Geography

Multi-scale Regional Inequality in Guangdong, China

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I. Regional Inequality in China

Over the past three decades, China has successfully achieved a nearly two-digit annual economic growth rate but the regional inequality has also been intensified particularly between the coastal and inland areas. Different from the classical convergent and divergent theories maintained by economists, geographers call for a multi-scale approach to better understand China's regional inequality and argue that China's regional inequality is neither divergent nor convergent, but depends on different spatial scales (Wei 1999). Figure 1 shows that China's regional inequality can be manifested as interregional, interprovincial and even intra-provincial inequalities. Through the case study of Guangdong province, a province known for "one step ahead" in China's reform, this paper attempts to validate the multi-scale approach and further look into the underlying mechanisms in China's regional development using GIS and advanced spatial statistics.

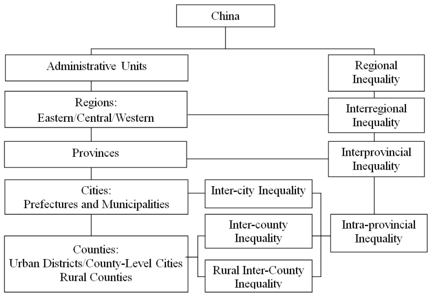

Fig. 1. Multi-scale Regional Inequalities in China

II. Multi-scale and Multi-mechanism Framework

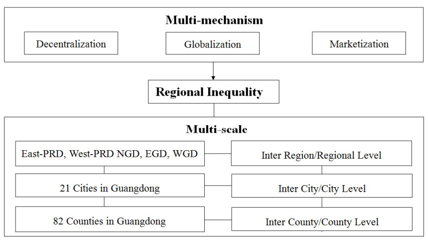

Fig. 2 Conceptual and Analytical Framework

China's transition in the era of reform can be conceptualized into a gradual transformation from a planned closed socialist system to a market open economy, in which three broad processes, namely, marketization, decentralization and globalization play a vital role (Wei 2000). In order to guide the following study of regional inequality in China's Guangdong province, a multi-scale and multi-mechanism framework is proposed (Fig. 2; Wei, 2000). We hypothesize that the triple process is also fundamental in accounting for the regional inequalities at the intra-provincial level. In the mean time, such intra-provincial inequalities are also sensitive to different spatial scales, including region, city and county (Fig. 2).

III. Research Setting and Data

Guangdong is selected as the case since it is recognized for both impressive economic success and growing internal regional inequality. With a population of 95.44 million in 2008, Guangdong is located in China's southeast coast, occupying only 1.7% of China's territory. However, the size of Guangdong's economy measured by GDP in 2009 ranks 1st in 31 provinces in China, whereas the economic growth is highly concentrated in the core region of the Pearl River Delta (the PRD) near Hong Kong (Fig. 3).

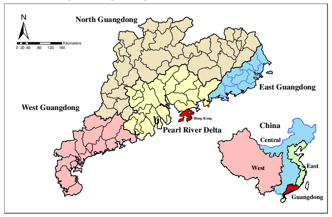

Fig 3. Location of Guangdong Province in China

Guided by a multi-scale and multi-mechanism framework (Fig. 2), three variables are used as the proxies of globalization, marketization and decentralization (Table 1). Globalization is estimated by FDI per capita and per capita local fiscal expenditure (government spending) is employed to denote decentralization effects. As ownership transformation has been identified as a suitable indicator for China's marketization process (Wei and Ye 2009), the share of non-state enterprises in total staff and workers (NSOE) is used as the proxy for marketization. All of the data were collected from Guangdong Statistical Bureau.

Table 1. Dependent Variables and Independent Variables

Name	Description	Abbreviation
Dependent Variables:		
Economic Inequality	Per capita GDP (in yuan)	GDPPC
Independent Variables (Triple Process of China's Transition):		
Globalization	Per capita actualized foreign investment (in USD)	FDIPC
Decentralization	Per capita local fiscal expenditure (in yuan)	FEPPC
Marketization	Share of non-state owned enterprises in employment	NSOE
Infrastructure Investment	Per capita fixed assets investment (in yuan)	FIXPC
Spatial Lag Variables:	100km/200km Spatial lag of GDPPC (in yuan)	Lag_GDP

IV. Analyzing Multi-scale Regional Inequality in Guangdong with Exploratory Spatial Data Analysis (ESDA)

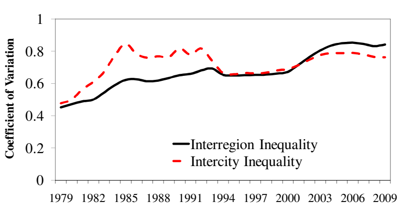

Fig. 4 Inter-region and Inter-city Inequality in Guangdong, 1979-2009

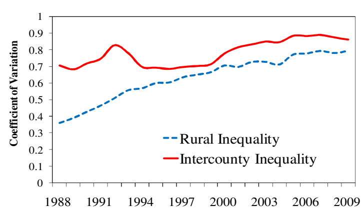

Fig. 5 Inter-county Inequality in Guangdong, 1988-2009

As is shown in the Figure 4, because of the growing gap between the core region of the PRD and the periphery area, the interregional inequality in Guangdong keeps rising over the past three decades. However, different from the steady upward tendency of interregional inequality, the intercity inequality in Guangdong has shown a U pattern (Fig. 4), characterized by the increasing inequality in the 1980s, declining in the 1990s, and rebounding in the 2000s particularly after China's entry into WTO. Similar to the vicissitudes of intercity inequality, the inter-county inequality also demonstrates a U shape while the rural inequality has been intensified (Fig. 5). This is highly related to the bottom-up rural industrialization in the PRD driven by foreign investment from Hong Kong and Taiwan (Sit and Yang 1997). On the contrary, most rural counties in the periphery area are still very poor. In short, the case of Guangdong points out that the trends of regional inequality are sensitive to spatial scales and can not be simply summarized into divergent or convergent trajectories.

