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Introduction

Regional science research in China: Spatial dynamics, disparities and regional productivity

Anping Chen[1], **Peter Nijkamp**[2], **Takatoshi Tabuchi**[3], **Jouke van Dijk**[4]

[1] School of Economics, Jinan University, Guangzhou, 510632, Guangdong Province, China (e-mail: anping.chen@hotmail.com)
[2] Department of Spatial Economics, Free University, De Boelelaan 1105, NL-1081 HV Amsterdam, The Netherlands (e-mail: p.nijkamp@vu.nl)
[3] Faculty of Economics, University of Tokyo, Hongo 7-3-1, Bunkyo-ku, Tokyo 113-0033, Japan (e-mail: ttabuchi@e.u-tokyo.ac.jp)
[4] Department of Economic Geography, Urban and Regional Research Institute, Faculty of Spatial Sciences, University of Groningen, Landleven 1, NL-9747 AD Groningen, The Netherlands (e-mail: jouke.van.dijk@rug.nl)

1 Introduction

This special issue is devoted to the analysis of spatial dynamics, disparities and regional productivity in the emerging Chinese economy. China's economic growth has averaged about 10 per cent since opening-up and reforms began to take hold in 1978 (NBSC 2013). The result has been a vast improvement in living standards. On the basis of GNI *per capita* in World Bank tables, China rose from the 130th position in 1990 to the 120th in 2000 and the 77th in 2012 (World Bank 2013). However, not everyone has benefited equally from this growing prosperity. For example, the ratio of GDP *per capita* in the richest province in 2012 (Jiangsu) to that of the poorest (Guizhou) was 3.5, a very large disparity by any standards (NBSC 2013). The uneven regional distribution of output has been a perennial policy concern at the highest levels of Chinese policy-making.

Such concerns have stimulated the interest of researchers on regional issues and made regional science a hot research area in China. Many Chinese universities have sponsored a Ph.D. programme on regional economics in recent years. More and more young people are joining the research community of regional science inside China and abroad. There has been great achievement in research on regional disparities, regional co-ordinated development, agglomeration, output spillovers, environmental issues, and spread and backwash development in China (e.g., Chen and Groenewold 2013; Chen and Partridge 2013; Guo and Xu 2013; Ke and Feser 2010; Zhang et al. 2014).

However, regional science research in China is still in an early stage. First, many studies provide a description of regional characteristics, rather than using modern models and approaches to carry out rigorous analysis that explains the underlying processes. Second, most regional scientists in China publish their work only in Chinese language journals and their work is not exposed to the international regional science journals outside of China. Third, although there are a few regional scientists' associations in China, there have been no formal connections between these and international associations on regional science like the Regional Science Association International (RSAI). So, there is almost no voice from China in international regional science activities.

In order to stimulate regional science research in China and increase the international visibility of Chinese regional scientists in leading regional science journals, the editors of *Papers in Regional Science* and *Journal of Regional Science* co-organized the first International Workshop in Regional, Urban and Spatial Economics (RUSE) in China in co-operation with Jinan University in Guangzhou on 15–16 June 2012. Most papers in this special issue are selected from papers presented in this workshop. Another set of papers from this workshop is published in a special issue of *Journal of Regional Science* (see the introduction of the special issue by Chen et al. 2014). In addition to that a number of papers in this special issue are selected from two other meetings co-organized by RSAI in 2012 in China, namely, a meeting in March at the University of Geoscience in Beijing, and a PRSCO Summer Institute held at Remnin University in Beijing in July. All papers in this special issue have gone through the standard double blind peer review process of *PiRS*.

As mentioned above, China has shown a remarkable and unprecedented dynamics, with profound local, regional, environmental and infrastructural implications over the past decades. Especially the short time span of these spatial transformations is noteworthy. Such developments reflect broader global research and policy challenges related to: structural urbanization rise, local and global mobility increase, climate change with both domestic and world-wide implications, growth in spatial disparities at various spatial scale levels, and accelerated technological innovation in many fields and regions. These trends appear to emerge simultaneously and in mutual interactions in China. From this perspective, one may argue that China is clearly at the edge of a critical transition phase for its regional, environmental and land-use system. It is interesting to observe that part of this dynamics can be found earlier in other countries as well, whereas other new developments seem to be taking place in advance of developments elsewhere, for example, the trend towards mega-cities. Based on the final selection of papers, we offer now a systematic typology of the above force field, by making a distinction into:

- spatial dynamics and disparities in open regional systems;
- regional productivity and innovation; and
- spatial dynamics in relation to environment and land use.

