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A Geospatial Analysis of Multi-scalar Regional Inequality in China

中国多尺度区域差异分析：地理空间分析视角

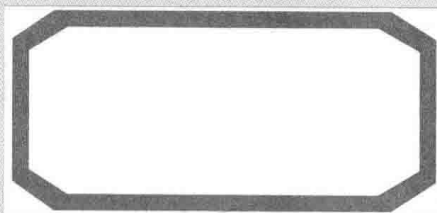
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List of Abbreviations

GIS	Geographic Information System
GDP	Gross Domestic Product
PCGDP	Per Capita Gross Domestic Product
ESDA	Exploratory Spatial Data Analysis
FDI	Foreign Direct Investment
FAI	Fixed Asset Investment
MAUP	Modifiable Areal Unit Problem
PRD	Pearl River Delta
YRD	Yangtze River Delta
BER	Bohai Economic Rim
BTH	Beijing–Tianjin–Hebei region
CP	Central Plain
CCMR	City Clusters along the Middle Reaches of the Yangtze River
CYM	Chengyu Megalopolis
HCC	Harbin–Changchun Area
SOE	State-owned Enterprises
WTO	World Trade Organization
LISA	Local Indicators of Spatial Association
HMLM	Hierarchical, Multivariate Linear Model

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Chapter 1 Introduction

1.1 Research background

Given its significant ramifications on social instability and national insecurity, regional inequality is a major concern for both national governments and academic inquiries (Y. D. Wei, 1999; Wei, 2002b). The temporal trend as well as the driving forces underlying regional inequality has been subjected to heated debates (Amos Jr, 1990; Barro & Sala-i-Martin, 1995; Fan & Sun, 2008; Fleisher, Li, & Zhao, 2010; Smith, 1984; Wei & Ma, 1996). Until now no real consensus has been reached since a number of different data sources, time periods and methodologies have been utilized in the literature (Kanbur & Zhang, 1999; Liu, 2006; Tsui, 1996, 1998; Wei & Ye, 2009).

Since the Opening up and Reform Policy in 1978, China is characterized by tremendous economic development with an average growth rate of 9.91% from 1978 to 2010 (CSB, 2011). However, the consequent intensifying regional inequality forms another major concern for the Chinese governments, which constitutes a potential threatening factor for social instability (Y. D. Wei, 1999). The intensifying regional inequality has elicited a series of policy responses from local and central governments. At the beginning, the development of the coastal regions was encouraged firstly because the central government intended to accelerate the development of other regions by virtue of the spillover effect from coastal areas. However, contrary to what the government expected, the polarization effect was much stronger than the spillover effect, resulting in intensifying disparity among coastal, western and central regions. In this background, the western development was proposed in 1999 while the rise of central China was put forward in 2004. These two strategies were adjusted to the local conditions. The

former strategy is devoted to enhancing the infrastructure investment, improving the education and the ecological environment in the western region. The latter one aims to enhance the agricultural infrastructure, develop the coal-based industry and equip the transportation network in connection with the western and the coastal parts. Besides the regional disparity, urban-rural inequality is another concern for the Chinese governments. The rural tax-free reform has been implemented since 2004 to increase the income of farmers. In 2006, the rural highway construction programme was proposed to enhance the rural transportation and improve the county-level economic development. All these strategies aim to reduce regional inequality as well as urban-rural inequality in China.

Are these development strategies effective to address the intensifying regional inequality in China? According to the World Bank, the Gini index in China is as high as 0.49 in 2009. To answer this question, the primary issue is to understand the determinants of regional inequality in China. Until now, there has been no consensus regarding the driving factors causing regional inequality (Amos Jr, 1990; Barro & Sala-i-Martin, 1995; Smith, 1984). At the beginning, preferential treatment of the coastal regions, especially the establishment of Special Economic Zones, was largely blamed for the intensifying regional disparity (Démurger, Sachs, Woo, Bao, & Chang, 2002; Jian, Sachs, & Warner, 1996). Wei (2001) put forward a triple process of decentralization, globalization and marketization, which fundamentally changed the mechanisms underlying regional inequality. Later on, a multilevel and multi-mechanism framework was proposed by Wei (2002b) to explain the characteristics of regional development in China. However, the significance of policy and geography has always been neglected by these frameworks, or it has been simplified by the means of a regional dummy variable. How these multiple mechanisms interact with each other and show spatially heterogeneous impact on regional development remains significantly theoretical and practical questions to be answered.

