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How is regional cooperation possible in cross-border institutional conflicts? The Guangdong-Hong Kong-Macao cooperation from the perspective of the sociology of knowledge

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Abstract: Regional cooperation stands as a key strategy to address intense economic competition and formidable local governance challenges. Successful regional collaborations are typically founded on the basis of institutional similarity, which also serves as the starting point for a multitude of related theoretical studies. Consequently, the regional cooperation within the context of institutional conflicts has been overlooked. This paper aims to explore the process of regional cooperation against the backdrop of conflicts, using the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) as a case study and analyzing it from the perspective of the sociology of knowledge. The article posits that conflicts can stimulate interactions among various actors, foster the generation of local knowledge, and propel specific cooperative practices. Moreover, local and central governments, grounded in local knowledge and universal managerial insights, continuously authenticate and propagate local innovations, establishing guiding policies and, consequently, producing rational knowledge. The accumulation of such knowledge has not only strengthened civilian cooperation but also facilitated broader collaborative efforts. The study reveals that despite the GBA's remarkable achievements in cooperation, challenges persist: on the one hand, there are issues with the government's process of rational knowledge production and the quality of knowledge itself; on the other hand, excessive governmental dominance may suppress the production and application of local knowledge. Therefore, refining the knowledge production mechanism is especially critical. The findings of this paper uncover the mechanisms of regional cooperation amidst institutional conflicts and deepen our understanding of regional collaboration and cross-border governance.

Keywords: conflict and cooperation; knowledge production; local knowledge; rational knowledge; cross-border governance

1. Introduction

In the information age, the increasing consensus is that cooperation in capital, technology, production, and governance is a more sensible approach than operating independently. Across the globe, cooperation in the realms of economy, politics, culture, and science and technology is continuously emerging (Haftel and Hofmann, 2017; Panke, 2020). Regional cooperation represents an attempt to concretely collaborate in these diverse fields. In an effort to enhance regional competitiveness, address governance issues across regions, and reduce regional inequality (Zhang et al., 2024), regional cooperation has garnered significant attention from governments (Panke, 2020; Rotta, 2008), with many governments and citizens advocating for such collaboration. Globally, there are many celebrated instances of regional collaboration,

including the European Union, the San Francisco Bay Area, the New York Metropolitan Area, and Japan's Tokyo Bay Area. These regional partnerships have notably succeeded in enhancing economic efficiency, elevating regional profiles, and bridging the wealth disparity among nations (Basboga, 2020; ESCAP, 2004; Garcia-Duran et al., 2011), also creating a strong demonstration effect.

According to prevailing perceptions, regions that have successfully cooperated, despite some specific differences, generally share institutional similarities (Feng and Genna, 2003). Here, the term "institution" is defined as per North (1990), who posits that institutions are deliberately designed constraints that shape the interactions among people, encompassing both formal institutions, such as artificially crafted rules, and informal institutions, like conventions. In North's view, factors with binding and normative significance, including political, economic, and cultural elements, are all considered institutions. From this perspective, whether it is the European Union, the Tokyo Bay Area, New York Bay Area, or San Francisco Bay Area, their fundamental aspects are similar, all belonging to the capitalist institutional framework. Regardless of whether it is recognized or not, existing research on regional cooperation has an underlying premise that institutions are similar.

Logically and empirically, cooperation between regions with institutional conflicts may face challenges (Chen, 2023; Zhang et al., 2024). Kobayashi (2019) has identified that normative conflicts, including values and governance principles, hinder the functional cooperation between the European Union and the Eurasian Economic Union in the post-Soviet space. However, a quintessential anomaly is observed within China's GBA (Guangdong-Hong Kong-Macao Greater Bay Area), where cooperation has been achieved despite the coexistence of socialist and capitalist systems under the "one country, two systems" framework, along with the attendant political, economic, and cultural conflicts. So, how has the GBA achieved cooperation? How should we view such cooperation? This paper offers an explanation from the perspective of the sociology of knowledge.

As part of a series of studies on collaboration within the GBA, this paper, grounded in the dichotomy of local and rational knowledge, unravels the mechanisms through which the GBA achieves cooperation. It endeavors to formulate certain perspectives, thereby laying the groundwork for further in-depth research. Additionally, based on the analytical framework, this paper assesses the achievements and challenges of the GBA's cooperation and offers corresponding recommendations for improvement.

The following content is arranged as follows: The first part introduces the relationship between regional cooperation and knowledge production, presenting the analytical framework. The following two sections discuss how local and rational knowledge are generated and how they foster cooperation within the GBA. The fourth section analyzes the effectiveness and challenges of cooperation, with the final section offering a summary.

