher education must act as a vital bridge connecting these communities.

(3) The demand of Guangdong-Hong Kong-Macao Greater Bay Area scientific and technological innovation for the development of higher education

The Guangdong-Hong Kong-Macao Greater Bay Area, a strategic hub in China's national development blueprint, aims to become a world-class bay region. As the driving force behind its high-quality growth, technological innovation serves as the key benchmark for evaluating its development progress. Statistics reveal that Guangdong Province hosts

over 60,000 high-tech enterprises and has established numerous national and provincial research platforms, including 30 State Key Laboratories and 6,714 Provincial Engineering Technology Research Centers. While these resources are concentrated in core cities, the region still faces critical challenges such as dependence on foreign technologies, insufficient high-end talent reserves, and weak original innovation capabilities. To address these issues, higher education urgently needs to accelerate the cultivation of innovative interdisciplinary professionals. The historical experience of Silicon Valley demonstrates that a sustained supply of high-caliber talents from surrounding universities and research institutions has been crucial to its success.

(4) Demand for higher education in the international development trend of Guangdong, Hong Kong and Macao Greater Bay Area

The Guangdong-Hong Kong-Macao Greater Bay Area aims to become a top-tier domestic and internationally renowned bay area. Before Hong Kong's return, the region was heavily influenced by Britain, boasting high internationalization and significant global influence. Macau's outstanding gaming industry, shaped by Portuguese cultural heritage, fostered extensive Western connections. Guangzhou and Shenzhen have achieved rapid development while aligning with international standards. The Chinese government established Hengqin and Qianhai Special Economic Zones to boost growth. Hengqin was incorporated into the Free Trade Zone in 2015, further expanding its openness. Established in 2010, Qianhai focuses on developing high-end service industries, driving Guangdong-Hong Kong-Macao collaboration, opening-up policies, and enhancing global influence. Higher education must cultivate talents with an international perspective.

(5) Current situation of higher education supply capacity in Guangdong, Hong Kong and Macao Greater Bay Area

Guangdong Province boasts a sufficient number of higher education institutions, though their regional distribution

remains uneven with few top-tier universities. While the province has experienced rapid development in higher education, it still lags behind other leading regions. It has 66 regular undergraduate institutions, significantly fewer than Beijing, Shanghai, and Jiangsu, with most concentrated in Guangzhou (38) and Shenzhen. The number of Double First-Class universities is limited (2 in the first round and 5 in the second round, as shown in Table 2). The talent distribution in the Guangdong-Hong Kong-Macao Greater Bay Area remains imbalanced, with insufficient supply of high-level professionals. The province's economic growth has been driven by the "14th Five-Year Plan" (2021-2025) framework: ten pillar industries, ten emerging industries, and six future industries. The proposed "One Core, One Belt, One Zone" strategy positions the Pearl River Delta nine cities as the core. Collaborative efforts to build the Greater Bay Area aim to establish an international innovation hub and manufacturing cluster, boosting provincial development. The industrial structure remains stable with the secondary and tertiary sectors dominating, as evidenced by 2021 data showing a ratio of 4.0:40.5:55.6, where the secondary industry's share increased by 0.9 percentage points. Guangzhou and Shenzhen's manufacturing sectors are rapidly expanding, requiring substantial high-end talent. While higher education has made progress, it still struggles with talent shortages and needs intensified cultivation efforts. The sector lags behind economic growth rates and lacks internationalization: only two institutions rank among the QS World University Rankings (2023) top 500, with low-level collaborations. There are currently five Sino-foreign cooperative programs (including both legal entities and non-legal entities) focusing mainly on undergraduate education, with few master's and doctoral programs. Fifty-five cooperation projects are mostly formal rather than substantive. Government-led universities lack sufficient market participation, necessitating the establishment of a tripartite open framework involving government, universities, and market forces.

**Table 2.** Comparison of the Number and Types of Higher Education Institutions in Guangdong Province and Some Regions of the Domestic Area

Region	Total number of universities	Department-run	(%)	Ordinary undergraduate universities	(%)	Professional colleges (including undergraduate programs)	(%)	Higher vocational colleges	(%)
Beijing	92	39	42.4	67	72.8	0	0	25	27.7
Shanghai	64	10	15	39	60.9	1	1.6	24	37.5
Jiangsu	168	10	6	77	45.83	worker	0.59	90	53.57
Guangdong	161	4	2.5	66	40.99	2	1.24	93	57.76

Source: Compiled based on the 2022 education statistics from the Ministry of Education

(6) Pathway analysis of higher education services to meet the development needs of the Guangdong-Hong Kong-Macao Greater Bay Area

1) Strengthen the development of higher education clusters to enhance regional industrial service capabilities. The clustering of universities serves as a key indicator of regional economic development, exemplified by the San Francisco Bay Area. Cities like Guangzhou, Shenzhen, and Hong Kong should establish cluster effects centered around top-tier universities. Applied universities should form strategic alliances, while regional institutions need to explore collaborative pathways.

