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INTERCITY RELATIONSHIPS WITHIN URBAN AGGLOMERATION AND THEIR IMPACTS ON URBAN ECONOMIC DEVELOPMENT IN THE CASE OF GUANGDONG-HONG KONG-MACAU GREATER BAY AREA, CHINA

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ABSTRACT

Urban agglomerations play an increasingly significant role in the process of regional and national participation in international labour division and competition. how to understand cities' positions within urban agglomeration, and how to promote economic development through complementarity-ness is a significant or worthwhile research subject. This thesis took 11 cities from Guangdong-Hong Kong-Macau Greater Bay Area, one of the most developed urban agglomerations in China as a case to clarify the characteristics of urban relationships and their impacts on urban economic development. First, it measured and analysed the influencing paths of intercity relationships on urban economic which were based on urban aggregation and diffusion effects, urban economic network and industrial division of labour. Second, it judged intercity relationship as either competition or complementarity according to the quantitative outcomes of the relationships of three industrial sectors. Finally, this thesis tested and evaluated the impacts of intercity competition on urban economic development.

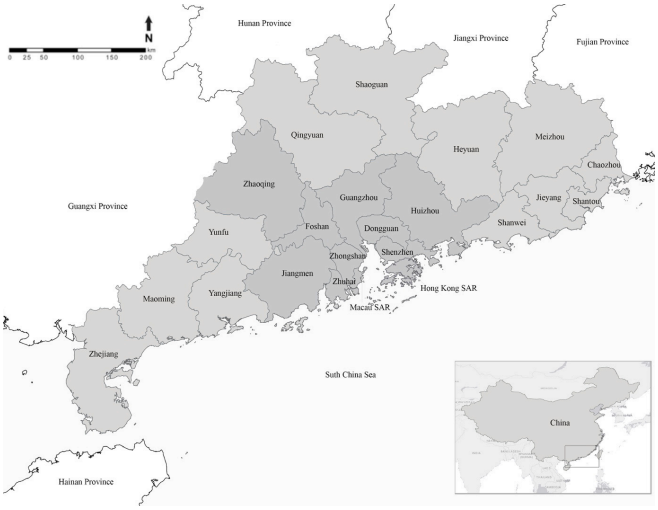
Key Words: Urban agglomeration, competition, complementarity, urban economic development

1. INTRODUCTION

1.1 Background

Urban agglomeration is the results of flows of production factors and industrial division of labours among cities within a specific geographic area(Sevtsuk and Mekonnen, 2012). In the context of economic globalization and regional integration, urban agglomerations have become an important spatial unit that representing a country's participation in international competition and complementarity(Alderson and Beckfield, 2004). The development of urban agglomerations in conducive to the optimal allocation of resources within the region(Meijers, 2005). However, cities mostly ignore the interests of the other cities to attract capital, business, talent and investment, thus promoting their own economic development. This often leads to regional problems such as industry contradiction, function duplication, and uneven development levels among cities(Goetz and Kayser, 1993). Therefore, how to recognize cities' position within the urban agglomeration, and how to promote economic development through complementarity is a significant research subject.

Eleven cities from Guangdong-Hong Kong-Greater Bay Area (see Figure 1), one of the most developed urban agglomerations in China, are the study samples of this research. These eleven cities show a clear hierarchy in terms of political position, economic development level, comparative advantages and industrial characteristics(Zhang, Lin, et al., 2017). Since 1980s, based on their own comparative advantages, a strong network of competition and complementarity has formed among these cities(Sit, 1998). However, in the meanwhile, several factors have also led to fierce disorder competition and unscientific complementary behaviours among these cities(Yang, 2006). First, due to Hong Kong, Macau, and mainland cities from PRD enjoy three different administrative systems, currency systems and economic systems, the complementary obstacles between these three regions always exist. Second, due to the lack of scientific regional development guidance, cities tend to develop the similar high-valued industries, even in the case they do not have the comparative advantages(Zhang and Kloosterman, 2016). This leads to geographic



niche overlaps and functional niche overlaps among cities.