2. Knowledge production and regional cooperation with the institutional conflicts

Regional cooperation represents a pivotal political and economic occurrence,

manifesting within nations, between regions and nations, and among multiple countries. Numerous studies have noted that regional cooperation generates knowledge (Kiminami and Furuzawa, 2013; Mawdsley et al., 2019; Nave and Franco, 2021; Suttmeier, 2014). In turn, knowledge can also promote regional cooperation. Research related to knowledge spillovers indicates that such spillovers positively affect enterprises' participation in cooperation (Montoro-Sánchez et al., 2011; Zhou et al., 2020). These studies lay the groundwork for this article's comprehension of regional cooperation. Based on the practice in the GBA, this paper discusses the mechanisms by which cooperation is achieved amidst the various conflicts, from the perspective of the sociology of knowledge. The GBA includes China's Hong Kong and Macao Special Administrative Regions and nine cities in Guangdong Province: Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen, and Zhaoqing (Li et al., 2022). The GBA encompasses a multitude of differences and conflicts. It is characterized by one country with two systems—capitalism and socialism—three customs territories, three currencies, three legal systems, and a variety of languages, including Mandarin, Cantonese, English, and Portuguese (Li et al., 2022). These institutional conflicts create obstacles for regional cooperation and increase the costs of such cooperation. However, it is surprising that these conflicts have not eliminated the possibility of cooperation. In fact, the construction and cooperation of the GBA are deepening, and various cooperative mechanisms and systems are being improved (Xie, 2023). Why is this the case? This paper proposes that the continuous communication and collision caused by institutional conflicts have generated new knowledge, making cooperation a reality.

Drawing upon preliminary insights into the case study of collaborative practices within the GBA, this paper begins its analysis based on Scott's (2020) research on knowledge and knowledge production. Scott made a nuanced distinction between types of knowledge. Using large-scale social engineering projects undertaken by nations as his case studies, he differentiated between rational knowledge and local knowledge. Rational knowledge is typically employed by states or large organizations and represents an explicit, top-down knowledge system that emphasizes universality and standardization. This type of knowledge attempts to understand complex societies through abstraction and simplification for better planning, control, and management. In contrast, local knowledge is a bottom-up knowledge system that emphasizes particularity, adaptability, and individual practice. This knowledge is deeply rooted in specific local environments and social contexts and is sometimes tacit. Compared to rational knowledge, local knowledge pays more attention to detail, diversity, and individual differences. Scott argues that the failure of many state-led large projects is due to the neglect of local knowledge. He points out that a healthy social order should be able to accommodate and integrate these two knowledge systems to achieve a more humane and sustainable development. Based on Scott's research and classification of knowledge, this paper constructs an analytical framework for how knowledge promotes cooperation amidst institutional conflicts (**Figure 1**).

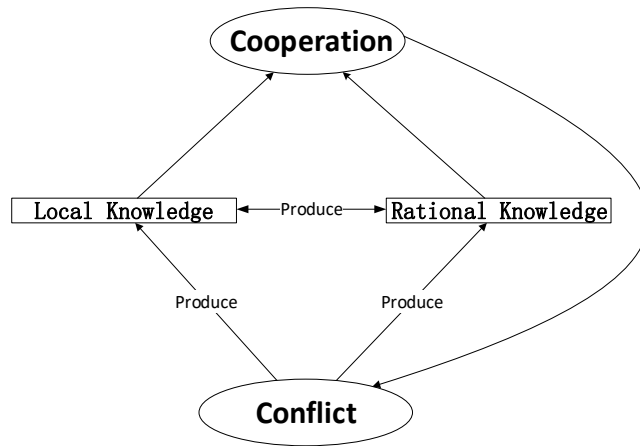


Figure 1. Analytical framework.

This paper proposes that institutional conflicts can produce both local knowledge and rational knowledge, and both types of knowledge can promote regional cooperation. This paper, grounded in the process of knowledge production, the characteristics of knowledge, and its scope of application, delineates spontaneous, micro-level, or industry-specific exchanges and interactions as activities of local knowledge production. It regards the planning and guiding activities of the GBA local governments and the central government as activities for producing rational knowledge. Local knowledge brings about grassroots, industry-specific, and concrete cooperation, while rational knowledge brings about official participation and leadership in overall cooperation. Moreover, the two types of knowledge are interwoven and can transform into each other. Local knowledge can be elevated to rational knowledge through certification by authority, similar to Lenz's (2018) theoretical process of transforming experience into abstract cognitive schemas, while rational knowledge can guide and influence the production of local knowledge. The two types of knowledge drive regional cooperation in a cycle. If there is a problem with the production of either type of knowledge, regional cooperation may be difficult to sustain.

