

The spatial structure of economic development and regional occupational structure in late Imperial China, 1734-1898

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Abstract

Through a spatio-temporal analysis of Chinese occupational structure at the regional level in the eighteenth and nineteenth centuries, this paper reveals that there existed a significant level of spatial heterogeneity in the economic development of the different regions of late Imperial China. Based on the observed spatio-temporal patterns of regional occupational structure and as an empirical revisit to both G. William Skinner's pioneering macro-region framework and the Great Divergence debate, the paper further identified and defined six key economic regions, including, but not limited to, Huang-Ji, a major advanced region outside of the Lower Yangtze, and, the Huai Valley, an economic backwater that separated the two most advanced regions. The disparate trajectories of occupational structure found in all six key regions strongly suggested that a sound understanding of economic development in late Imperial China must be based on a solid empirical understanding of the much wider spatio-temporal context than the one in which the field is currently trapped. This paper aims to make a first step towards bridging this gap.

(Note: while this paper focuses on presenting and discussing the spatial-temporal patterns of regional occupational structure in a more descriptive manner, I am currently working on further analysis to explore the causes and long-term consequences of these patterns, and hopefully, we can show more on this in the conference)

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1. Introduction

The Qing Empire's territory extended over more than ten million square kilometres and, included diverse landforms such as plains, mountains, plateaus, and deserts, as well as disparate climates ranging from tropical monsoon climates, to continental climates, to polar climates. While many parts of this vast territory were well connected to an already extensive network of official roads (*guandao* 官道), and to the nationwide waterways connecting navigable rivers, large lakes, canal networks, and the Grand Canal, many suffered from extremely poor transport conditions and remained isolated from the rest of the country. Overall, therefore, the vast size and diverse geography of the Empire are likely to have led to large spatial variations in economic development in the eighteenth and nineteenth centuries: and indeed, numerous contemporary qualitative sources depict significant spatial heterogeneity in economic development across the various Chinese regions.¹ Yet the spatio-temporal context of regional Chinese economic development has not hitherto been established quantitatively for the period under investigation.

The preliminary analysis presented in this paper will present evidence of vibrant, and divergent, regional economic developments. A sound understanding of the nature of the changes taking place in the Chinese economy in the eighteenth and nineteenth centuries thus requires a thorough grasp of the levels and trajectories of economic development at the regional level. Skinner's framework of macro socio-economic regions was ground-breaking, but his definition of the regions and his claims about their autarkic nature has never been empirically substantiated.² The *XKTB* dataset,³ with its exceptionally wide geographic coverage (see map 1), provides the first opportunity in Chinese economic and social history to investigate quantitatively this long-missing, but much-needed, historical, economic, and geographical data-based context of regional economic development in eighteenth- and nineteenth-century China.

¹ For example, see J.-B. Du Halde et al., *A Description of the Empire of China and Chinese-Tartary*, 1738; John Barrow, *Travels in China* (Philadelphia: W. F. M'Laughlin, 1805); George Leonard Staunton, *An Authentic Account of An Embassy from the King of Great Britain to the Empire of China* (W. Bulmer and Co. For G. Nichol, 1798).

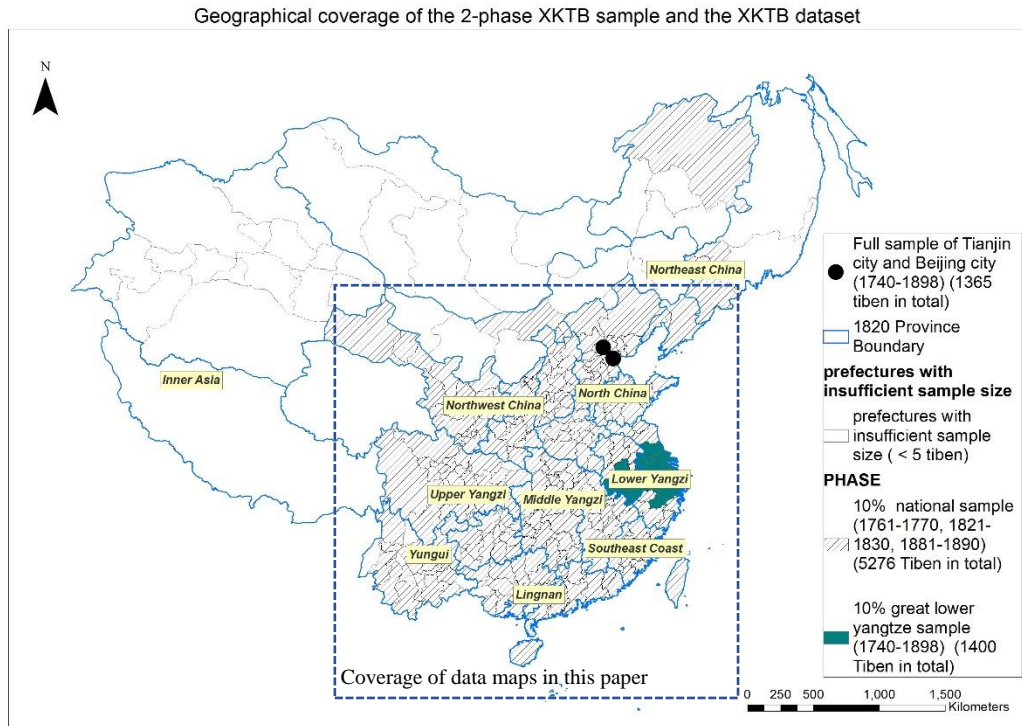
² G William Skinner and Hugh D R Baker, eds., *The City in Late Imperial China* (Stanford University Press, 1977).

³ Please see the discussion of the source and data of the XKTB dataset in Cheng Yang, "A New Estimate of Chinese Male Occupational Structure during 1734–1898 by Sector, Sub-sector Pattern, and Region," *The Economic History Review*, March 17, 2022, <https://doi.org/10.1111/ehr.13157>.

As an empirical revisiting of Skinner's pioneering framework, this paper will further propose to use this new data as the basis for the identification of six key economic regions in Qing China.

Before we delve into the spatial patterns in the next half of the thesis, two important notes has to be made. First, to increase the legibility of the maps and the legends, the data maps in the rest of these paper will be scaled to show mainly the China Proper (indicated by the dashed-line box on Map 1), the region where more than 95% of the national population lived in the period under study and where most of the XKTB data are from.⁴ These maps do not show the Inner Asia or the Northeast China only because we currently have comparatively much less data on the occupational structure of these regions, which I hope to improve by searching for new sources in the future. Second, while the spatial scale of this project is large because it was designed to take full advantage of the source's wide spatial coverage, the XKTB dataset is based on only 10% random sample of the total XKTB available in the three benchmark periods. Although the sample is created through random sampling, in the cases of smaller areas or sparsely populated prefectures or the post-1860 periods when the total XKTB available dropped greatly, the sample size can be very small. In these circumstances, these subsets of the XKTB dataset probably do not have the strength of statistical significance and my method does not attempt to demonstrate this. What I present next are thus preliminary findings and a possible interpretation. They are hypotheses.

⁴ The population estimate is based on Cao, *Zhongguo Renkou Shi (Chinese Population History,) Vol.5*; Analysis on the spatial distribution of the Chinese population in this period can be found in Yang, "Long Run Regional Economic Development and Population Density in Imperial China." [Mphil dissertation] Chapter three.



Map 1 Geographical coverage of the XKTB dataset (regions' names are Skinner's definition; the box indicates China Proper which the data maps in this paper will focus on.)

Spatially varied and rapidly changing environmental, political, economic and social conditions in the eighteenth- and nineteenth-century China also led to different trajectories of economic change across these key regions. This process of diverging regional trends had already begun in the eighteenth century, and accelerated following the White Lotus Rebellion of 1796-1804, the Yellow River's course change in 1855, China's opening to the West in the 1840s, the devastating Taiping Rebellion of 1850-1864, and the lifting of the ban on migration into Manchuria in 1873.

In order to establish this spatio-temporal context in more detail, this paper will begin by focussing on spatial patterns in levels of economic development, as reflected by regional occupational structure, and relying primarily on the 1761-70 and 1821-1830 national *XKTB* dataset. Having established the spatial context, I will then move on to an examination of economic change over time, by discussing the disparate trajectories in occupational structure visible across the different key areas.

2. Spatial concentration of economic functions

2.1. Agriculture

2.1.1. Share of agricultural employment in the local labour force

Eighteenth- and nineteenth-century China was an agrarian economy, but never a closed one. Before the Opium War and the opening of treaty ports after the 1840s, China had already been long engaged in foreign trade along its coast and through its inland trade routes for centuries, even after 1757 when Guangzhou was designated as the only legal port for foreign trade.⁵ However, although China did import large amounts of rice from Southeast Asian countries such as Vietnam and Burma, it seems safe to assume that, before the prevalence of steamships in overseas trade in late nineteenth century, the Chinese agrarian economy had to rely mainly on its own agricultural produce for food supply. In an agrarian economy with limited food imports and exports, the relationship between non-agricultural growth and agricultural productivity plays a pivotal role in economic growth. As workers in the secondary and tertiary sectors produce little food themselves, they depend upon the existence of an agricultural surplus for subsistence. If, for example, the agricultural sector produced 33.3% more than the food requirements of the agricultural population, the food requirements of a non-agricultural population that constituted 25% of the total population could be satisfied. As a result, agricultural productivity sets a ceiling on the level of non-agricultural economic growth achievable within an agrarian economy. At the same time, agricultural productivity itself is strongly influenced by the demand generated by the non-agricultural population, particularly that residing in urban areas: without a substantial non-agricultural sector (or a large food export market), there would be little to no incentive for rural areas to produce significantly more food than local needs, and, therefore, agricultural productivity would remain low. In contrast, if the non-agricultural sector is large and growing (or if there exists a large food export market), the

⁵ Hans van de Ven, *Breaking with the Past: The Maritime Customs Service and the Global Origins of Modernity in China* (Columbia University Press, 2014). pp.54-63. Chinese Junks, Asian ships and European ships were all involved in the overseas trade with Common imports such as cotton from India and rice from Burma and Vietnam, and exports such as silk, tea and porcelain. China also imported large amount of silver from Japan and Philippines (Latin American Silver trade operated by European countries). See Man-houng Lin, *China Upside Down: Currency, Society, and Ideologies, 1809–1856* (Harvard University Press, 2006). pp.59-66.