[Figure 1] Location of Guangdong-Hong Kong-Macau Greater Bay

1.2 Research question and objectives

This thesis takes GBA as a case to analyse intercity relationships among cities, as well as measure the impacts of intercity competition and complementarity on urban economic development. The specific objectives were:

a). To analyse the influence paths of intercity relationships on urban economic development from three perspectives: spatial economic distribution, urban economic network, and industrial division of labour.

b). To measure to what extent which city compete or complement with each other in terms of three sectors of industries.

c). To examine and evaluate the impacts of intercity competition and complementarity on urban economic development.

d). To propose policy recommendations on dealing with intercity relationships for policy-makers.

e). Based on the research objects, the main research question is:

f). What are the characteristics of intercity relationships among cities within urban agglomeration and their impacts on urban economic development in the case of Guangdong-Hong Kong-Macau Greater Bay?

g). It includes three sub-research questions:

h). What are the influencing paths of intercity relationships on urban economics in cities within GBA?

i). To what extent do cities compete or complement with each other in terms of different industrial sectors

within GBA?

j). What are the impacts between intercity competition/complementary relationships and urban economic development within GBA?

1.3 Research significance

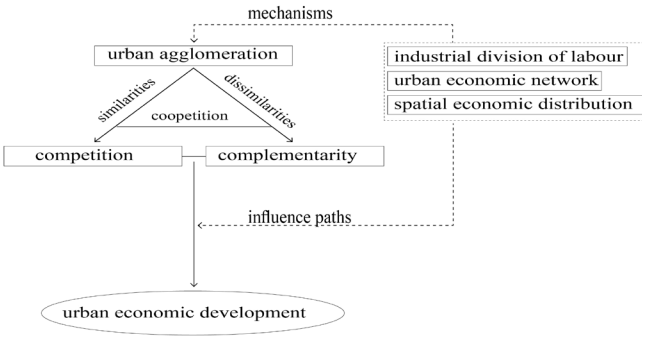
This thesis contributes to academic research and policy recommendations to GBA as well as the other urban agglomerations. As for scientific significance, it researches intercity geo-economic relationships, thus contributing to theoretical development in economic geography. In focusing on urban agglomerations that play increasingly significant role in promoting national and regional economic development as well as competitiveness, this study offers new insights to measure the extent of intercity competition and complementarity. As for policy relevance, the evaluation of geo-economic relationships, which may have influencing effects on urban economic development, contributes necessary ingredients needed for appropriate economic strategies.

2. RESEARCH GAPS AND CONCEPTUAL FRAMEWORK

The research gaps on impacts of intercity relationships on urban economic development are as following:
First, a great deal of empirical research have been done from the perspectives of intercity economic relations and the functional division of labour within the urban agglomeration(Frenken and Boschma, 2007). However, the existing research is limited and few are on judgment criteria of intercity relations(Wheeler and Beatley, 2014).

Second, many factors affect urban economic development(Van der Ploeg and Poelhekke, 2008). Except for factors such as capital, technology, the development of surrounding cities, especially those within the same urban agglomeration, also makes a significant impact. However, only a few literatures reviewed concerned the impacts of the surrounding cities on the development of itself(Wall, Burger, et al., 2011). Also, most of the studies on intercity competition and complementary relationships have applied qualitative methods. Quantitative research is limited.

Third, the generation of intercity relationships and their impact on urban economic development requires paths, but there have been few relevant researches focusing on these important paths(Wall and Stavropoulos, 2016). These research gap appeal for the need to establish a new theoretical framework to understand the impacts of inter-



city relationships on urban economic development and more explanations on the influencing paths.

[Figure 2] Conceptual Framework

As was illustrated in the conceptual framework (see Figure 2), regional industrial labour division, urban economic network, and the aggregation and diffusion effects of core cities would contribute to the emergence of urban agglomeration. The similarities between cities would lead to the emergence of competitive relationships, while the dissimilarity between cities would cause the emergence of complementarity relationship, which was defined as 'coopetition'. The impacts of intercity relationship on urban economic development need certain paths. After reviewing the literature, this thesis believed that three factors, which promoted the formation of intercity relationships among cities, were also the influence paths for the impact of intercity relationships on urban economic development. After this, based on the quality of urban economic development, the impact of intercity competition and complementarity on urban economic development was assessed.

Based on the conceptual framework, this thesis was implemented in three analytical steps: Part A focused on quantitative measurements of intercity competition and complementarity relationship among cities; Part B focused on quantitative analysis and qualitative description of the influencing paths and mechanisms of intercity on urban economic development; and Part C focused on verification of whether intercity competition make influence on urban economic development.