1.1 Spatial dynamics and disparities in open regional systems

The paper by Lili Tan and Dao-Zhi Zeng rebuilds Takahashi et al. (2013) by incorporating international differences in technologies and factor endowments in a theoretical model. It highlights the effect of the first-nature Ricardian and Heckscher-Ohlin advantages and the effect of second-nature NEG advantages on international income inequality. In contrast to the simple results of the existing theoretical papers, this paper provides mixed results on international and interregional inequalities.

The volatility of Chinese economic activities at both the regional and national levels is examined by Qing He, Jack W. Hou, Boqun Wang, and Ning Zhang by using panel data from 1978 to 2008. They find that China experienced a sudden reduction in output volatility in mid-1990s and the timing and magnitude of volatility reductions vary substantially across provinces. They also find that state-owned enterprise reform and human capital accumulation are important factors that explain the volatility reduction and the provincial differences in volatility reduction.

The paper by Kevin Honglin Zhang explores the link between globalization and industrial performance in China by using data on 21 manufacturing sectors for 31 provinces from 2005 to 2010. He finds that globalization enhances China's industrial capacity and export ability via foreign direct investment (FDI) and trade but its contributions to industrial upgrading and

technological complexity are very limited. At the regional level, the impact of globalization on industrial performance is much larger in the costal region than in the inland region.

Empirical research on the determinants of regional economic growth typically neglects the influence of culture. The study by Shuxing Shi, Kunming Huang, Dezhu Ye and Linhui Yu fills that gap in the Chinese context by attempting to establish a causal linkage between culture and economic growth. Protestantism is used as a proxy for culture because the Protestant ethic has been linked to the spirit of capitalism and commercial culture in Weber's (1930) famous work. The estimation results suggest that Christian commercial culture has a significantly positive impact on economic performance *per capita* GDP after other important influences are controlled for. They also find heterogeneous effects of culture on economic development in different regions of China.

The paper by Xiwei Zhu examines a recent Chinese policy called Home Appliances Going to the Countryside (HAGC), which aims to reduce urban-rural differentials in a dual economy. Under an NEG framework, it is clarified that the effectiveness of the HAGC policy on the social welfare depends on the substitutability and transport cost of the manufacturing goods.

1.2 Regional productivity and innovation

Marian Rizov and Xufei Zhang analyse regional disparities and productivity in China using micro data for a large and representative sample of Chinese manufacturing firms over the period 2000–2007 with a semi-parametric algorithm. They distinguish three regional typologies, based on population density, coastal-inland, and rural-urban criteria. They find clear evidence of regional convergence. Besides density of economic activity, recent policy and structural factors seem to affect regional productivity level and growth differentials.

Yuyuan Wen examines the spillovers and impacts of FDI on urban productivity in the Yangtze River Delta (YRD) and the Pearl River Delta (PRD). Using a dynamic panel data spatial Durbin model, he finds that FDI has positive impacts on local city's productivity but its spatial spillovers behave differently in the YRD and PRD. FDI accelerates the economic growth convergence in the YRD while slows down convergence in the PRD. Positive spatial spillovers of productivity occur in the YRD while negative spatial spillovers occur in the PRD. The spatially different outcomes are important for developing effective policy measures for the two regions to attract FDI and promote urban development.

The paper by Rudai Yang and Canfei He addresses the productivity puzzle that Chinese exporters are less productive than non-exporters using a plant level dataset which includes the large industrial firms during the period of 1998–2007. They find that productive firms indeed tend to favour the domestic market because they can enjoy local protection, and that export spillover effects help firms with lower productivity to sell their products in the global market. This paper suggests that local protection and spillover effects can influence the export decision of Chinese firms, providing a complementary contribution to the related literature.

The spatial diffusion of innovation is an important topic in regional science. Zheng Wang, Zixuan Yao, Gaoxiang Gu, Fei Hu and Xiaoye Dai develop an agent-based simulation (ABS) model to study technical innovation and its diffusion process in China. They find that only a small fraction of firms conduct independent product-innovation, and most firms prefer imitation and/or purchases. Most of the innovative firms are located in the East. Preferential policies to the other regions in China can speed up the process of innovation diffusion and improve the regional economies of less developed areas. Lastly, preferential policies can also improve the labour attractiveness and prevent loss of capital and reduce emigration to the East. The results show that preferential policies work best in the Middle region. However, such policies do not have the same effects in the West and the Northeast, even with a higher tax discount in the West, partly because these regions are relatively far from the East.