With the aid of the more rigorous Geographic Information System (GIS) and econometric methods, a rich literature has contributed to the dynamics, patterns and mechanisms of regional inequality in Chinese provinces. However, more ef-

forts are still found wanting to tackle the following research limitations. First, regional inequality not only exists among provinces or subregions, but is more conspicuous within provinces (Liao & Wei, 2012). Although some attempts have been made to figure out the intra-provincial inequality (Fan & Sun, 2008; Wei & Ma, 1996), the concentrated research on several coastal provinces like Guangdong or Jiangsu (Fan, 1995a; Gu, Shen, Wong, & Zhen, 2001; Tsui, 1998; Yu, 2011) is insufficient to uncover the holistic picture of regional inequality across counties in China. Provinces, prefectures and counties are three major forms of administrative divisions in China. How to make a comparative analysis from a multi-scalar perspective is definitely conducive to policy-making for the central and local governments. Second, a spatial view is very crucial for regional inequality analysis (Isard, 1956; Krugman, 1991). Some scholars have examined the spatial pattern of regional development and attempted to explain regional inequality by studying spatial autocorrelation (Wei & Ye, 2009; Yu & Wei, 2003). However, spatial dependence, spatial heterogeneity, spatial scales and spatial hierarchy constitute primary characteristics of spatial data, which have rarely been studied together when studying regional inequality. Third, GIS and econometrics have been widely employed as effective techniques to study regional inequality (Song, 2013; Yu & Wei, 2003). However, they failed to investigate the spatio-temporal hierarchy embedded in the process of regional development. More advanced spatial and hierarchical models like spatial econometrics, hierarchical multivariate multilevel model, should be utilized to shed some new lights on regional studies.

1.2 Research objectives

The main objective of this book is to investigate regional inequality across counties in China and examine their spatio-temporal characteristics. Specifically, this research is to analyze the changing processes of regional development after the Asian financial crisis in 1997, to understand the spatio-temporal characteristics of regional inequality across counties, to identify the consequent emergence of new methods of regional economics, and to explain the determinants causing

regional inequality in the context of socialist marketization.

Research objectives are threefold. The first objective is to figure out the temporal trend and the spatial pattern of regional inequality across counties and compare their differences with other tiers of regions (e. g. subregions, provinces and prefectures). Special attention will be paid to the scale effect of regional inequality. This analysis is based on a comparative spatio-temporal theoretical framework. The second objective is to analyze regional heterogeneity of regional development within four subregions in China and compare their different development trajectories. Particular interest will be given to the agglomeration economies and the development of metropolitan regions within each subregion. Some advanced spatial techniques are employed to assist the prediction of regional development in the long run. The third objective is to examine the determinants of regional inequality across counties from a spatially hierarchical perspective and to identify the combination of major driving factors. Besides the impact of globalization, decentralization and marketization, special concern will be put on geographical factors and different policies as well as their heterogeneous influence in four subregions.

China provides a unique and significant example to study regional inequality and test the related theoretical foundations justified in the West. Different from the capitalist system, China is characterized by a socialist transitional economy from a planned system to a market-oriented one after the Opening-up and Reform Policy in 1978. Deng Xiaoping's tour around southern China in 1990s aroused a new round of socialist marketization reform after the 1989 Tiananmen incident. With the deepening of the Opening-up and Reform, China has increasingly integrated itself to the global economy and showed its presence on various international occasions. Whether these Western theories in regional economy can be applicable to Asia, and China in particular, and how these theories are affected by the socialist system will be examined in this book. Furthermore, as the most populous country in the world, it may provide some significant hints on the development of India as the second most populous country.