3. Local knowledge production and cooperation in the GBA

The GBA is confronted with institutional conflicts that pose challenges to cooperation. However, these conflicts can also serve as catalysts for communication and collaboration among the parties involved (Li and Kwok, 2019). The regions within the GBA, being geographically interconnected, possess an inherent and essential need for mutual communication and exchange. The institutional conflicts, which encompass legal frameworks, economic regulations, and socio-cultural elements, have led to multi-dimensional collisions, creating numerous difficulties for entrepreneurs, social organizations, and individuals. Yet, the process of conflict is also one of showcasing, communicating, and resolving disagreements. The positive outcome of these conflicts is the emergence of new concepts, rules, social relations, and social orders, collectively termed as local knowledge. This local knowledge forms the foundational resource for the continued cooperation among the parties. As an example, in 2019, Bai Hexiang, the director of the People's Bank of China Guangzhou branch, stated that there are

significant differences among Guangdong, Hong Kong, and Macao in terms of legal frameworks and economic systems. Resolving financial disputes through traditional means such as litigation faces conflicts arising from different judicial systems, resulting in high costs. He expressed that this has propelled the three regions to establish a financial dispute mediation cooperation mechanism, aiming to construct a mutually recognized approach to resolving financial disputes (Liu, 2019).

Specifically, within the GBA, conflicts have engendered local knowledge, which encompasses a variety of senses of identity and cooperative skills.

3.1. Production of multiple identities

A sense of identity is an important foundation for regional cooperation. Existing research has found that regions lacking a sense of identity struggle to achieve cooperation (German, 2012). In the GBA, the identities that need to be established and strengthened include political, economic, and cultural identities, as well as ethnic and national identities. Identity often affects the willingness to cooperate and the level of mutual trust. Through sustained interaction, the GBA has progressively cultivated a diverse array of identities, rooted in mutual tolerance and an appreciation for distinctiveness. The connection between Mainland China and Hong Kong and Macao has never been interrupted, ensuring the maintenance and production of institutional and cultural identities. Historically, Hong Kong was a British colony, and Macao was a Portuguese colony. Influenced by colonial rule, significant differences emerged between Hong Kong, Macao, and Mainland China in various aspects, such as legal and linguistic differences. However, Mainland China has always maintained communication with these regions, despite encountering and overcoming various obstacles to communication. Prior to the return of sovereignty to China, Hong Kong was already an important trade partner and channel for the introduction of foreign capital to Mainland China. There was already frequent movement of people between Mainland China and the Hong Kong and Macao regions for business, medical treatment, tourism, shopping, and visiting relatives, as well as various forms of exchange and cooperation between educational and research institutions. Since the return of Hong Kong and Macao to China at the end of the 20th century, exchanges within the GBA have become more frequent and diverse. According to official statistical data, since the handover, there has been a steady increase in cultural exchanges between Hong Kong and Mainland China. The annual average number of cultural programs and exchanges has reached 750 events and 10,000 participants, which is double the amount at the time of the handover (Ding, 2019). This has strengthened the cultural sense of belonging and patriotic fervor among Hong Kong residents (Ding, 2019). Furthermore, the technological innovation cooperation between universities in the GBA has also achieved numerous tangible outcomes with substantial impact (Yang et al., 2024).

Especially since the reform and opening up of Mainland China in 1978, after continuous debate, Mainland Chinese society has recognized some of the merits of the capitalist economic, political, and cultural systems and has gradually embraced some of the living habits and social cultures of Hong Kong and Macao. For instance, in the 1980s and 1990s, Hong Kong movies, songs, and film stars, which were originally

seen as part of an undesirable culture, became widely known in Mainland China and even became synonymous with fashion, pursued by the younger generation. Many people from Mainland China have also changed their negative evaluations and stereotypes about business derived from communist ideology, and like those from Hong Kong, they invest in businesses and regard entrepreneurship as a career in life. Additionally, although gambling has been viewed as an industry that leads to moral decay and social instability in Mainland China and has been culturally rejected and officially banned, Mainland society has gradually accepted Macao's gambling industry and culture after a period of adjustment.

3.2. Production of cooperative skills

In the GBA, the process by which official or private actors address conflicts is also a process of establishing order and producing cooperative skills. Parties including industry leaders, policymakers, and scholars, in response to various conflict scenarios, pool intellectual resources to develop or improve solutions, creating tools for all parties to maintain interaction amidst conflicts. At the same time, these skills are tested in practice, providing a reference for the reproduction of cooperative skills. The most common manifestation of cooperative skills is the establishment of cooperative mechanisms, which is crucial for regional cooperation. There is evidence to suggest that after 1949, cooperation based on "verbal agreements" had already been established between Guangdong and Hong Kong (Li, 2022). Different mechanisms provide a platform for regional cooperation and lay the foundation for exchanges and cooperation on a larger scale. Moreover, various specific cooperative mechanisms may exert pressure from the bottom up, prompting officials to pay attention to and promote regional cooperation (Kamiński, 2019). In this regard, the continuous emergence of cooperative mechanisms has allowed officials to see the landscape of multi-party communication in today's society.