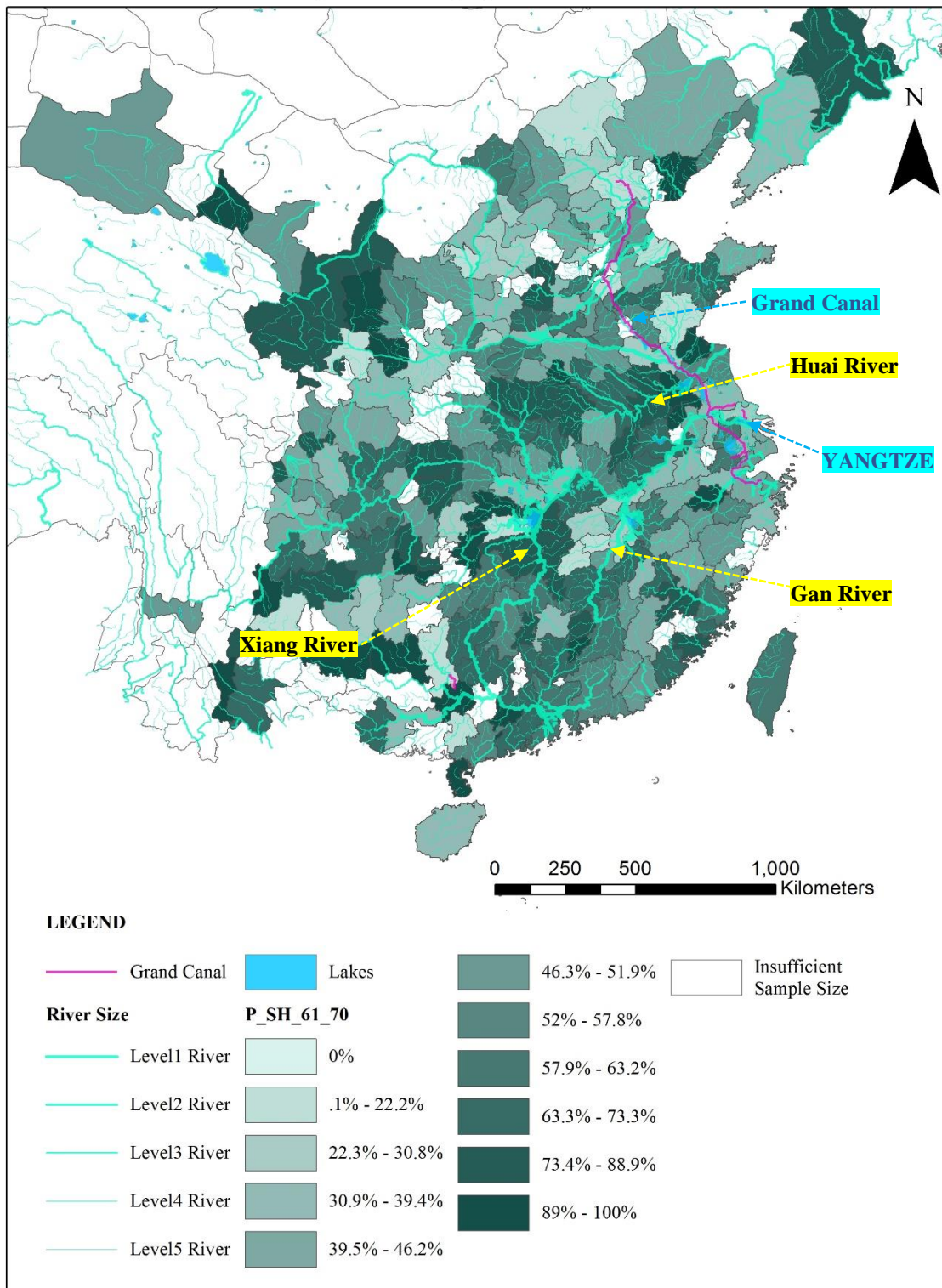
non-agricultural population's demand for food incentivizes agricultural areas to increase output, thus enabling the supply and demand of food to remain in equilibrium as the non-agricultural sectors continue to grow. In short, the relationship between agricultural productivity and non-agricultural growth can be characterised by a process of either negative or positive feedback. In this manner, positive feedback between non-agricultural growth and improved agricultural productivity was a key characteristic of pre-industrial economic growth, and the relationship between the two may reflect the nature and level of economic development of an agrarian economy.

Although I cannot, at present, estimate the productivity of either the agricultural sector or the non-agricultural sector directly for eighteenth- and nineteenth-century China, both can be assessed indirectly by examining the share of agricultural employment in the labour force. Typically, a higher share of non-agricultural employment will either indicate higher agricultural productivity enabling the production and trade of growing quantities of consumer goods; or, in areas well connected to wider (regional, national, or international) food markets, the existence of manufacturing and trade sectors generating sufficient income for the local population to buy food produced outside of the local market. Hence, a decline in the shares of primary-sector employment and a rise in that of non-agricultural-sector employment is usually a strong indicator of economic growth. However, this is not to say that a high share of primary-sector employment necessarily denotes an underdeveloped economy. In areas benefitting from favourable land, irrigation and climactic conditions that specialise in producing and exporting agricultural goods (and thus in cases that do not correspond to a model of a closed agrarian economy), it may well be the case that agricultural employment represents the most profitable option for a high proportion of the local labour force, with the area providing food to many regions beyond the local market as a result. In short, while the share of agricultural employment in the local labour force can be extremely revealing, it cannot, by itself, be considered a holistic measure of the level of economic development of any given area, particularly if this area is well connected to the wider market and to larger, extra-regional trade networks.

In my previous paper (Yang, 2022), I estimated the share of agricultural employment at the national level to have been at least sixty per cent throughout the period 1761-1898. This means that discounting food imports and exports and assuming a similar diet among the general population, in China as a whole, workers employed in agriculture were able to produce as much as, but no more than, 66.7 per cent ($(1-0.6)/0.6$) more than their own consumption, which satisfied the demand of those employed in non-agricultural sectors.⁶ Using the same national data, spatial analysis reveals significant spatial heterogeneity in the shares of the local labour force employed in agriculture (see Map 2). The Lower Yangtze is confirmed as a unique case of low agricultural employment, but other regions such as North China, the Middle Yangtze, and the Upper Yangtze (Sichuan) also display relatively low agricultural employment shares around their cores: while these have been previously relatively overlooked in the Great Divergence debate, they clearly deserve further academic attention.

⁶ Throughout the period, the Qing government created tax incentives to encourage merchants to import rice from Thailand, Vietnam and other Southeast Asian countries. But judging from Canton custom records in 1830s, the amount of imported rice was rather small considering the size of domestic consumption of food. See Liang Tingnan, *Yue Haiguanzhi (records of Canton customs)*, vol. 24. *Shibo*. Reference quoted from Guo Songyi, *Qingdai De Liangshi Maoyi (Rice Trade in the Qing Dynasty)*, *Pinghuai Xuekan*, Vol.1. 198 However, rice import rapidly increased after the Sino-French War (1884-85), see van de Ven, *Breaking with the Past: The Maritime Customs Service and the Global Origins of Modernity in China*. pp.124-2 It is also noted that my current assumption on diet is highly tentative, because at this stage we do not have sufficient studies on the diet of the Chinese by occupation in this period.

Prefectural Agricultural Employment Share in 1761-70



Map 2 Prefectural-level agricultural employment shares of the local labour force, 1761-1890.

Moreover, it becomes apparent that geographical conditions, particularly the river system, played a significant part in shaping regional variation. The share of agricultural employment in

areas where the Yangtze River and the Grand Canal (marked by blue labels on Map 2) flowed tended to be comparatively lower than in other areas of China. On the contrary, the shares of agricultural employment in the Huai River Basin (淮河流域), Upper Stream of the Xiang River (湘江上游), and Upper Stream of the Gan River (赣江上游) (marked by yellow labels) were among the highest in the country. Without further quantitative evidence enabling us to establish the main causes behind this sharp contrast, a look at current qualitative sources suggests that evident differences between these rivers in terms of navigational conditions and accessibility for irrigation, combined with the topography of the different regions, played an important part in shaping spatial heterogeneity. The Upper stream of Gan River was long known for being difficult to navigate due to its inconsistent depth, rapid flow, and hidden reefs, particularly in the area known as the “eighteen rapids of Gan River” (see figure 1 for a modern drawing of the eighteen rapids).⁷ In fact, the upper streams of the Gan River and Xiang River were both passing through mountainous regions, which might have limited both the scale of farming and labour productivity in agriculture, and, accordingly, would have resulted in high proportions of agricultural employment in the labour force (see figure 2 and Map 3). Meanwhile, the region around the lower streams of both rivers, combined with the Poyang Lake (鄱阳湖) and Dongting Lake (洞庭湖) regions was long known for exporting rice, probably a result of both better transport and irrigation condition in these regions (see maps 2-3).⁸

⁷ Chinese: 赣江十八滩 (*Shi-ba-tan of Gan River*). *Shui-jing-zhu (Commentary on the Water Classic)* (ca. 515 AD) describes the dangerous navigation conditions on this river in the following manner: “Gan River has many rocks in it, the water flow is very rapid, difficult for travelling”. The lyrics of folk songs from the region also frequently and vividly depict the danger (possibly exaggerating it): “the eighteen rapids are all like gate of hell. The heart trembles as the pole touches the water, nine out of ten boats sinks while attempting to pass.”

⁸ For example, one of the most famous place in the Lower stream of Gan River area, is Wannian County of Raozhou Prefecture.

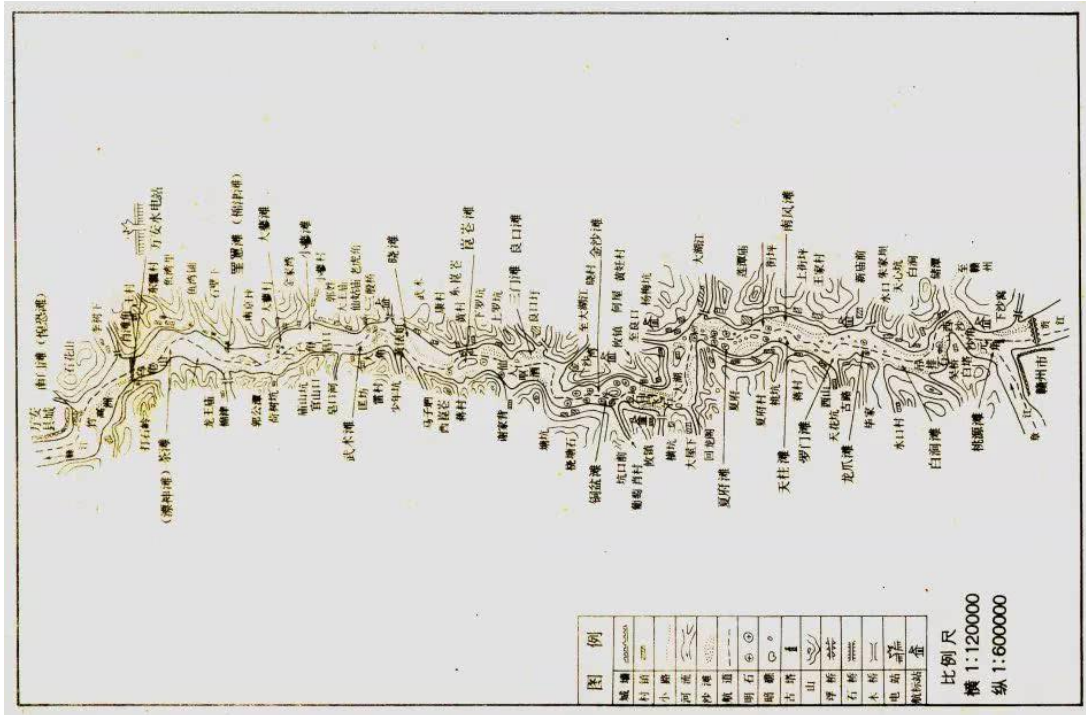
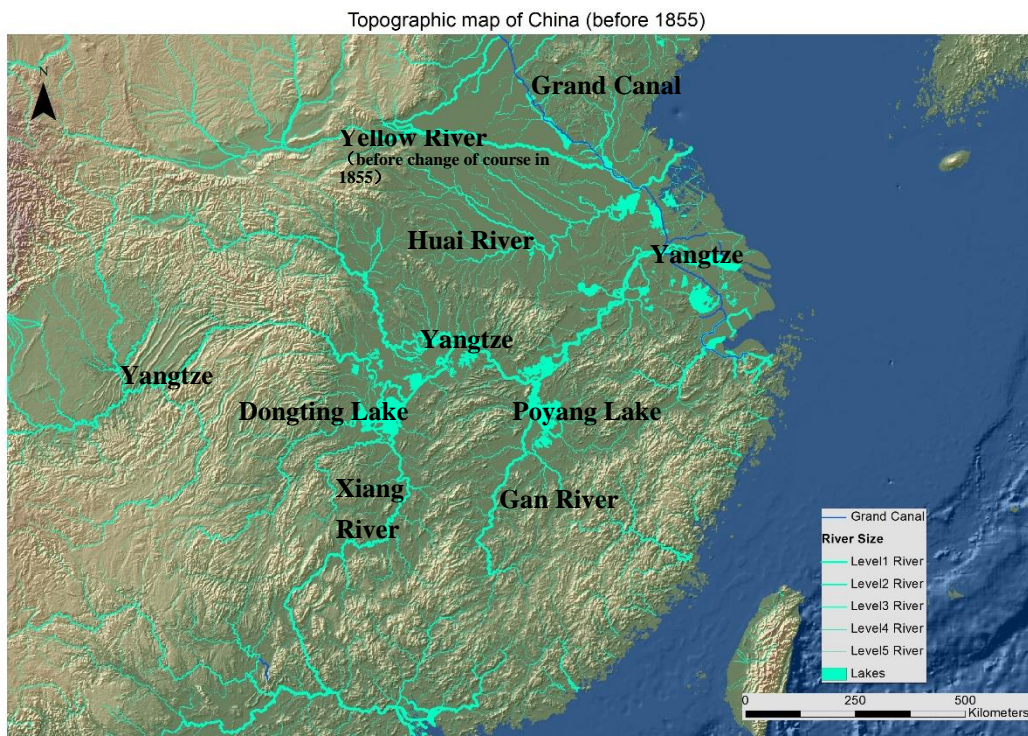


Figure 1 The eighteen rapids of Gan River near the Gan County (赣县) and Wan'an County (万安县) (c.1990).