3. RESEARCH METHODS

The dependent variable in this research is the level of urban economic development, which is represented by PGDP of each city. Different independent variables are used to proxy the levels of intercity competition and complementary relationships, respectively. For inter-city competition, the percentage of FDI to GDP is used as an independent

variable. The percentage of cargo volume in GDP is used to proxy inter-city complementarity. Beyond these two variables being used to proxy intercity competition and complementary relationships, thus considered as influencing factors on urban economic development, several other variables (unemployment rate, urbanization rate, and Engel coefficient) were used as control variables. In addition, in order to clarify the influencing paths of intercity relationships on urban economic development, economic spatial distribution, industrial location division of labour, and urban network were analysed.

[Table 1] Operationalization of sub-questions

Specific research question	Concepts	Variables	Indicators	Data collection methods and sources	Data analysis methods
What are the influencing paths of intercity relationships on urban economic development in cities within GBA?	Industrial location division of labour	Industrial structure similarities	Industrial relational degree of three sectors of eleven cities, GBA and China (%)	Secondary data including gross domestic product of three sectors of industries of 11 cities, GBA and China from 2010 to 2015: -Yearbooks of 11 cities - Statistical beaus websites	Location-entropy grey relational analysis at MathCad
	City economic network	The attractiveness between cities, centralities	The degree of attractiveness of two cities (number), city centralities (number)	Secondary data including total population of 11 cities, highway distance between each two cities: -Yearbooks of 11 cities -Google Map	Urban gravity model at MathCad and Ucient
	Economic aggregation and diffusion	Economic spatial distribution	Global Moran' I (number) Local Moran' I (number)	Secondary data including PGDP of 130 districts in eleven cities: - Yearbooks of 11 cities	Global Morans' I, Abselin Local Moran's I at ArcGIS and Geoda
To what extent do cities compete or complement with each other in terms of three sectors of industries within GBA?	Regional competition network	Percentage of GDP of three sectoral industries in GDP	Degree of intercity competition in three industrial sectors	Secondary data including add values of three sectors of industries in eleven cities from 2000 to 2016: -Yearbooks of 11 cities - Statistical beaus website	Dendrinos-Sonis model and SUR estimation at excel and Stata
	Regional complementary network		Degree of intercity complementarity in three industrial sectors		

What is the relation between intercity competition/ complementary relationships and urban economic development?	Urban economic development	The levels of urban economic development	Total value of gross domestic production per capita (number)	Secondary data including PGDP of 11 cities from 2010 to 2015: - Yearbooks of 11 cities	Panel regression models at Stata (Spatial Durbin Model)
	Competition	External investments	Percentage of FDI to GDP (%)	Secondary data including the amount of FDI and DI of eleven cities from 2010 to 2015: - Yearbooks of 11 cities - World Bank Database	
	Complementary	Cargo capacity	-Percentage of Cargo volume in GDP (%)	Secondary data including the amount of total cargo volume of eleven cities from 2010 to 2015: Website of Ministry of Transportation of China	
	Labour source	Labour source	Employment rate (%)	Secondary data of the number of employers of eleven cities, total population from 2010 to 2015: - Yearbooks of 11 cities	
	Urbanization rate	Urbanization rate	The percentage of non-agricultural population to total population (%)	Secondary data of the amount of non-agricultural population, total population from 2010 to 2015: - Yearbooks of 11 cities	
	Engel coefficient	Engel coefficient	The percentage of food expenditures to total consumer spending (%)	Secondary data of the amount of food expenditures from 2010 to 2015: - Yearbooks of 11 cities	

4. RESEARCH FINDINGS

Synthesizing all the analysis mentioned, the answer to the three sub research questions could be summarized as follows:

4.1 Economic spatial distribution

Based on the research results of economic spatial distribution, we can conclude that the economic spatial pattern within GBA shows a concentrated state. The Global Moran's I index rose from 0.176142 in 2005 to 0.278832 in 2015. However, in the meanwhile, the outcomes of Local Moran's I indicates that the imbalance of economic development within GBA is obvious. It can be seen from the Lisa maps that the economically developed regions are concentrated around the estuary of the Pearl River, although it shows a tendency to expand to the surrounding areas. Economically less developed areas gather in the northern and eastern parts of GBA. This also indicates that the aggregation effect of the core cities is stronger than the diffusion effect.