Aiming to achieve the above research objectives, this book revolves around three central themes about regional inequality in China. The first theme is to examine the temporal trend of multi-scalar regional inequality in China. Drawing on

recent releasing of county-level statistical yearbooks, a multilevel geodatabase of socio-economic variables could be constructed at provincial, prefectural and county levels. By selecting an appropriate inequality indicator, this book will put emphasis on the multi-scalar review of convergent or divergent regional inequality and its heterogeneous characteristics of regional disparity. Furthermore, a multi-scalar decomposition analysis is undertaken to portray the evolution of regional inequality within and between subregions/provinces/prefectures. The long-run property of regional inequality is also examined to predict the future scenario of regional development in China. The second theme is to investigate the spatial characteristics of multi-scalar regional inequality in China, such as global and local spatial pattern, spatial agglomeration and spatial dynamics. A series of spatial techniques will be employed to figure out the spatio-temporal hierarchy of regional inequality and the long-run spatial structure of multi-scalar regional development. Geovisualization method will be adopted as well to assist the visualization of dynamic spatial relations. The third theme is to explore the major determinants of regional inequality across counties under a comparative spatio-temporal framework. A multi-scale and multi-mechanism analytic framework is utilized to review the development processes in county-level China. How globalization, marketization, decentralization, geography, policy, urbanization, investment and education demonstrate a different impact on regional development and to what extent these factors interact with each other have been examined in the context of transitional China.

Furthermore, there are three major hypotheses this book aims to test.

Hypothesis I: Are the development strategies effective to address the intensifying regional inequality in China? The central government proposed western development in 1999, the rise of central China and revitalization of northeastern China in 2004. It remains an unsolved question to the effectiveness of these strategies in the context of a socialist country.

Hypothesis II: Can those western theories be applied in the Chinese context? In the field of regional studies, the majority of theories originate from the West such as neoclassical growth theory, Kuznets hypothesis, new economic geography, etc. Few studies questioned the suitability of these theories in the so-

cialist market economy of China.

Hypothesis III: Is a spatial viewpoint indispensable to interpret regional inequality in China? With the advent of new economic geography proposed by Krugman (1991), a spatial view into region studies is emphasized by many scholars and utilized in the Chinese context. Whether a spatial viewpoint can shed some lights on understanding multi-scalar regional inequality in China remains unknown.

1.3 Theoretical significance and practical importance

Uneven development as a significant geographic issue has aroused great interest of many geographers. At the beginning, geographers treated uneven development as a historical and universal process, which can be described as “everything develops unevenly”. Later on, great efforts have been made to theorize the phenomenon of uneven development, which has a legacy in Marxist theory. Dependency theory, central-periphery theory, neoclassical theory, endogenous growth, new economic geography theory and other various theories of underdevelopment all capture something of this process. But their focus tends to be on the global scale and their applicability in socialist countries has yet to be investigated. Although many scholars have studied regional inequality in China and tried to persuade readers that Western theories cannot explain the Chinese story completely, some scholars still instantiate that the famous Williamson hypothesis (Williamson, 1965) or new economic geography (Krugman, 1990) applies to China very well. Many disputes or inconsistencies about the uneven geographical restructuring widely exist. Few previous studies have scaled down to a finer-scale analysis in the whole China to test the theoretical hypothesis. Regional inequality is sensitive to geographic scales. Therefore, this study aims to test whether and to what extent Western theories apply to the socialist market economy by analyzing regional inequality in China from a multi-scalar view. Special attention will be given to clarify three theoretical disputes, namely “divergent or convergent”, “endogenous or exogenous” and “spatial or aspatial”.

Uneven development is a political issue as well as a geographical one. In ad-

dition to the geographical question, the theory of regional inequality aims to answer the political question: what kind of governmental intervention is effective to reduce regional inequality and maintain robust economic development as well? The threat of regional inequality to social instability and national security exists in many countries. How to gain a balance of equity and efficiency of development has become the main goal of them, and especially for the Chinese governments. As a result of territorial vastness in China, unbalanced growth is a very intense issue and many strategies have been carried out to relieve the intensifying regional disparity, such as western development, the rise of central China and reviving of northeastern China. However, these policies are mainly focused on these four subregions, even though within each subregion there is also a widening inequality. Furthermore, the development of counties has been recently emphasized by the central government as a new way to relieve poverty and reduce inequality. Within this background, the analyses on basis of counties are particularly significant to understand the socio-economic context of counties' development and make effective policies. This study aims to further the understanding of regional inequality in China from a finer scale, namely counties, and tries to uncover bottom-up and top-down processes of economic development, which would shed some new lights on policy implications for counties' balanced development.

1.4 Organizational structure

The organization of the study is as follows:

Chapter 1 introduces the research background, objectives, theoretical significance and practical importance and organization of this book.