In the GBA, the initial collaboration was market-driven (Lin et al., 2024; Yao et al., 2020), manifesting as decentralized, grassroots-led exchanges and partnerships. These spontaneous collaborations have yielded a variety of collaborative skills and knowledge. Although the government has now become the primary driving force, market-driven cooperation remains significant. Today, actors within the GBA have already established or are preparing to build different specific communication and cooperation mechanisms to achieve alignment between Mainland China and Hong Kong and Macao in areas such as rules, regulations, management, and standards, while also intending to institutionalize existing experiences of exchange. Cooperative mechanisms that have attracted attention include: new mechanisms for intellectual property cooperation between Guangdong and Hong Kong; cooperation between Mainland and Hong Kong social welfare institutions to expand social service work in the GBA; partnerships between law firms in Mainland China, Hong Kong, and Macao; high-quality medical resource cooperation mechanisms; collaborative mechanisms between media. It can be seen that these mechanisms cover various aspects of social life, together forming an interconnected and mutually promoting network of cooperation. These mechanisms are inherent in the characteristics of specific industries and the demands of participants, and even include the tacit understanding

formed by all parties over a long period, with the positive function of reducing communication costs and clarifying the rules and expected consequences of communication.

Overall, within the GBA's internal exchanges and collisions, various forms of identity have gradually emerged, and cooperative skills and mechanisms have appeared, resulting in the social and political integration of the GBA. In this regard, local knowledge is both an important driving force for regional cooperation and provides a social foundation for a higher level of regional cooperation.

At the same time, Hong Kong and Macao societies have also enhanced their understanding of Mainland China's politics, economy, and culture through ongoing exchanges, experiencing the national conditions and deepening their ethnic and national identity. Witnessing the poverty and backwardness of Mainland China, many people from Hong Kong and Macao have gone to Mainland China to teach, build primary schools, and assist the poor, earning praise from the public. Many impoverished university students have completed their university education with the help of caring individuals from Hong Kong and Macao, and such acts of kindness are often publicized by officials and civilians. Hong Kong and Macao have also learned some traditional cultures from Mainland China. Through continuous interactions, more and more people recognize the close kinship, similar customs, common roots, and shared honor and disgrace among the three regions of Guangdong, Hong Kong, and Macao.

In recent years, the depth of communication and interaction between Hong Kong, Macao, and Mainland China, including Guangdong Province, has significantly increased, leading to a further enhancement of diverse identities. For example, the promotion of performing arts works to the GBA for tours and exchanges, the holding of academic discussions and lectures, and frequent library business exchanges; Mainland tourists shopping, visiting book fairs, and attending concerts in Hong Kong and Macao; residents of Hong Kong and Macao visiting places like Guangzhou and Shenzhen in Guangdong for performances, sightseeing, and gourmet food; the establishment of non-governmental organizations related to the GBA, such as the Youth Federation of the Greater Bay Area and the Entrepreneurs Alliance of the GBA, has become a new platform for young people from Hong Kong and Macao to understand Mainland China. With the development of digital technology, new forms of communication between Hong Kong, Macao, and Mainland China have emerged. Digital platforms such as the "Guangdong-Hong Kong-Macao Cultural Information Network" and the "Guangdong-Hong Kong-Macao Cultural Life Map APP" have provided important windows for cultural exchanges among the three regions. Digital technology can also empower regional scientific and technological innovation cooperation, including the GBA (Yang et al., 2022), promoting digital forms of scientific and technological exchanges.

These particular exchanges have fostered a self-regulating influence and a cascading effect, which is instrumental in nurturing a variety of identity affirmations among individuals, from the grassroots to the organizational level. This process can stimulate regional interaction and collaboration, akin to Sousa's (2013) notion of "cooperation through heightened awareness."

4. Rational knowledge production and cooperation in the GBA

The various conflicts within the GBA imply risks and opportunities, attracting the attention of governments. The local governments of Guangdong, Hong Kong, and Macao, along with the central government, have been providing knowledge to facilitate cooperation. On the one hand, governments generalize folk, informal, or specific cooperative experiences through authority to guide in-depth cooperation, playing the role of facilitators. On the other hand, governments act as social engineers, facing real conflicts and planning in advance based on general regional cooperation experiences, lessons, and scientific management knowledge, drawing blueprints for GBA cooperation. This rational knowledge from governments plays a role in mitigating institutional conflicts, building cooperative frameworks, and guiding the production of local knowledge, which is an essential condition for the success of regional cooperation.