Map 3 Topographic Map of China (before 1850). Data: Fudan-Harvard CHGIS.



Figure 2 Relief drawing of China as seen from Guam (drawn by R. E. Harrison and published as a supplement to Fortune Magazine, April 1941).

On the contrary, the Yangtze-Grand Canal was the most important transport route for the Imperial grain tribute and granary system (*Caoyun* 漕运), which was centrally administrated by the *Caoyun* governor-general (漕运总督) seated at the Huaian prefecture (淮安府), and regulated the shipment of grain tributes from the provinces south of the Capital.⁹ When shipping grains, barge owners were also allowed to carry other commodities free of taxation. Moreover, before the flooding of the Yellow River in 1855, which resulted in the silting of the Grand Canal, the waterways were still navigable (although maintenance costs rose considerably after 1820), enabling grain and other commodities as well as passengers to move with relative ease between the Capital and the Lower Yangtze, which was in turn well connected to upstream inland areas through the Yangtze, and to the Southeast Coast via coastal routes.¹⁰ These various

⁹ For a comprehensive study on the institutional background and its significant influence on the national grain market and interregional trade, see Pierre-Étienne Will, Roy Bin Wong, and James Z Lee, *Nourish the People: The State Civilian Granary System in China, 1650-1850* (Ann Arbor: Center for Chinese Studies, University of Michigan, 1991).

¹⁰ There were huge problems with the Grand Canal by the 1820s at the latest – the cost of shipping rain tribute from Hubei to Beijing via Yangzi River and Grand Canal, for instance, rose about 500% between 1732 and 1821, and interruptions were quite frequent from the 1820s onward. See Kenneth Pomeranz, *The Making of a Hinterland: State, Society, and Economy in Inland North China, 1853-1937*, ed. American Council of Learned

routes provided excellent opportunities for trade and manufacture. With regards to preconditions for agricultural production, the Yangtze river connects flat and vast regions with fertile land, including the Sichuan Basin (四川盆地, Upper Yangtze), the Dongting Lake and Poyang Lake areas (Middle Yangtze), and the Yangtze Delta (Lower Yangtze), while the Grand Canal crossed the North China plains – all regions where conditions for agricultural production, transport, and trade, were on average better than in the Gan River Basin and the Xiang River Basin. Overall, the low agricultural employment shares in these regions and high shares in the Gan River area and Xiang River basin are therefore not particularly surprising.

A further noticeable spatial pattern in Map 2 is the high observed share of agricultural employment in the Huai River Valley. As a part of the Yellow River Flooding Area (*Huangfan Qu* 黄泛区) and an important natural geographic unit, the Huai River Basin is surprisingly under-represented in the current historiography in comparison to its neighbouring northern region (named ‘Huang-Yun’ by Pomeranz, see figure 3), and southern region, the Lower Yangtze – and this despite the fact that the Huai River Basin is located at the centre of the populous triangular zone formed by North China, the Lower Yangtze, and the Middle Yangtze. The Huai River flowed through flat, vast, and fertile plains (see map 3 and figure 2). Its branches were plentiful and well-spread, providing great opportunities for irrigation. Further, the entire region was well connected to the Grand Canal through the river, which facilitated the shipping of grains. In fact, the seat of the *Caoyun* governor-general was situated right at the meeting point of the Huai River and the Grand Canal. These various characteristics appear at first sight to have provided favourable preconditions for the development of agriculture and improvements in labour productivity. Furthermore, its advantageous access to the country’s major transport and trade route should have incentivised the growth of manufacturing and trade in the region. If that is the case, then, why was the share of agricultural employment observed in the region so high (see Map 2)? Although the region was long known for exporting rice to the Lower Yangtze, but the high shares of agricultural employment in this region’s prefectures,

Societies (Berkeley: University of California Press, 1993). p.154-64. Hoshi Ayao., *Dai Unga (The Grand Canal)* (Tokyo: Kundo shuppansha, 1971). p.223-27.

which were close to or higher than that of Burundi (89%), Ethiopia (84.7%), Rwanda (83.1%), and Laos (81.9%) in 1991, demands additional explanation.¹¹ This was most probably due to the fact that the region suffered from frequent flooding (see figure 4), in large part because of its location to the south of the Yellow River (see map 3).¹² Floods coming south from the Yellow River constantly threatened the region, destabilizing society and restraining economic development. While historical grain price data do suggest the regional grain market had been well integrated, this was probably the result of heavy government interventions, rather than a consequence of the natural growth of the market.¹³ Government interventions included introducing artificial controls of grain prices while trying to stabilize the market, and efforts to discourage the storage of grain and eliminate hoarding.¹⁴ On top of these, in the second half of the seventeenth-century, various measures used by the Qing government to incentivise migration and farming in an effort to restore the local economy had led to rapid population expansion, such that, by the mid eighteenth-century, population pressure on the land was extremely high, and, in some areas in the Huai River Basin, no land left uncultivated at all.¹⁵ Together, specialisation in food export, high opportunity costs due to frequent natural disasters, strict governmental control of the grain market, and scarce per capita land resources explain the high share of agricultural employment in the region. The fact that the region's agricultural employment share was amongst the highest in the entire country suggests that these negative factors probably significantly offset the economic benefits of its favourable location on the plain and advantageous access to the Grand Canal when determining the level of economic development of the region.

¹¹ World bank data <https://data.worldbank.org/indicator/SL.AGR.EMPL.MA.ZS>. It is also noted that our previous discussion in paper three suggests our current estimates tend to *underestimate* the share of agricultural employment.

¹² Shui li dian li bu shui guan si ke ji si.; Shui li shui dian ke xue yan jiu yuan., *Qing Dai Huai He Liu Yu Hong Lao Dang an Shi Liao (Archival Documents on the Flooding in the Huai River Basin in the Qing Dynasty)*. (Beijing: Zhonghua Shuju (Zhonghua Book Company), 1988); Shengrong Gao, "Qingdai Huaihe Liuyu Hanlao Zaihai de Renwei Yinsu Fenxi (A Study of Artificial Elements on Drought and Flood in the Huaihe River Valley in the Qing Dynasty)," *Zhongguo Lishi Dili Luncong (Journal of Chinese Historical Geography)*, no. 3 (2005).

¹³ Lin Zhu, *Qingdai Huaihe Liuyu de Liangjia, Shichang Yu Difang Shehui (Grain Price, Market and Local Society of the Huai River Basin in the Qing Dynasty)* (Beijing: Jing ji ke xue chu ban she (Economic Science Press), 2016).

¹⁴ Will, Wong, and Lee, *Nourish the People: The State Civilian Granary System in China, 1650-1850*.

¹⁵ For example, see *Jining zhou zhi* (Gazetteer of *Jining Zhou*, edited in *Daoguang* Reign) recorded that the number of registered adult males in *Jining zhou* in the Lower Huai River was of 17,590 in 1644; 20,890 in 1653-57; and 22,933 in 1662-69 and also *Shouzhou Zhi – Shuili, Qianlong* (Shouzhou Gazetteer – Paper on Water, Qianlong Reign).

However, as manufacturing capital is easily replaced so arguably would be more resilient than a flood-vulnerable population heavily invested in agriculture, it remains mysterious why the region did not invest more labour in manufacturing. The flood-afflicted agriculture production might have had led to poor accumulation of capital in the first place and greatly limited the financial capability to invest on manufacture. The region's agricultural specialisation for export might also incentivise financial and labour investment in agriculture, at least in the years when there was no flood. Further studies are thus required to deepen our understanding of the economic development of this region.

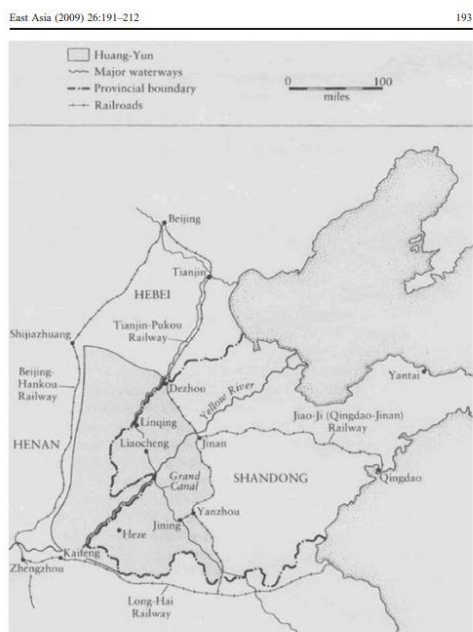


Fig. 1 Map of the Jining region and Shandong in modern transition. Source: Kenneth Pomeranz, *The Making of a Hinterland: State, Society, and Economy in Inland North China, 1853-1937*. (c) 1993 by the Regents of the University of California. Published by the University of California Press

Figure 3 Huang-Yun in Pomeranz, *The Making of a Hinterland*.¹⁶

¹⁶ Pomeranz, *The Making of a Hinterland: State, Society, and Economy in Inland North China, 1853-1937*.

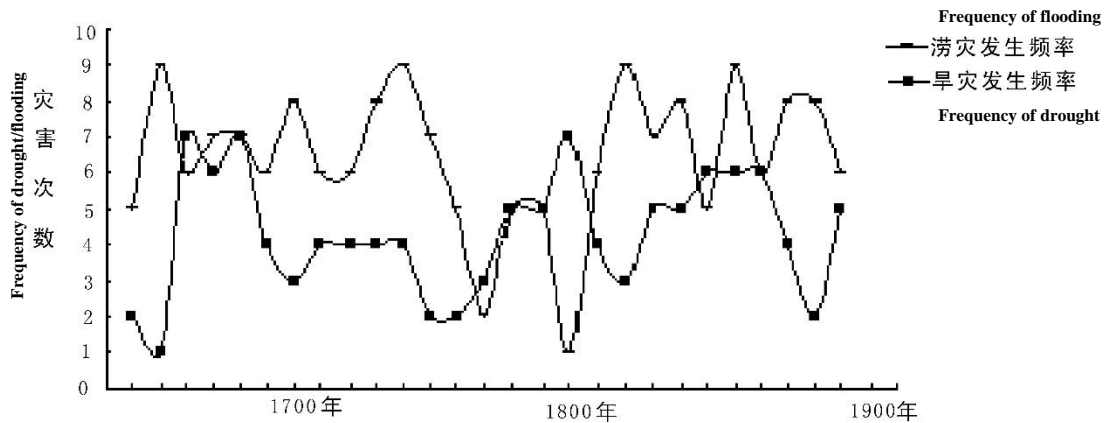


Figure 4 Frequency of recorded droughts and flooding in the Huai River Basin.¹⁷

We may further notice that the share of agricultural employment was very high near the Southeast Coast. The high levels observed in this region contrast sharply with North China, particularly those parts of North China through which the Grand Canal flowed. We are immediately reminded of G. W. Skinner's 'regional cycles of development' (see figure 5). In 1717, Chinese citizens were banned from going overseas for any purpose other than commerce or official matters, and in 1757 the Guangzhou prefecture was designated as the only legal port for foreign trade. Skinner described the eighteenth- and early nineteenth- centuries as the 'dark age' of the Southeast Coast, a dark age which only came to an end after the opening of treaty ports in the 1840s.¹⁸ However current studies already show that the Guangzhou designation was only for trade with European countries and was short-lived. It did not stop the overseas trade carried by Chinese junks.¹⁹ We will come back to this point as we examine the regional trajectories of economic development in the second section of this paper. For now, let us turn instead to another important aspect of the spatial variation in Chinese agriculture: spatial variation in absolute levels of farming labour input per unit of land.