2) Deepen the innovation function of universities to serve regional development. University knowledge spillover drives enterprise innovation and economic growth. The Guangdong-

Hong Kong-Macao Greater Bay Area needs to: optimize the talent training system, strengthen the connection between research and transformation, and deepen the integration of science, education, industry and education. Universities should actively respond to the needs.

3) Enhance the internationalization of higher education and promote global alignment. Research universities should engage in international innovation collaborations, while applied universities should strengthen their international development. Establish a tripartite collaboration mechanism involving governments, universities, and enterprises: Governments optimize policies and investments, universities expand international cooperation, and enterprises provide support. Emphasize the integration of global and local perspectives to cultivate versatile professionals.

4) Strengthen inter-school cultural exchanges and strengthen the cultural identity of Hong Kong and Macao students. Integrate cultural resources of the three regions to enhance cohesion. The implementation paths include: joint research and dissemination of traditional culture, promotion of teacher-student exchange programs, and promotion of social group interaction.

## 6. Summary

This study investigates the mechanisms through which investment scale and structure in higher education influence economic development quality, with particular focus on critical issues such as inter-regional funding disparities, resource allocation efficiency, and technology transfer effectiveness. These factors constitute key constraints hindering coordinated development between education and the economy. Effectively addressing these challenges holds strategic significance for achieving high-level synergy between educational systems and economic systems, advancing the construction of a national innovation system, and promoting high-quality economic development.

The core challenge of this study lies in quantifying the dynamic alignment between higher education investment and economic output, while addressing significant regional disparities and policy synergy effects. Moreover, revealing the complex mechanisms of their interaction within a multidimensional analytical framework poses heightened demands, particularly against the backdrop of deep integration between globalization and the knowledge economy. For instance, economically developed regions typically provide more abundant educational resources, profoundly influencing the structural layout, development pace, and institutional design of higher education. Different stages of economic development also require dynamic adjustments in the quantity, quality, and structure of talent cultivation. In terms of science communication and innovation application, primary and secondary education focus on popularizing scientific knowledge, whereas higher education concentrates on technological innovation and practical applications. Universities, gathering a wealth of research experts and scholars, serve as the core force in national scientific innovation systems. Empirical data shows that during the Ninth Five-Year Plan period (1996-2000), universities undertook over 70% of projects funded by the National Natural Science Foundation, significantly driving technological progress.

At the institutional and systemic levels, the economic system indirectly determines the fundamental structure of higher education through political systems, while the economic framework profoundly influences resource allocation patterns. The public and private sectors correspond to the primary stakeholders in public and private higher education institutions respectively, demonstrating the decisive role of economic foundations in shaping higher education systems. Higher education demonstrates proactive adaptation to economic development: it must not only meet current economic demands but also moderately advance beyond existing economic levels to exert positive catalytic effects. Specifically, higher education accelerates human resource development and reserves, providing critical intellectual support for the knowledge economy era; it effectively promotes scientific innovation and technological transformation. Existing research indicates that higher education investment significantly stimulates economic

growth through three pathways: human capital accumulation, innovation-driven development, and industrial upgrading. However, coordination among these pathways is constrained by regional imbalances, inefficient resource allocation, and insufficient policy synergy. Empirical analysis of the Guangdong-Hong Kong-Macao Greater Bay Area reveals acute challenges in higher education capacity, highlighting urgent needs to strengthen cluster development and internationalization of higher education.

Based on empirical research findings, this paper proposes three optimization pathways: First, optimizing the structure of higher education investment to enhance the precision and efficiency of resource allocation; Second, deepening industry-academia-research integration mechanisms to accelerate the transformation of knowledge achievements into practical productivity; Third, establishing a dynamic policy adjustment system to strengthen institutional responsiveness to educational-economic interaction demands, ultimately fostering a virtuous cycle between the education and economic systems.

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