4.1. Production of rational knowledge at the local government level

As developing the economy, improving local governance, and increasing social welfare have become the main responsibilities and sources of legitimacy for the Chinese government (Zhu, 2011), local governments, including the Guangdong Provincial Government, the Hong Kong and Macao Special Administrative Region Governments, and subordinate governments, have done a great deal of work to achieve and deepen cooperation. This is very important, as the high capacity of local governments is conducive to regional cooperation (Hamilton-Hart, 2003). Combining Zhou's (2023) research and practical progress, this paper outlines certain initiatives undertaken by local governments within the GBA (**Table 1**).

Table 1 can be seen as a reflection of the long-term efforts made by local governments within the GBA to address conflicts and promote cooperation, including conceptual ideas, development plans, action programs, framework agreements, and consensus on cooperation. This officially produced knowledge involves the allocation of government rights and responsibilities, political commitments, key areas and boundaries of cooperation, as well as government goals and value orientations. It includes the construction drawings and task books for the GBA. This knowledge can improve trust, stabilize expectations, help solve insurmountable obstacles encountered in folk communication and cooperation, provide clear political and policy signals for folk exchanges and cooperation, and provide policy and technical guidance for various entities such as subordinate governments, entrepreneurs, social organizations, and individuals to deepen exchanges and cooperation.

Taking the “Guangdong Province’s Three-Year Action Plan for Advancing the Construction of the Guangdong-Hong Kong-Macao Greater Bay Area (2018–2020)” as an example, the document clearly outlines the future construction plans, such as the integrated development of urban and rural areas, the construction of airport clusters, rapid rail transit, docks, and expressway networks, insurance cooperation, solid waste and soil pollution prevention and control, and encouraging social participation. For entrepreneurs, grassroots governments, social organizations, and individuals within the GBA, these are key bases for choosing cooperation projects and methods, and making economic decisions.

Table 1. Events at the local level regarding GBA cooperation.

Year	Event
2005	The Guangdong Provincial Government issued the “Pearl River Delta Economic Zone Urban Agglomeration Coordinated Development Plan (2004–2020)”
2008	The Guangdong Province compiled the “Pearl River Delta Reform and Development Plan Outline (2008–2020)”
2010	The Government of the Hong Kong Special Administrative Region and the Guangdong Provincial Government signed the “Guangdong-Hong Kong Cooperation Framework Agreement”
2011	The Guangdong Provincial Government and the Government of the Macao Special Administrative Region signed the “Guangdong-Macao Cooperation Framework Agreement”
2016	Macao and Shenzhen signed the “Strategic Cooperation Framework Agreement on Jointly Promoting Shenzhen Qianhai and Macao Youth Entrepreneurship Incubation,” “Memorandum of Cooperation on National Reading between the Cultural Affairs Bureau of the Macao SAR Government and the Shenzhen Municipal Bureau of Culture, Sports and Tourism,” and “Tourism Cooperation Memorandum between the Macao SAR Government’s Tourism Bureau and the Shenzhen Municipal Bureau of Culture, Sports and Tourism”
2017	The Chief Executive of the Hong Kong Special Administrative Region, Carrie Lam, the Chief Executive of the Macao Special Administrative Region, Chui Sai On, the Director of the National Development and Reform Commission, He Lifeng, and the Governor of Guangdong Province, Ma Xingrui, jointly signed the “Framework Agreement on Deepening Guangdong-Hong Kong-Macao Cooperation and Promoting the Construction of the Greater Bay Area”
2019	The Health Commission of Guangdong Province, the Food and Health Bureau of the Hong Kong SAR Government, and the Health Bureau of the Macao SAR Government signed the “Guangdong-Hong Kong-Macao Greater Bay Area Health Cooperation Consensus”
2019	The Leading Group for the Construction of the Guangdong-Hong Kong-Macao Greater Bay Area in Guangdong Province issued the “Guangdong Province’s Three-Year Action Plan for Advancing the Construction of the Guangdong-Hong Kong-Macao Greater Bay Area (2018–2020)”
2021	The Shenzhen Tax Service of the State Taxation Administration released the “Interim Measures for the Practice Management of Tax Professionals from Hong Kong and Macao in the Shenzhen Qianhai and Shekou Area of the China (Guangdong) Pilot Free Trade Zone”

4.2. Production of rational knowledge at the central government level

External impetus, especially political support from the higher echelons, is an important driving force for regional cooperation (Sousa, 2013). China’s central government has a strong motivation to promote the cooperation of the GBA. Firstly, the central government hopes to learn advanced Western technology and culture through strengthening cooperation between Hong Kong and Macao and the mainland, to expand the level of opening up to the outside world, and to develop the economy of the mainland. Secondly, the center intends to use tangible achievements to demonstrate the institutional advantage of “one country, two systems,” proving that high-quality cooperation can be achieved in an environment full of conflicts. Thirdly, the center hopes to continuously achieve economic performance through regional cooperation to obtain the legitimacy of the government (Zhu, 2011). Fourthly, the center endeavors to achieve political objectives, such as safeguarding economic security, by supporting cooperation within the GBA (Yu, 2024). **Table 2** shows some of the work done by the central government to promote the cooperation of the GBA.