4.2 Urban economic network

Based on the research results on the urban economic network conducted by social network analysis method, we can draw that the economic spatial structure of GBA has gradually changed from a hierarchical structure to a multi-polar centre network. To be specific, the core cities of GBA have changed from Hong Kong and Macau to Hong Kong, Guangzhou, Shenzhen and Macau. All the numerical values of economic linkages between each two cities calculated by urban gravity model are increasing yearly. This indicates that the cooperative relationship among cities is constantly improving, and the urban economic linkages tend to be spatially balanced. In the meanwhile, the calculating results on network centrality show that network centralization trend has slightly declined from 19.65% in 2005 to 17.95% in 2015. it indicates that although the core cities' superior positions within GBA are still obvious, the other cities also play constantly more significant roles within the urban network. However, the results of cohesive subgroup analysis show that the urban economic network still relies too much on the diffusion effects and the betweenness functions of the core cities.

4.3 Industrial division of labour

The calculation of industrial location quotient indicates that retails, accommodation and food service, and financial industry occupied the largest economic share in GBA, while agriculture and construction accounted for the lowest. The outcomes of the grey correlation degree of each city shows that Guangzhou, Shenzhen and Dongguan enjoy a

more competition relationship with other cities, which is caused by their large economic scale. The grey correlation degree of each industry shows that cities show a great competition relationship with each other in terms of real estate, construction, and transportation/storage.

4.4 Intercity quantitative competition and complementary relationships

Intercity relationship is defined as being either competition or complementary. Combined with D-S model, by using SUR method and taking Guangzhou as the reference city, this thesis measures the competition or complementary relationships of three sectors of industries among cities. Based on the outcomes of intercity industrial relationships, conclusions on intercity relationships can be drawn:

Cities with similar industrial comparative advantages are more likely to have a competition relationship, while cities enjoy a 'supplement-demands' relationships tend to complement with each other. In terms of primary industry, the main agricultural product export cities, Zhaoqing, Jiangmen and Huizhou compete with each other. In the same time, they enjoy a complementary relationship with agricultural product import cities, such as Guangzhou and Shenzhen. Cities with more developed secondary industry, Dongguan, Foshan and Zhongshan, show more complementary relationships with other cities. When these cities develop their own secondary industry, they also drive the development of secondary industry of the surrounding cities. When it comes to the tertiary industry, cities show a fierce competition relationship. In recent years, each city has implemented industrial upgrading policies and focuses on developing tertiary industry. It results in industrial homogeneity among cities. Overall, the division of labour in primary industry and secondary industry among cities is clear, while the contradiction of the division of labour in tertiary industry exits obviously.

When it comes to the core cities in GBA, Guangzhou shows a strong diffusion effect on the other cities, while Shenzhen does not. It can be seen from the results that there are industrial synergies between Guangzhou and most other cities. But Shenzhen only shows a complementary relationship with other cities in terms of secondary industry. Especially when it comes to the tertiary industry, Shenzhen shows competition relationship with all the other cities except for Hong Kong. Strengthening the aggregative effects of the core cities plays a significant role in the development of urban agglomeration. But excessive unequal policy support which neglects the development of the other regions will perform a negative impact on the urban cluster in the long term. The complementary relationships between Hong Kong/Macau and the mainland cities in PRD is weak. Due to the political and economic institutional reasons, these three independent market systems differ from each other in in terms of economic, administrative, fiscal and currency systems. As two relatively independent economies, the complementary relationship between Hong Kong/Macau and the other nine mainland cities from PRD is much weaker than that between cities from PRD and other mainland cities. Although various policies have been proposed in promoting collaboration between Hong Kong/Macau and PRD, rigid institutional constraints and administrative differences are still the major obstacles to the cooperation bottlenecks and the slow progress of cooperation policies.

4.5 Impacts of intercity relationships on urban economic development

Based on the OLS regression results of econometric quantitative model for intercity competition and intercity complementarity, we can conclude that to an extent, intercity competition relationship has a positive effect on local urban economic development. However, the spill-over effect on the economic development of the other cities is negative. That is, excessive intercity competition will limit the economic development of other cities. In the meanwhile, intercity complementary relationship has a positive effect on both the local economic development and the economic development of other cities. The spill-over effect on the other cities is positive. In addition, residents' consumption level, urbanization level and employment rates will also affect urban economic development to varying degrees.

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