Cities are connected together not only through conventional infrastructure, but also through digital infrastructure. The paper by Emmanouil Tranos, Karima Kourtit and Peter Nijkamp tests whether digital connectivity patterns follow traditional ones. Using a generalized spatial interaction model, this paper shows that geography (and distance) still matters for an extensive set of world cities and the same is found for the emerging large cities in China. The Chinese network is significantly more centralized than the European one. Despite a rapid increase in global bandwidth, the slowness of Internet traffic in China is caused by strict governmental arrangements. The Internet traffic to and from cities outside China is carried only through international gateways located in the three mega-cities of Beijing, Shanghai and Guangzhou, so that the Chinese government can better monitor and control the information on the Internet. Without extending international gateways in China, the increased development of bandwidth of the Internet of interconnected networks and core routers on the Internet will not be fully utilized in China (Dai 2003).

1.3 Spatial dynamics in relation to environment and land use

China has promised large cuts in CO_2 emissions by 2020, which is likely to have differential effects across regions. However, little is known about the regional effects of pollution reduction. Anping Chen and Nicolaas Groenewold in their paper examine this using a theoretical model with two regions, features of the Chinese economy and the right to emit CO_2 as a factor of production. They find regionally differentiated effects on income, welfare and output and explore government policies designed to reduce these effects. The effects of fiscal policies depend crucially on whether one or both regions respond and on whether output or welfare is targeted. Boosts to productive capacity do better in terms of output but not welfare.

The paper by Jianjun Tang, Henk Folmer, Arno J. van der Vlist and Jianhong Xue investigates the efficiency of irrigation water use in the Guanzhong Plain of China. Stochastic frontier analysis is applied to estimate irrigation water use efficiency, based on panel data for 800 farmers, spread over 80 irrigation canals, for the period 1999–2005. They find that water price and disclosure of water management procedure to farmers are important factors that determine water use efficiency. They also find that irrigation management reform, particularly the introduction of Joint-stock Cooperative and Water User Association has substantial positive effects on water use efficiency.

Jingjing Yan, Jinghua Sha, Xiao Chu, Feng Xu and Yoshiro Higano develop a computer simulation model to find optimal environmental policies for proper treatment of stockbreeding wastes in the upstream region of the Miyun Reservoir. This is the only surface water resource of Beijing, providing more than 60 per cent of the water resources for Beijing City. Stockbreeding industries are increasing rapidly in rural areas around big cities in China and this increase carries high risks to the environment due to emissions of large amounts of water pollutants and greenhouse gases. On the other hand, stockbreeding wastes are a typical biomass resource and can be used as an energy source by advanced technologies. The results indicate that the synthetic policies for the catchment area, especially the introduction of advanced technologies for the pig farming industry are very effective and the utilization of biomass resources allows simultaneous pursuit of environmental preservation and economic development.

The paper by Jinfeng Du, Jean-Claude Thill and Changchun Feng studies rural land value appreciation and the wealth redistribution effects of China's dual land system, taking Beijing as a case study. They propose a robust method to estimate the land value gap between the land granting price paid by the developer and the rural resident's compensation for the expropriated land. Their study shows that the land value gap manifests dramatic variability. While, on average, expropriation charges amount to 15 per cent of the estimated market value of land, this

share is under 5 per cent in about a quarter of all rural expropriation cases. The land value gap shows significant and positive correlation with market prices and the intended use for the land, and significant evidence of spatial dependence and heterogeneity.

2 Ways forward

The selected papers in this special issue of *Papers in Regional Science* help move forward our understanding of the Chinese regional science issues on spatial dynamics, regional disparities, productivity, innovation, environment and land use. Furthermore, it gives inside in the effects of a variety of policy measures that are used, for example, to diminish regional disparities, stimulate regional development and mitigate negative pollution effects on the environment. This special issue shows that the analysis of Chinese regional issues by Chinese regional scientists can make interesting contributions to the regional science literature and related policy implications. However, more regional science research is needed to explore the spatial dynamics given the rapid economic growth and structural change in China which certainly will raise new regional issues in the country. To understand the underlying processes and develop effective policy measures Chinese regional scientists need to make use of cutting edge theories, models and methods used in international regional science research and make their research more rigorous. When they publish their work in English in leading international regional science journals, this will also lead to higher international recognition of Chinese regional research in the near future. We hope that this special issue will stimulate more Chinese regional scientists to participate more actively in the scientific and policy debate in international events of the Regional Science Association International. This will foster the development of better policy measures and result in a higher welfare level and better quality of life all over the world.

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