It can be seen that the central government has introduced a series of global policies related to overall planning, overall plans, and development planning outlines, and has also presided over the signing of strategic documents to promote the cooperation of the GBA. The knowledge produced by the central government reflects the national focus and value distribution, involving the macro design of the national level for the construction of the GBA, and is the most important political signal, which has attracted close attention from all parties. Especially for large-scale cooperation projects, the policy signals issued by the central government have a decisive impact.

Table 2. Selected central government initiatives on GBA cooperation.

Year	Event
2003	The Central Government and the Government of the Hong Kong Special Administrative Region signed the “Mainland and Hong Kong Closer Economic Partnership Arrangement,” mainly covering three aspects: trade in goods, trade in services, and trade facilitation. Subsequent supplementary agreements were signed based on evolving circumstances.
2016	The “Guangdong-Hong Kong-Macao Greater Bay Area” was mentioned in the national “13th Five-Year Plan” and the Pan-Pearl River Delta regional cooperation proposals.
2019	The Central Government issued the “Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area”
2021	The Central Government issued the “Overall Plan for the Construction of the Hengqin Guangdong-Macao In-Depth Cooperation Zone”
2021	The Central Government issued the “Comprehensive Plan for the Reform and Opening-up of the Qianhai Shenzhen-Hong Kong Modern Service Industry Cooperation Zone”
2022	The Central Government issued the “Overall Plan for the Deepening of the Comprehensive Cooperation between Guangzhou Nansha and the Guangdong-Hong Kong-Macao Greater Bay Area Facing the World”

Taking the “Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area” issued by the central government in 2019 as an example, this is the most comprehensive and highest-level planning document for the development of the GBA to date. This document discusses various aspects of the cooperation, including opportunities and challenges, overall requirements, basic principles, strategic positioning, development goals, and spatial layout. Compared with the policies introduced by the local governments of Guangdong, Hong Kong, and Macao, the knowledge produced by the central government has a more obvious political significance, the content is more abstract, and it has a fundamental influence on the resource allocation, market operation, and folk cooperation.

In summary, the central government’s rational knowledge production plays a crucial role in guiding and promoting the cooperation within the GBA, providing the most important policy support for the regional construction and development.

5. Knowledge-driven collaboration in the GBA: Achievements, challenges, and enhancement recommendations

5.1. Specific achievements

Thanks to spontaneous, decentralized exchanges and cooperation among civilians (local knowledge production), as well as the guidance of government policies (rational knowledge production), the GBA has achieved numerous accomplishments. He Lifeng, Director of the Leading Group Office for the Development of the GBA, declared in 2021 that the GBA has become one of the most open and economically vibrant regions in China (He, 2021). In 2022, Zhu Wei, Executive Deputy Director of the GBA Office of Guangdong Province, believed that with the support of a series of policies from central and local governments, the construction of the GBA has achieved phased results (Xu, 2022). A recent study shows that within the GBA, different cities have formed industrial collaboration, innovation collaboration, infrastructure collaboration, and institutional collaboration with their own characteristics (Wang et al., 2024). According to this study, the interactions between cities such as Guangzhou-Shenzhen, Hong Kong-Shenzhen, Guangzhou-Foshan, and Shenzhen-Dongguan are particularly prominent, and the interaction trend between partnerships such as

Guangzhou-Dongguan and Shenzhen-Zhuhai/Shenzhen-Foshan is increasing.

A wealth of data reflects the achievements of the development and cooperation of the GBA.

According to information disclosed by the GBA Office of Guangdong Province, in 2023, the total economic output of the GBA exceeded 14 trillion yuan, an increase of 3.2 trillion yuan over five years (Ye and Wu, 2024). With less than 0.6% of China's land area, it has created one-ninth of the country's total economic output (Ye and Wu, 2024). In terms of collaborative innovation capabilities, in 2022, the R&D expenditure of the GBA, which represents innovation capabilities, has exceeded 360 billion yuan, entering the top ten global science and technology innovation clusters (Liang, 2023). The joint application of invention patents between cities is an important reflection of the collaborative interaction and innovation links between different innovation entities. The "Guangdong-Hong Kong-Macao Greater Bay Area Collaborative Innovation Development Report (2022)" published by the Guangzhou Daily Data and Digital Research Institute (2022) uses the cross-city invention patent cooperation rate as a measure to explore the effectiveness of collaborative innovation development among different innovation entities. The report shows that the cross-city patent cooperation rate between Hong Kong and Shenzhen is 68.03%, demonstrating a trend of collaborative innovation with industrial agglomeration and concentration of factors; the cross-city patent cooperation rate between Macao and Zhuhai is 18.86%, demonstrating a trend of collaborative innovation with multi-field cooperation and focus on industrialization between the two places.