¹⁷ Gao, "Qingdai Huaihe Liuyu Hanlao Zaihai de Renwei Yinsu Fenxi (A Study of Artificial Elements on Drought and Flood in the Huaihe River Valley in the Qing Dynasty)."

¹⁸ G William Skinner, "Presidential Address: The Structure of Chinese History," *Journal of Asian Studies* 44, no. 2 (1985): 271–92. p.279.

¹⁹ van de Ven, *Breaking with the Past: The Maritime Customs Service and the Global Origins of Modernity in China*. pp.52-63.

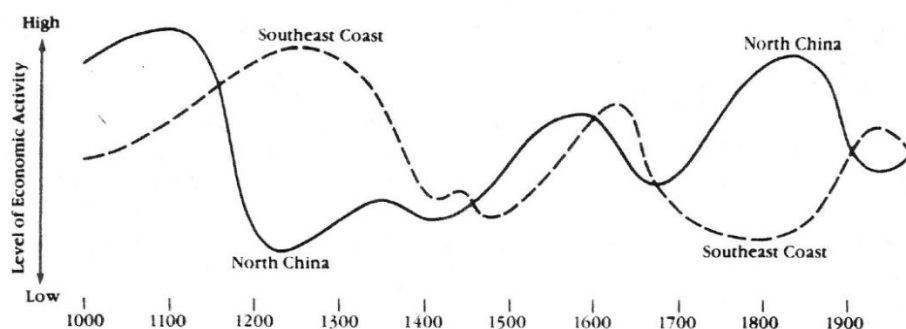


Figure 1. Regional Cycles of Development, North China and the Southeast Coast, 1000–1980. (The vertical axis should be thought of as a per capita index.)

Figure 5 G.W. Skinner's 'regional cycles of development'.²⁰

2.1.2. Farming labour input per unit of land

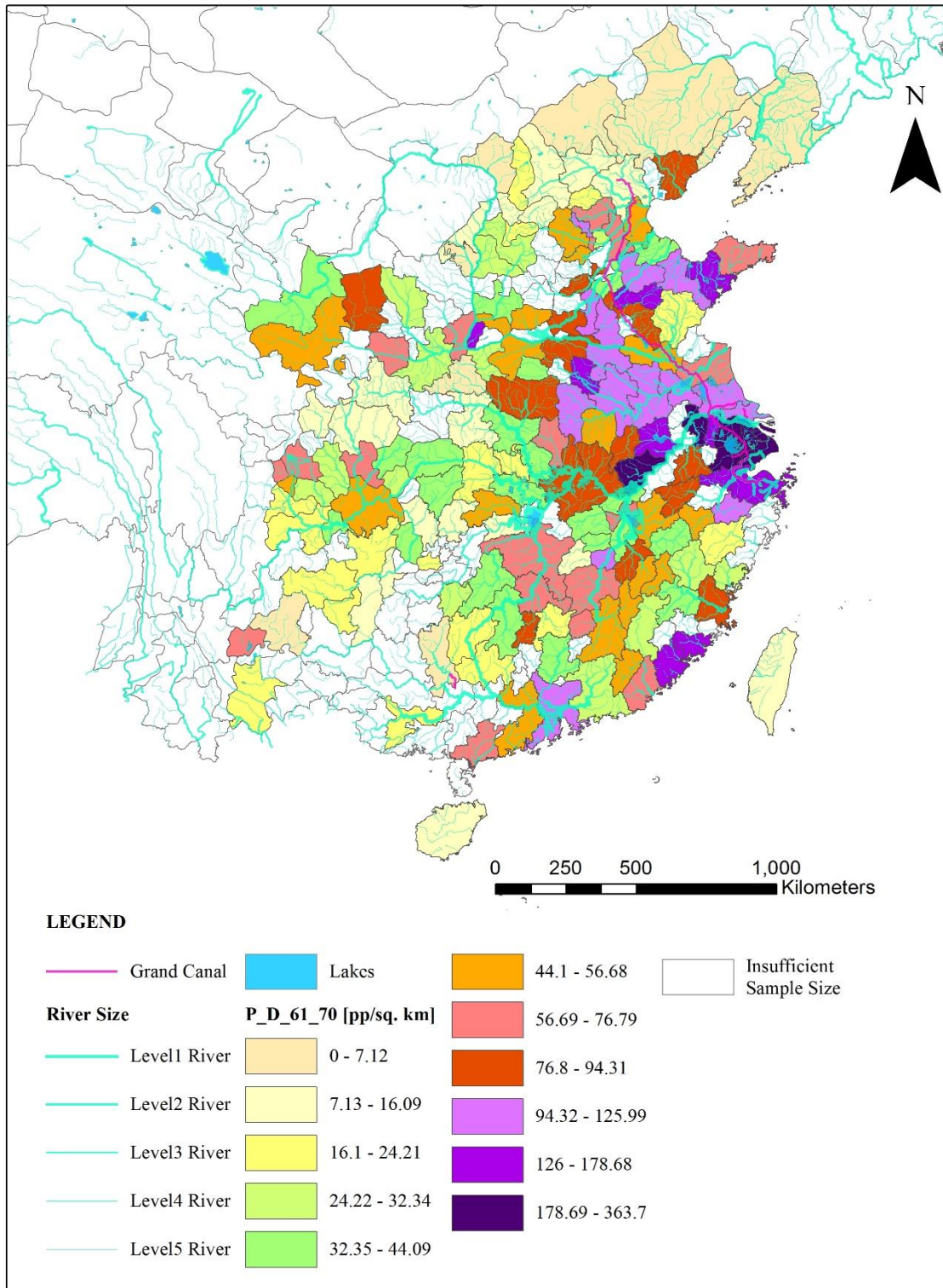
Map 4 shows my current estimate of farming population density (agricultural workers per square kilometre) at the prefectural level in 1761-70. Two patterns are worth noticing. First, as represented in dark purple on the map, the farming population density in the Lower Yangtze was the highest in the country, despite its low share of the labour force in agricultural employment. The combination of these two patterns would appear to indicate that, in the Lower Yangtze, the high level of labour productivity reflected by the low share of agricultural employment was achieved through high labour input per unit of land.²¹ This seems to match the characteristics of paddy rice cultivation, the dominant form of food production in this region, which is labour-intensive but also high-yielding. Second and contrastingly, the farming population density in the Huai River was almost as high as that of the Lower Yangtze, although the region's agricultural employment share of the local labour force was practically the highest

²⁰ Skinner, "Presidential Address: The Structure of Chinese History." (1985) p.279.

²¹ Qualitative evidence on this region's food trade, albeit sparsely available in time and space, does suggest that at least in the beginning of the eighteenth century, the Lower Yangtze was not entirely self-sufficient in food provision and it had to import rice from Upper Yangtze and Middle Yangtze to fill the gap in food provision. See *Qing Shengzu Shilu*, vol. 233, 1708 (47th Year of the Kangxi Reign). Reference quoted from Guo Songyi, *Qingdai De Liangshi Maoyi* (Rice Trade in the Qing Dynasty), *Pinghuai Xuekan*, Vol.1. 198 It is also noted that rice import increased rapidly after 1885, and Wuhu of Taiping Prefecture of the Lower Yangtze was the centre for the trade of imported rice. van de Ven, *Breaking with the Past: The Maritime Customs Service and the Global Origins of Modernity in China*. p.12

in the country. This suggests that labour productivity in agriculture in the Huai River Basin remained low *despite* high labour input per unit of land.

Prefectural Farming Population Density in 1761-70



Map 4 Farming population density at the prefectural level. (Data: XKTB dataset for prefectural agricultural employment shares, and Cao (2001) for prefectural population estimates.)

Admittedly, as the data on the total amount of agricultural production in these regions and the trade of agricultural goods among the regions are not available, I cannot draw a firmer and more quantitative conclusion regarding the agricultural productivity difference among the Chinese regions. However, the fact that these two adjacent regions present such sharply contrasting patterns in share and density of agricultural employment still reminds us of the importance of historical economic and geographic context to any understanding of the Chinese economy in the eighteenth and nineteenth centuries. Since the Lower Yangtze was well connected to its neighbouring regions through extensive waterways on which commodities, people and capital could move relatively easily and frequently, it is likely that at least part of the Lower Yangtze's economic success derived from draining economic resources from the neighbouring regions. The same process may also have indirectly contributed to the economic failure of some regions such as the Huai River Basin. Indeed, one may ask to what extent the observed levels and trajectories of economic development in any given region in eighteenth- and nineteenth-century China were related to the decline and development of *other* regions. In short: to what degree were Chinese regions interconnected in terms of economic development? Four decades ago, Skinner suggested that individual Chinese regions were semi-autarkic systems with no economic exchange - but this assertion had a very limited empirical basis.²² In contrast, and based on prefectural food price series, Yeh-Chien Wang argued that the markets in different regions of China were well integrated, but Kishimoto Mio maintained that the integration of urban markets cannot be understood to denote the existence of an integrated *national* market, but only a "line-node" system of urban markets as cities along the Yangtze ultimately coexisted in isolation from each other.²³ The *XKTB* dataset will enable this question to be revisited through an examination of human interactions and economic activities taking place both within and across Chinese regions. This will be covered in my later studies in the context of a discussion of the long-run occupational structure of the Lower Yangtze. For now,

²² Skinner and Baker, *The City in Late Imperial China*.

²³ Wang, Y., "Spatial and Temporal Patterns of Grain Price in China: 1740-1910", Paper presented at the conference on Chinese economic history, Bellagin, 1984; Wang, Y., "Food Supply and Grain Prices in the Yangtze Delta in the Eighteenth Century", *dierjie zhongguo jindai jingjishi taohunhui lunwenji* (Proceedings of the Second Conference of Chinese Modern Economic History), Institute of Economics, Academia Sinica, 1989. Kishimoto Mio, "Present Progress on the Study of Qing Price History", *Chinese Modern History Research*, vol.5, 1987. P.91-92.

let us turn instead to the third major aspect of the spatial variation in Chinese agriculture in the eighteenth and nineteenth centuries: the organisation of farm labour.