Based on the exploratory spatial data analysis (ESDA), the rise of interregional inequality in Guangdong is mainly driven by the clustering of rich counties (high-high association) in the PRD (Fig 6A& Fig. 6B). In addition, as is shown in Figure 6C and 6D, the growth poles in Guangdong have changed from Shenzhen and Zhuhai near the border in the 1980s to Guangzhou and Shenzhen, reflecting the revitalization of Guangzhou as a core city in the region since the late 1990s.

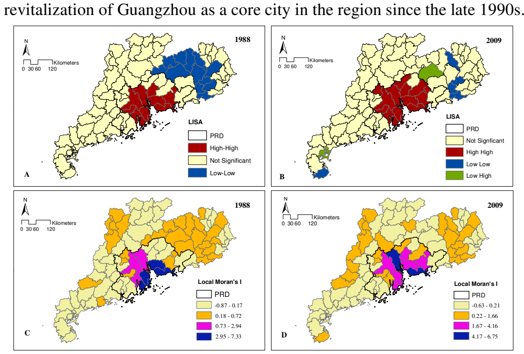

Fig. 6. Local Spatial Patterns (LISA) and Local Moran's I for County Level GDP Per Capita in Guangdong China, 1988 and 2009.

V. Spatial Modeling of Development Mechanisms

The mechanisms of Guangdong's regional development are modeled by OLS regression, spatial lag regression and geographically weighted regression (GWR). Table 2 points out that besides FDI, marketization (NSOE) has become an important force in Guangdong's development while the impact of infrastructure development has been declining, showing the transformation of Guangdong's economy towards knowledge-based economy and indigenous growth.

Table 2: Results of OLS Regression

Dependent Variables:	GDPPC1988	GDPPC1998	GDPPC2008
Estimates:			
NSOE	-0.001(0.146)	0.370***(0.468***)	0.510***
FDIPC	0.004(0.068**)	0.071**(0.138***)	0.147***
GOVPC	0.121*(0.553***)	-0.123 (0.245***)	0.349***
FIXPC	0.513***	0.488***	0.003
AdjustR^2	0.841(0.653)	0.741(0.647)	0.679

Notes: * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level.
In 1988 and 1998 models, due to multicollinearity, we run the regression models controlling the FIXPC. Estimates and adjusted R square are reported by the numbers in parentheses.

Spatial lag regression further reveals that the development status of neighbor counties within 100km has strong impact on a county's development dynamics; but such neighbor effects have been declining since the late 1990s.

Table 3. Results of Spatial Lag Regression Model

Dependent Variables:	GDPPC1988	GDPPC 1998	GDPPC 2008
Estimates			
NSOE	-0.040 (0.010)	0.346***(0.424***)	0.475***
FDIPC	0.008 (0.057***)	0.010 (0.091**)	0.109**
GOVPC	0.131** (0.419***)	0.077(0.434***)	0.274**
FIXPC	0.422***	0.534***	0.040
Lag_GDP100KM	0.298***(0.577***)	0.349***(0.436***)	0.280**
Lag_GDP200KM	0.301***	0.313*(0.361*)	0.015
AIC100KM (OLS)	-163.194(-154.131)	-111.395(-94.433)	-46.192 (-40.270)
AIC 200KM (OLS)	-159.561(-154.131)	-95.8074 (-94.433)	-41.393 (-40.270)

Notes: * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level. In order to handle multicollinearity in the 1998 and 1988 models, numbers in parenthesis are the estimates when the FIXPC is controlled.

Geographically weighted regression (GWR) unfolds that the development mechanisms in Guangdong spatially vary. The globalization force (FDI) is more influential in the East PRD while marketization (NSOE) plays a more important role in the development in the East Guangdong and West Guangdong in the periphery area (Fig. 7) .

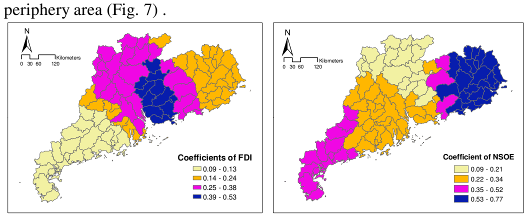

Fig. 7. Coefficients of FDI and NSOE in Geographically Weighted Regression

VI. Conclusion

1. Multi-scale and multi-mechanism is a valuable framework in studying regional inequality in China. Regional inequality in China and Guangdong in particular is not divergent or convergent but sensitive to spatial scales.
2. Development mechanisms in Guangdong have transformed towards knowledge-based economy beyond the singular FDI-driven outward processing model by integrating both globalization and marketization.
3. The development in poor areas in Guangdong faces more difficulties due to the power of agglomeration and the constrains of geographical structure.

Selected References:

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