The Global Innovation Index (GII) "Science and Technology Clusters" ranking released by The World Intellectual Property Organization (2023) shows that the Shenzhen-Hong Kong-Guangzhou cluster ranks second, which is the fourth consecutive year that this technology cluster has ranked second globally. This indicates that since the central government issued the "Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area" in 2019, the GBA has made significant progress in cooperation and innovation. A study shows that from 2010 to 2020, the overall integration level of the GBA has shown an upward trend, and the gap in integration levels between regions has gradually narrowed since 2016 (Zheng et al., 2023). In addition, this study also found that the regional innovation capability of the GBA is improving.

5.2. Existing challenges

While the GBA has achieved a series of accomplishments in cooperation, challenges still persist against the backdrop of institutional conflicts. These challenges are manifested in the production and integration of the two types of knowledge. Firstly, there are issues in the production and application of rational knowledge. Within the GBA, different cities have varying foundational conditions and interests, leading to spatial disparities in their responses to regional cooperation (Zhang et al., 2024). These disparities are reflected in the policies and actions of various local governments. The divergent knowledge produced by local governments represents chaotic signals, which are detrimental to cooperation. In many cases, local governments within the GBA are also engaged in pursuing economic benefits and competing for dominance within the

region (Yu, 2021), manifesting as policies and objectives that protect local interests and create barriers, hindering the integrated regional development. Additionally, some of the GBA development plans formulated by the central government, despite being ambitious, have relatively vague specifics, lack implementation mechanisms, and lack operational policy effectiveness evaluation standards (Yang et al., 2022; Yu, 2021). Such flawed rational knowledge is difficult to have the desired impact on cooperative practices.

Secondly, the production of rational knowledge suppresses the production of local knowledge. As the driver of cooperation in the GBA gradually shifts from the market to the government, especially the central government (Lin et al., 2024), conflicts in the production of the two types of knowledge are inevitable. Compared to the United States, regional cooperation in China relies more on policy mobilization and participation from higher levels of government, which plays a key role in promoting regional cooperation and reducing regional inequality (Zhang et al., 2024). However, central dominance can also easily suppress local initiative when promoting cooperation (Yang et al., 2022). Specifically, in the process of promoting cooperation in the GBA, the central government has not only the intention to develop the economy, as cited by Yu (2021), but also possesses clear political objectives. For the central government, promoting cooperation in the GBA is an important task in advancing the country's "Belt and Road" initiative. At the same time, against the backdrop of Sino-American trade conflicts, the central government also attempts to promote cooperation in the GBA to safeguard the country's economic security (Yu, 2024). These political objectives of the central government are reflected in its knowledge production, such as the planning of a cooperative project that does not have anticipated economic benefits. Since the central government's objectives are not necessarily economically oriented, the political signals it sends may not align with public expectations, which could hinder proactive innovation.

In the context of institutional conflicts, government intervention in regional cooperation particularly needs to maintain boundaries. Although there has been improvement through gradual civilian exchanges, political trust within the GBA is still insufficient (Yang et al., 2022). In such a context, excessive government dominance, especially excessive central government dominance, may suppress the enthusiasm for civilian interaction, which is not conducive to cooperation and may even damage the foundation of cooperation established through spontaneous civilian exchanges. According to research, Hong Kong society has complex reactions to the GBA plans introduced by the government, with concerns and resistance to deepening integration with the mainland (Yu, 2021).

5.3. Recommendations for improvement

Firstly, it is essential to improve the production of rational knowledge. To reduce divergence and friction and enhance the compatibility of local policies, there is a need for more reliable communication and coordination mechanisms among local governments in the GBA to output consistent policies and promote the integrated development. Although Hong Kong and Macao enjoy a high degree of autonomy, China remains a unitary state where the higher-level government can significantly

influence local governments. In coordinating the knowledge output of local governments, the central government can thoroughly analyze the causes of local conflicts and subsequently exert influence. Additionally, the central government needs to increase communication with local governments, work with them to refine macro policies, and promote the establishment of cross-border implementation mechanisms for central policies at the local level, providing subordinate levels and society with complete and clear rational knowledge.