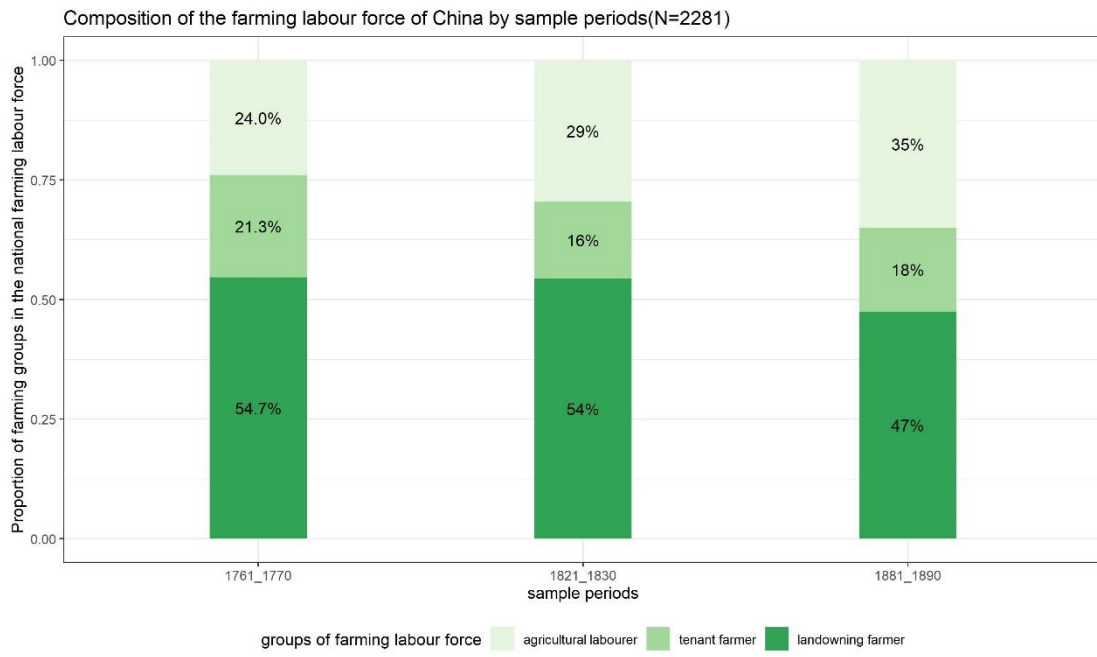
2.1.3. The labour organisation in agriculture

The labour organisation of agricultural production, defined through land contracts and labour contracts, has always played a key role in past economic and social studies of agrarian societies.²⁴ For China, the widespread usage of agricultural labourers as a representative group for the Chinese agricultural labour force in the existing literature on the Great Divergence has led to the discovery of important sources such as the agricultural manuals in the Lower Yangtze, but also raises doubts on how representative agricultural labourers were of the Chinese agricultural labour force.²⁵ To avoid this problem, quantitative insights into the labour organisation of agricultural production, its temporal evolution, and its spatial patterns, are therefore necessary. A brief attempt at establishing the patterns of the organisation of farm labour through an analysis of the relative proportions of agricultural labourers, tenant farmers, and landowning farmers at the regional level was presented in the last paper (the results of which are reproduced in Figure 6A, B, and C). Given that the sample size is relatively small at this stage, and that the *XKTB* dataset only provides land ownership status and employment status for approximately 55% of all individuals belonging to the farming labour force, the spatial accuracy of the analysis can only be refined down to the provincial level, rather than the prefectural level. As an example, a set of 1761-70 maps illustrating the spatial patterns are provided (maps 5-A, B, and C).

²⁴ See Leigh Shaw-Taylor, "The Rise of Agrarian Capitalism and the Decline of Family Farming in England," *Economic History Review* 65, no. 1 (2012): 26–60.

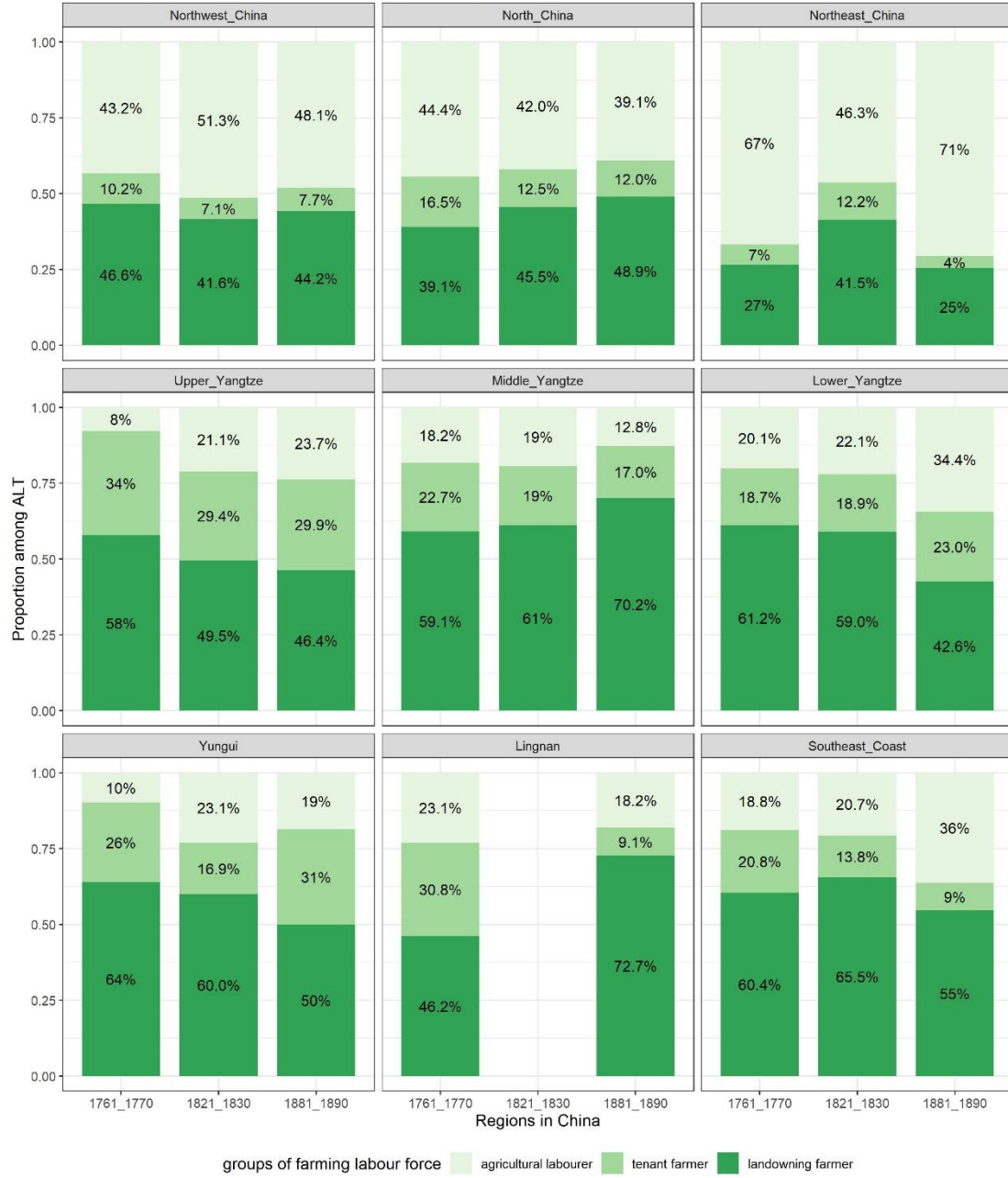
²⁵ Allen (2009), Allen et al.(2011).

(A)



(B)

Variation in the composition of farming group across regions by sample periods(N=2174)



(C)

Proportion of farming groups in the farming labour force across region groups by sample periods(N=2174)