Chapter 2 examines pivotal concepts and approaches of regional inequality and reviews the theoretical debates and methodological advances in the field of regional studies. A comparative spatio-temporal theoretical framework is formulated on the basis of theoretical and empirical studies on the Western and Chinese contexts.

Chapter 3 describes the study area and specific concerns regarding to data processing. Research methodologies are introduced to tackle three major issues of

regional inequality. GIS and various spatial techniques are utilized and their working procedures are also elaborated.

Chapter 4 investigates the temporal trend of multi-scalar regional inequality in China and analyzes inter/intra provincial/prefectural inequality as well as urban-rural inequality using a multi-scalar decomposition analysis. Markov chain is utilized to explore the ergodic distribution of regional development, providing foundation for economic forecasting in China.

Chapter 5 utilizes GIS and its spatial analysis to examine the global and local spatial pattern of regional development across counties. Metropolitan regions as the growth engines of regional development are compared in terms of socio-economic context and spatial pattern. Moreover, by virtue of spatial analysis and geovisualization methods, the spatial distributional dynamics of multi-scalar regional development are demonstrated as well.

Chapter 6 employs a hierarchical, multivariatelinear model (HMLM) and the spatial filtering method to examine the determinants of regional inequality at the county level and make some policy suggestions for China's economic development.

Chapter 7 discusses the research findings in this book and attempts to propose some new research directions.

Chapter 2 A Theoretical Framework for Multi-scalar Regional Inequality in China

The last three decades of China have witnessed an emerging restructuring of the geographic space as well as a dramatic economic restructuring. The objective of this chapter is to unravel the theoretical logic driving the intensifying economic inequality at different geographic scales in China. Although regional inequality has been a long-debating issue, definitions of the region and concepts of inequality are often different by each scholar, leading to unclear terminologies. By clarifying these fundamental concepts of regional inequality, this chapter conducts an exhaustive review on theoretical and methodological advances prevailing in the field of regional economics. Since these popular theories originated from the West, how to justify their applicability in the context of transitional China remains a critical research issue. Drawing upon recent theoretical advances and empirical evidences in China, this chapter integrates Western theories into the China context and puts forward a comparative spatio-temporal framework for studying the multi-scalar regional inequality in China. A dialectical analysis is elaborated to justify the rationality and suitability of this framework in the Chinese case.

2. 1 Pivotal concepts and approaches

Definition of the region

It is widely acknowledged that regions unevenly develop, as has been seen in Great Britain as well as other regions, making it therefore a “regional” problem (Kaldor, 1970). Furthermore, this problem of uneven development does not necessarily lead to the same kind of inequalities across cultures and social

structures. Generally speaking, regional inequalities within countries are not nearly as large as that between the rich and poor countries of the world. The primary question of what causes the “regional” differentials of economic growth rates has been posed by many scholars. Before the dimensions of “regional” uneven development will be discussed, it is important to define the concept of region.

A region usually as a part of a “nation” or a “country” is inclined to be homogenous in political institutions, taxing, spending authority and currency (Kaldor, 1970). It acts as a whole and interacts with other external entities, formulating certain economic relations. But actually it is arbitrary to define a region according to the political homogeneity in terms of other socio-economic or cultural aspects. There are numerous ways to determine the scope of a region, which is rather difficult to decide the optimal method of regional division. In regards to previous contributions (Cheshire, 1990; Cheshire & Carbonaro, 1996; Cheshire, Carbonaro, & Hay, 1986; Cheshire & Hay, 1989), a region is to be defined economically coherent, self-contained as spatial divisions of a single open economy. One region is representative of the local economy and the local political effect in accordance with its self-containment feature (Gordon & Lamont, 1982).

Even though administrative units are not always economically coherent, a region has often been defined according to its historical and administrative boundaries. Cheshire and Carbonaro (1996) defined regions as Functional Urban Regions in terms of concentrations of employment. Even though having disparate regional divisions, it does not make too much difference to the subsequence analysis only if the identical spatial partition is adopted for time-series comparisons. Furthermore, the definition of a region is usually macroscopic as one constituent part of a “nation” or a “country”. However, in the context of China, as a result of a four-tier spatial hierarchy and the vastness of China, the land area of a county is equivalent to some “nations” in the European Union. Hence, how to define a region could be extended to finer scales depending on research issues.