Secondly, there is a need to value the production of local knowledge. It must be clear that the role of the government in the cooperation of the GBA is bounded. To ensure the vitality of civilian entities, it is necessary to prevent the government from becoming a monopolistic force in promoting cooperation (Lin et al., 2024). The power of entities outside the government must be taken into account. According to Hayek (1980), decentralized and localized civilian knowledge is crucial for decision-making. Therefore, the government needs to create more favorable conditions and expand support for civilian exchanges and cooperation, such as cultural exchanges in both directions (Han et al., 2019), to accumulate local knowledge resources for further cooperation. Moreover, the government also needs to construct more multi-party participatory, open cooperation frameworks (Yao et al., 2020), allowing more voices to be included in the planning and decision-making of the GBA.

6. Conclusion

In the contemporary era, cooperation has become a necessary condition for regions to maintain sustainable development capabilities, and the creation of win-win situations through cooperation has become a consensus. Numerous regional cooperation practices that span cities, regions, and even national borders have emerged, such as the European Union, the Association of Southeast Asian Nations, and the Tokyo Bay Area. These collaborations have facilitated regional economic growth, local governance, and social welfare. Based on existing practical experience, successful regional cooperation generally possesses institutional similarity, and most existing research on regional cooperation is also conducted under the premise of institutional similarity. This gives rise to the perception that regions facing institutional conflicts may find it difficult to cooperate. However, the actual situation is not entirely so, and the GBA in China is an example that defies common sense. In the GBA of China, there is a coexistence of capitalist and socialist systems, where institutional conflicts are quite evident. Nonetheless, regional cooperation has still been achieved. This paper provides an answer to this question based on the sociology of knowledge.

This paper points out that the collisions resulting from institutional conflicts within the GBA have yielded positive outcomes. These collisions have prompted all parties to maintain dialogues and to design response strategies based on local conditions, past experiences, and available resources, thereby establishing identity and cultivating specific cooperation rules and mechanisms in various fields. This is the process of producing local knowledge. Such knowledge has promoted various forms of exchange and specific cooperation and has also provided conditions for official promotion of large-scale cooperation.

Local knowledge sends signals to local and central governments about what

needs to be done and how to do it, and institutional conflicts have also attracted the attention of the government. These factors have prompted the official sector to take actions that meet local needs and provide support for regional cooperation. This is the process of producing rational knowledge. Rational knowledge has encouraged specific cooperation at the grassroots level and has also facilitated large-scale, global cooperation. The two types of knowledge promote each other, enabling cooperation in the GBA, despite conflicts, to be realized. A recent study supports the viewpoint of this paper from one aspect. This study points out that since the 1980s, cooperation in the GBA has shifted from market-driven to a joint drive by both market and government, with the role of the central government becoming increasingly apparent (Lin et al., 2024). In fact, market-driven and government-driven correspond to the production of local and rational knowledge, respectively.

This paper finds that under the influence of two types of knowledge, the cooperation within the GBA has achieved notable accomplishments, yet challenges persist. Firstly, there are issues with the production of rational knowledge by the government. Most notably, the knowledge produced by various local governments is inconsistent, leading to a chaotic array of knowledge products. Additionally, the rational knowledge produced by the central government is not yet systematic or comprehensive, which restricts the practical impact of central policies on regional cooperation. Secondly, the production of local knowledge has been suppressed. The objectives of government-promoted cooperation may not align with those of spontaneous grassroots cooperation, hence excessive government intervention could stifle the enthusiasm and creativity of civilian entities in participating in cooperation. This is particularly evident in the GBA, where there are significant institutional differences and political trust remains inadequate. In response to these issues, it is necessary for central and local governments to take targeted actions to improve the production of both types of knowledge.

The research presented in this paper contributes new insights to regional cooperation and governance, offering a reference path for a multitude of regions around the world that suffer from institutional conflicts to achieve cooperation. Through an analysis based on the sociology of knowledge, this paper reveals the dynamic mechanisms by which regional cooperation within institutional conflicts is realized. The paper points out that despite potential challenges, regional cooperation within conflicts is entirely possible.

This study also has some shortcomings. First, compared to the EU, the San Francisco Bay Area, and the New York Bay Area, the GBA is relatively young, and this paper cannot capture some dynamics that only emerge in the long-term cooperation, such as the transformation of the government's role. Second, this paper mainly focuses on institutional conflicts and pays less attention to other types of conflicts that regional cooperation faces under the background of "one country, two systems." These shortcomings also provide directions for future research. Next, it is necessary to conduct a diachronic observation of the cooperation in the GBA, and it is also necessary to carry out cross-regional comparative studies to further confirm the uniqueness of regional cooperation amidst institutional conflicts.

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