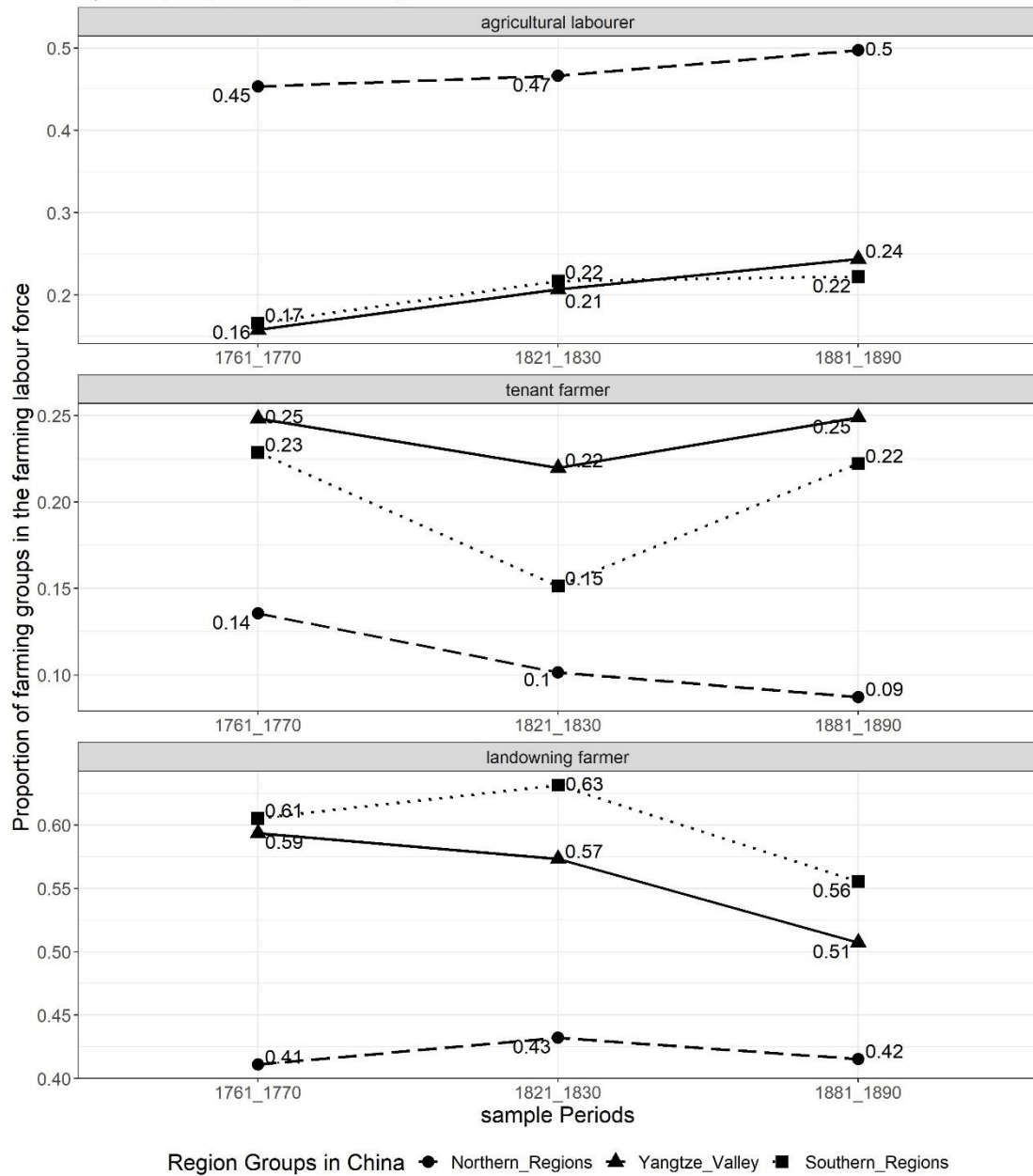
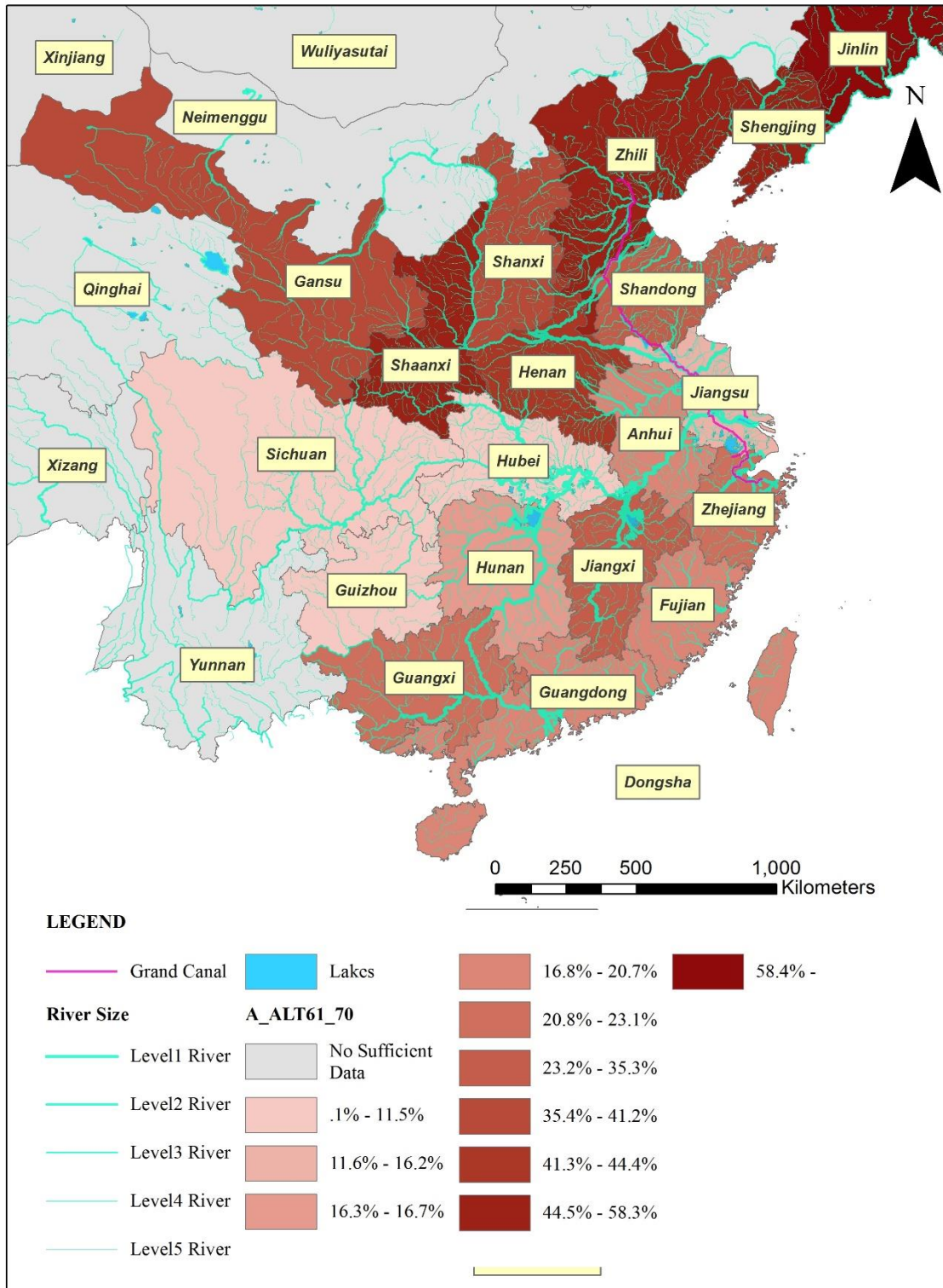
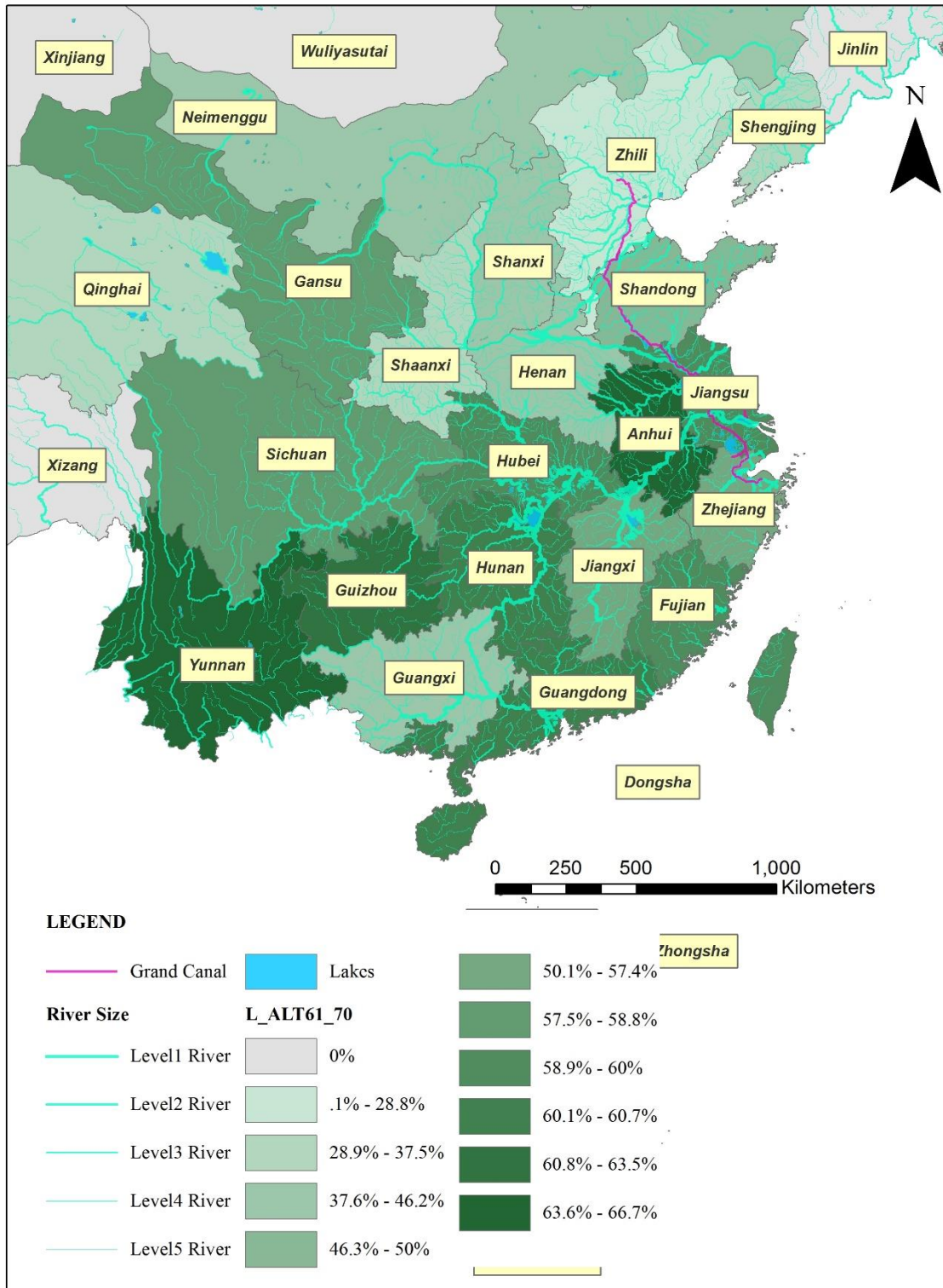


Figure 6 Relative weights of agricultural labourers, landowning farmers, and tenant farmers in the Chinese farming labour force (A: on the national level; B: by regions, 1761-1890. C: by region groups, 1761-1890).

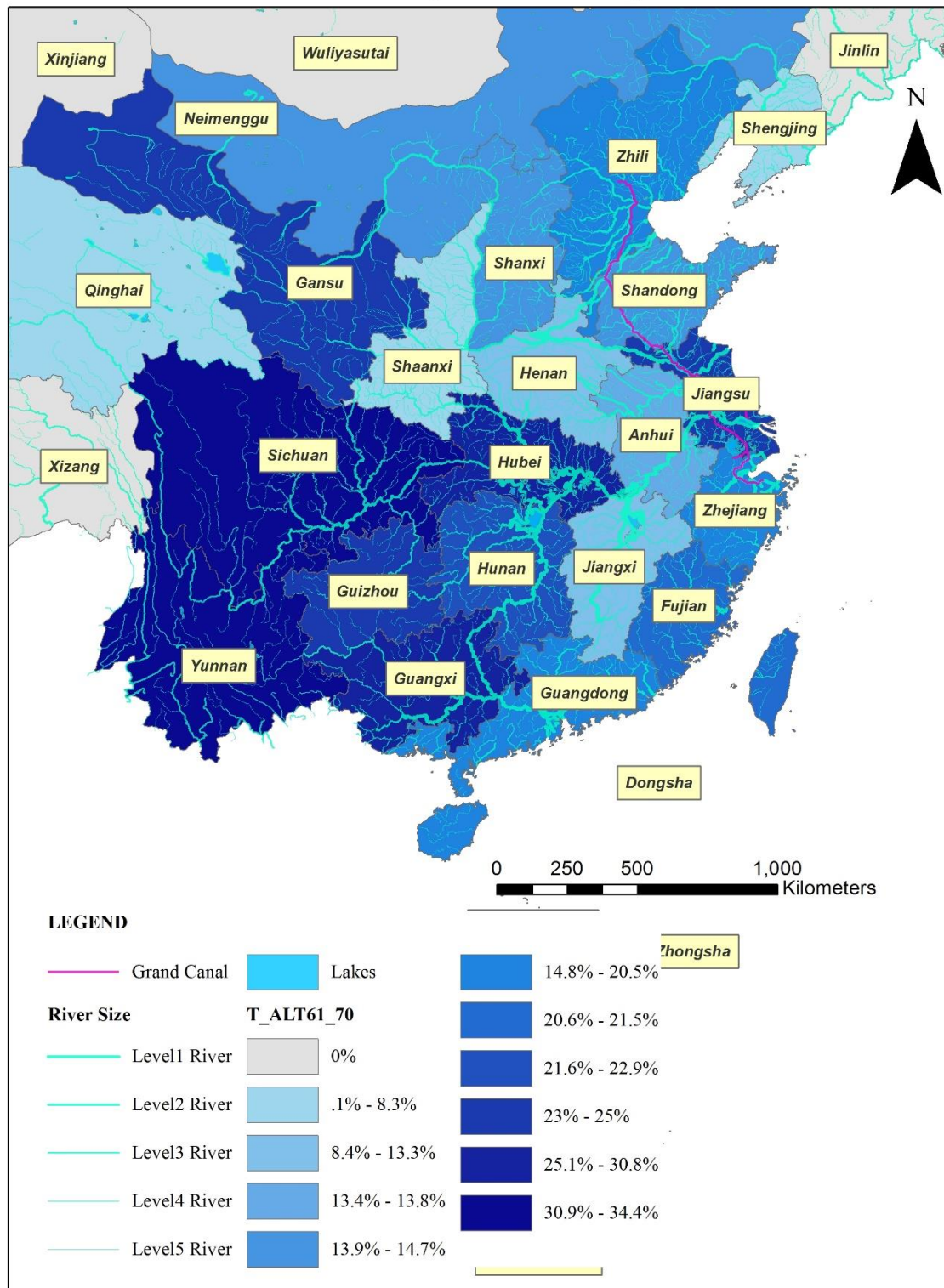
Share of agricultural labourers in the farming labour force on the provincial level in 1761-70



Share of landowning farmers in the farming labour force on the provincial level in 1761-70



Share of tenant farmers in the farming labour force on the provincial level in 1761-70



Map 5 Composition of farm labour at the provincial level (A: Share of agricultural labourers. B: Share of landowning farmers. C: Share of tenant farmers).

Based on these spatial-temporal patterns, it was concluded that at the national level, the share of agricultural labourers (in light green) in the farming labour force throughout the period might be low compared with England, but probably not compared to most of Europe or Asia (Figure 6A). Spatially, there were at least three distinct models of labour organisation in agricultural production in late Imperial China, the Northern Regions Model features a high usage of wage labour, the Yangtze Valley model presents a high level of tenancy development, and the Southern Regions model displays the highest share of landowners; and temporally, all three models see the increasing use of wage labour across all three sample periods and a shrinking landownership after 1821-30, which might be a consequence of the socio-economic changes after the 1840s (Figures 6 B and C).²⁶ While the current sample size forbids exploring the farming labour organisation patterns beyond the provincial level, our sample expansion currently underway will help us to improve the spatial resolution of our dataset. When these become available, we can further examine the spatial heterogeneity in the labour organisation in agriculture in imperial China, as well as its causes and consequences.

2.1.4. The seasonality of employment in agriculture

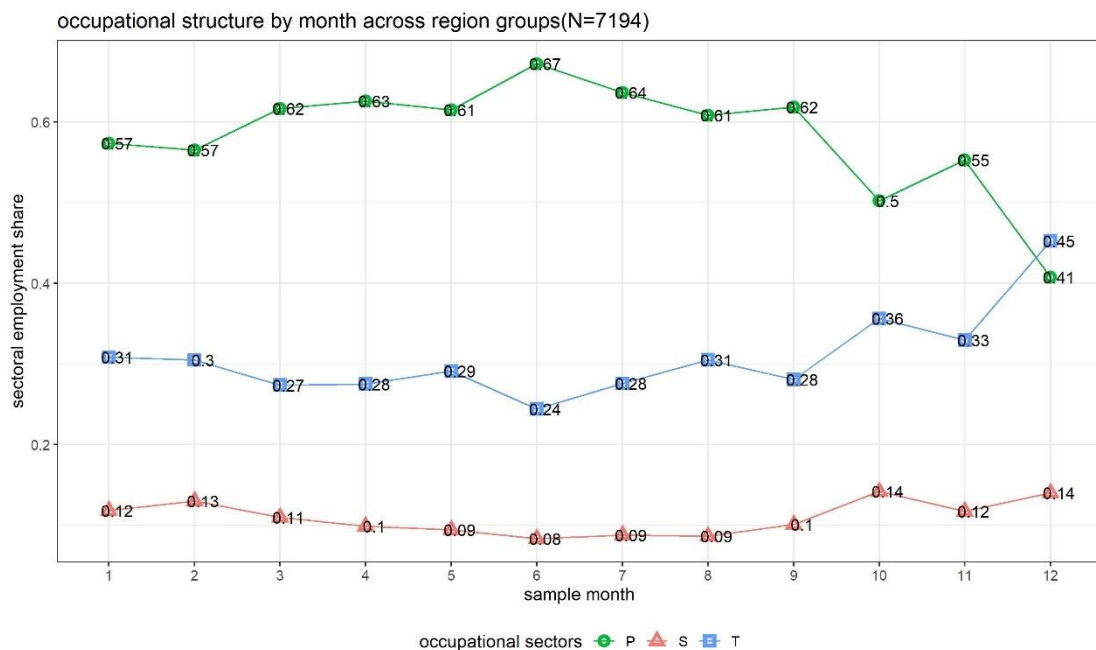
Similar to most historical court records, the *Xingke Tiben* reports document meticulously when the homicide took place. As a result, all reported occupation data are accompanied by data on the time of the observation, accurate to the specific day of the month (occasionally to the hour). Taking advantage of the temporal accuracy of the dataset, we analyse the occupational structure by month and the results reveal a strong seasonality of employment in China at both the national (see figure 7 A and B) and the regional levels (see figure 8 A and B).

First and foremost, while seasonality is certainly not surprising in the Chinese history field, what is surprising indeed here is, besides the traditional “farming-textile” complementarity which has been discussed in numerous literature, there exists an even stronger complementary relationship of primary (in green on all graphs) and tertiary sector employment (in blue on all graphs). This pattern might be caused by two main reasons. First, our main focus on the male

²⁶ Yang, “A New Estimate of Chinese Male Occupational Structure during 1734–1898 by Sector, Sub-sector Pattern, and Region.”

occupational structure means we are currently missing the large amount of women engaged in the agriculture-textile (spinning and weaving) employment complementarity. Second, as argued in a previous paper, the tertiary sector absorbed large amount of surplus labour and people were not drawn to the tertiary sector not in the pursuit of higher income but forced into the tertiary sector as means of survival.²⁷ Similarly, for male agricultural workers, in the slack season, when textile employment had been fulfilled by women, the elderly and themselves working at night, and other traditional secondary sector employment (such as blacksmithing or carpentry) had a high skill threshold and required lots of training and apprenticeship years ahead, certain tertiary sector occupations (such as petty sellers, as well as some minor professions such as barbers, domestic servants, entertainers, and restaurant waiters) were relatively “open”, requiring minimal skill and little initial capital, became attractive for the extra-income. It is noted here that this does not suggest against the involution theory but instead suggests that if involution indeed existed, it would be a more complex involution scenario while the involution among the agricultural household involves both seasonality and employment outside the traditional farming-textile complementarity.

(A)



²⁷ Yang.

(B)

occupational structure by month across sample years(N=7194)

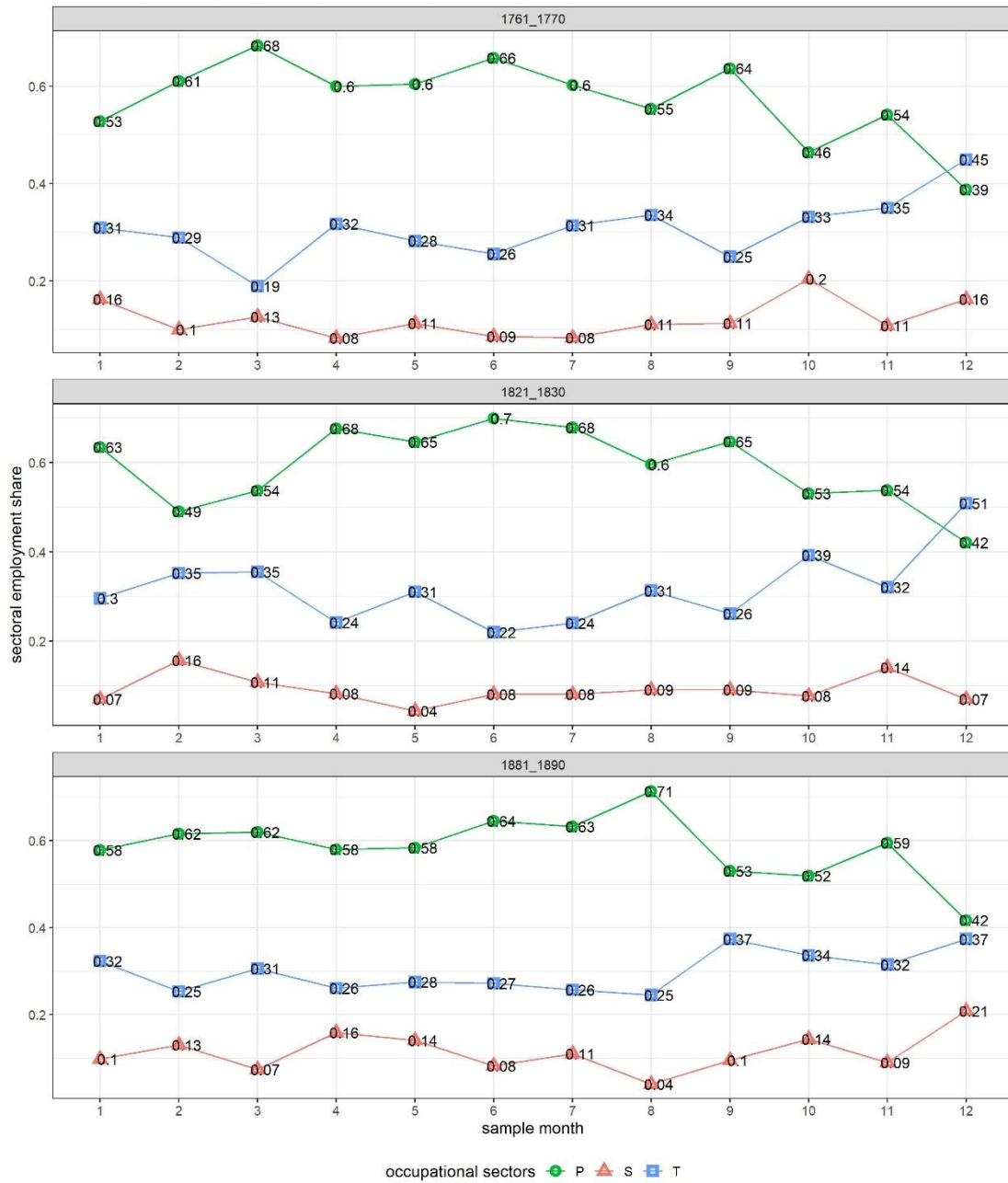
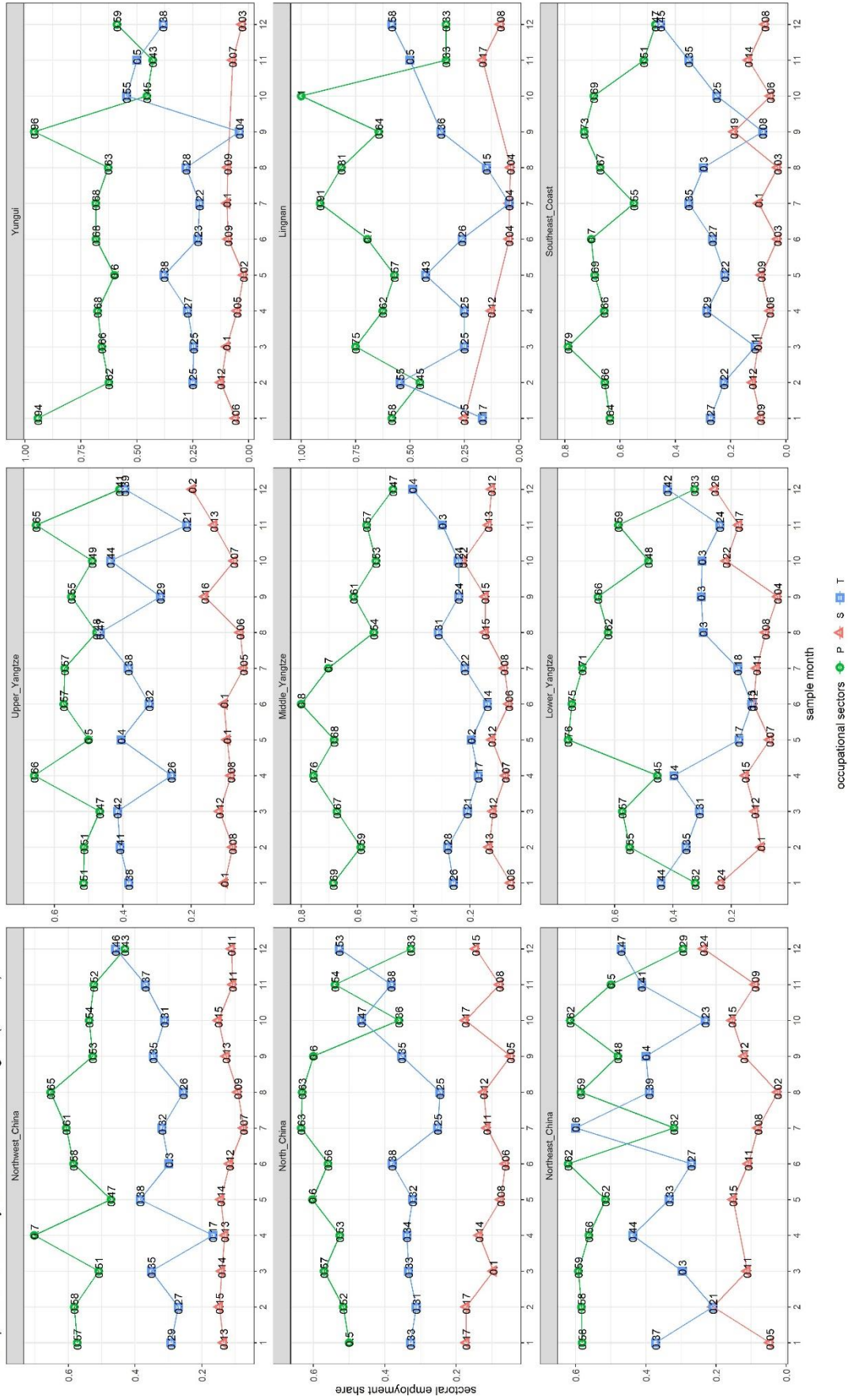


Figure 7 The seasonality of employment in the XKTB dataset on the national-level (A: 1761-70, 1821-30 and 1881-90 all combined; B: 1761-70, 1821-30 and 1881-90 respectively)

(A)

occupational structure by month across macroregions(N=7194)



(B)

occupational structure by month across region groups(N=7194)

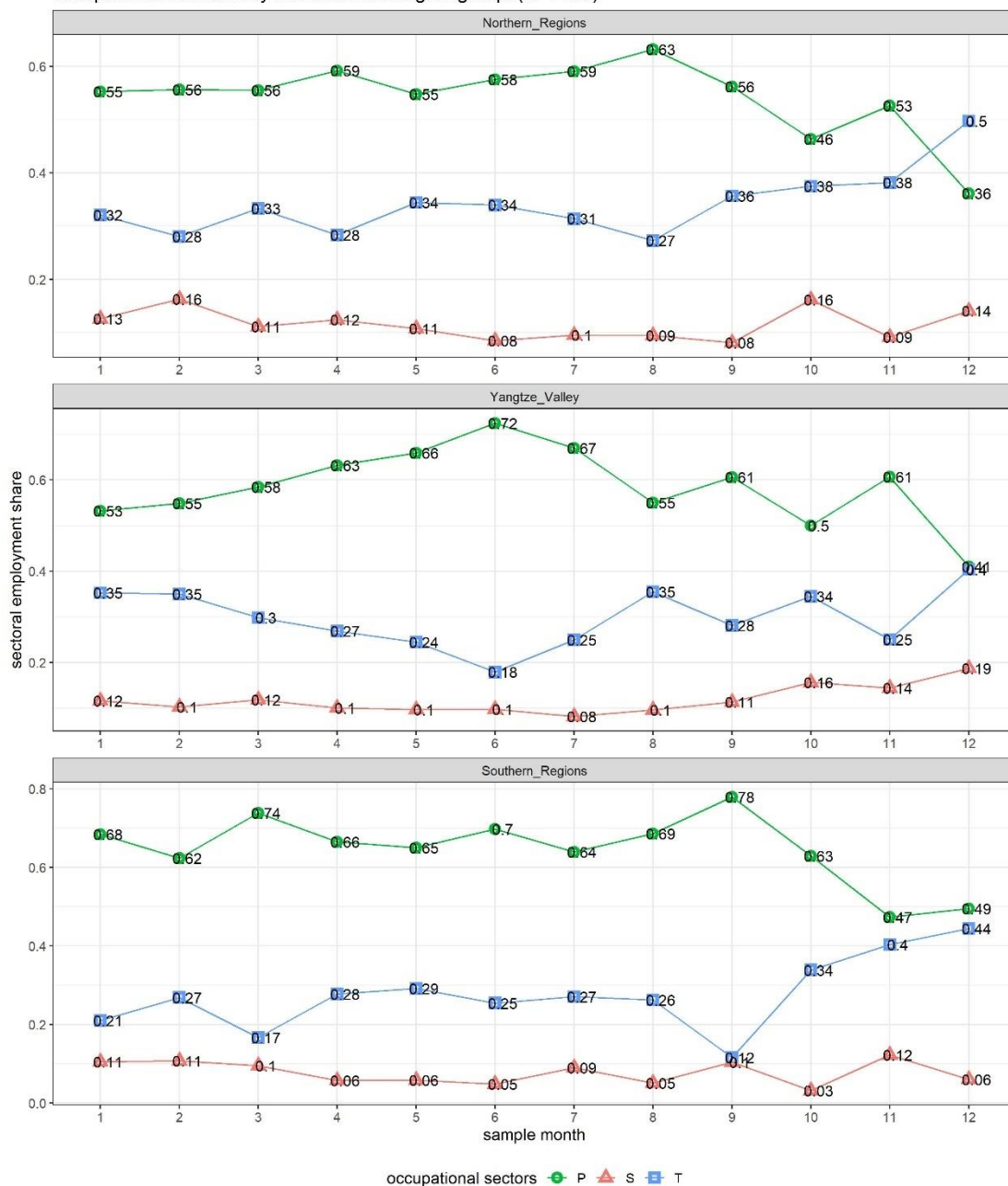


Figure 8 The seasonality of employment in the XKTB dataset on the regional level (A: by region; B: by region groups)

The temporal and spatial patterns are also illuminating. On the national level, seasonality in the long run slightly waned in January to June but remain strong in July to December (Chinese lunar Calendar), meanwhile the primary-tertiary complementarity was gradually

replaced by primary-secondary complementarity. These changes might be caused by changing agricultural practice (for example, multi-cropping and intercropping) reducing length of slack season, and, new manufacturing employment opportunities with low threshold attracting labor in slack season. On the regional level, we see highly diverse seasonality patterns across the regions. When these are grouped into the three region groups (Northern Regions, Yangtze Valley and Southern Regions), we can see that the primary-secondary complementarity is the strongest in the Yangtze Valley, meanwhile the primary-tertiary complementarity is strong in all three cases. Further, the peak of agricultural employment took place in August in Northern Regions and Southern Regions, but in June in the Yangtze Valley. With more data in the sample expansion and more local-level case studies of historical agricultural practice, we are hoping to improve the temporal and spatial resolution and accuracy of these estimates soon.

Overall, therefore, all four aspects of Chinese agricultural production exhibited clear spatial-temporal heterogeneity: Chinese agrarian society was constituted of many regions exhibiting different levels of dependency upon farm labour, varying densities of agricultural labour input and diverse ways of organising farm labour for agricultural production, with highly seasonal and dynamic labour.²⁸ In the second section of this paper, I explore the consequences of these different starting points on the different regions' trajectories of economic change in the nineteenth century and on the manner in which the different regions reacted to China's opening to the West after 1840. For now, let us turn to another aspect of the spatial diversity of the Chinese economy: the non-agricultural sectors.

2.2. Manufacture

2.2.1. Share of manufacturing employment in the local labour force

In the historiography of global economic history, analyses of the manufacturing sector in Late Imperial China have tended to focus on urban workers, government-hired artisans, and workers

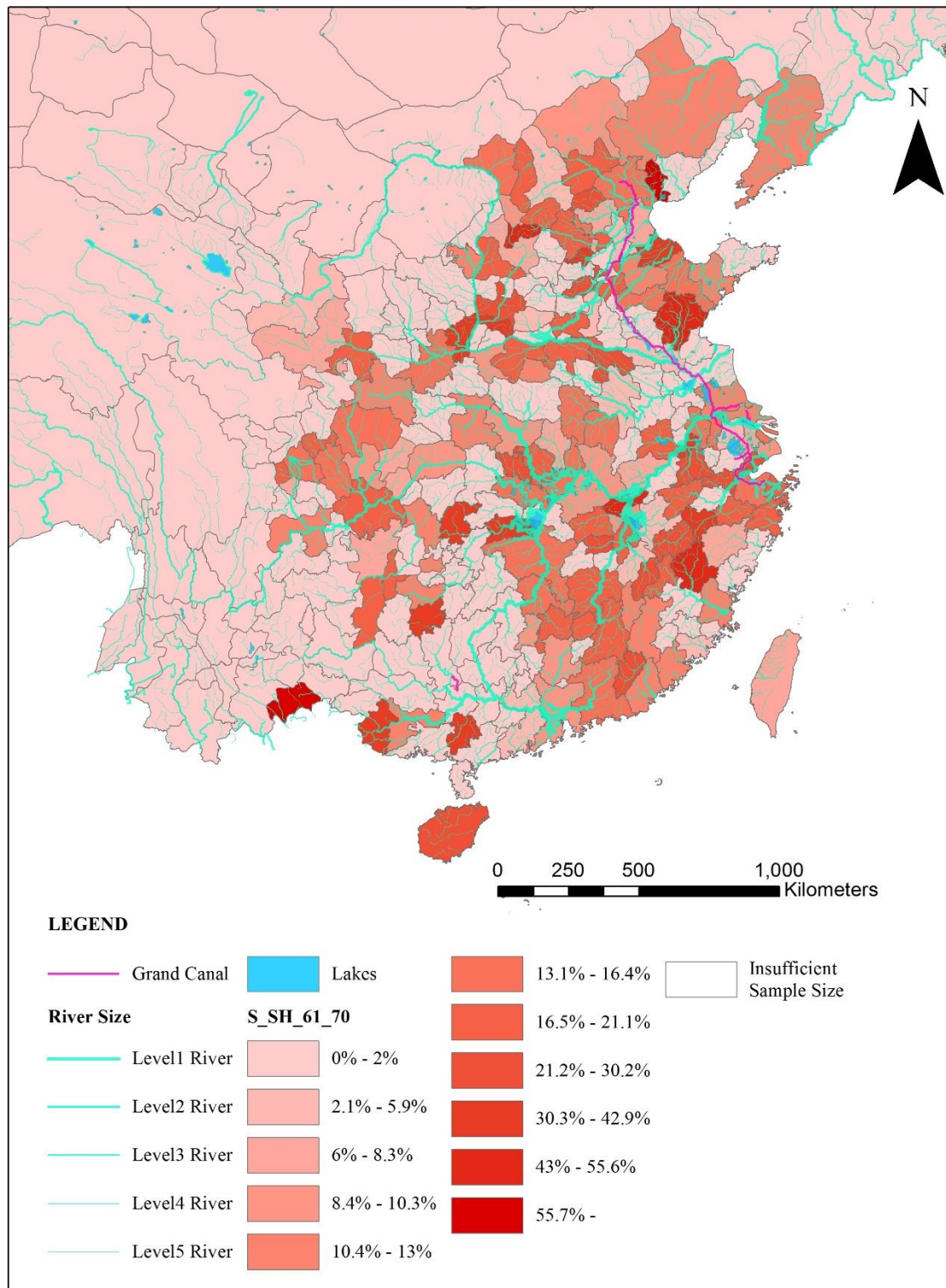
²⁸ Numerous qualitative sources suggest that the regions also varied greatly in their main types of grain for production and consumption, which could in turn affects all these patterns discussed here. Currently no solid quantitative data has been found on this aspect according to my knowledge.

employed by foreign companies, often with limited spatial coverage.²⁹ Manufacturers in rural areas, small towns, and areas beyond the few cities selected for these existing studies have rarely been discussed, in part because of the limited availability of sources. The *XKTB* dataset, however, enables an examination of spatial patterns of this sector with a much wider spatial range.

From the perspective of occupational structure, the manufacturing sector of eighteenth-century China was characterised by the co-existence of multiple regions with a relatively high share of manufacturers in their local labour force (see map 6). Outside the Lower Yangtze, the share of manufacturers in the local labour force was also relatively high in parts of North China and the Middle Yangtze. Rivers and lakes once again played an important role in shaping spatial variation. In North China, the areas with higher shares of manufacturers in the local labour force were mostly located to the north of the Yellow River, to the east of the Grand Canal, and in the Hai River Basin. The Huai River Basin of North China, by contrast, featured quite a low share of manufacturers. While the Middle Yangtze attracted much academic attention for its economic change after the opening of treaty ports in 1858, its pre-1858 level of economic development has rarely been discussed. Map 6 suggests that the share of manufacturers in the local labour force in the areas adjacent to Dongting Lake and Poyang Lake, as well as in the areas on the banks of the Yangtze River, were relatively high for the country. While this fact alone cannot be assumed to denote a higher level of economic development, it at least suggests that pre-1858 economic development in this region deserves more attention.

²⁹ For example, Robert C Allen et al., “Wages, Prices, and Living Standards in China, 1738-1925: In Comparison with Europe, Japan, and India,” *Economic History Review* 64 (February 2, 2011): 8–38.

Prefectural secondary sector employment share in 1761-70



Map 6 Secondary-sector employment shares at the prefectural level, China, 1761-70.

What is rather surprising in this spatial analysis of secondary-sector employment shares in eighteenth-century China is that the shares observed in the Lower Yangtze are comparable to,

rather than significantly higher than, those of the other regions presenting relatively high manufacturing employment shares. This result seems to contradict the widespread notion that the Lower Yangtze was the most economically advanced region in China. One possible explanation is that the *XKTB* dataset, as discussed before, under-recorded by-employment. If the Lower Yangtze was much more extensively developed than other regions in certain industries (let us call these group BE-oriented Industries), and equally advanced in other industries, and, if these BE-oriented industries relied primarily on by-employment, then the *XKTB* dataset would significantly under-count the manufacturing employment share of the labour force in the Lower Yangtze, while not affecting as much other regions where the share of labour force in BE-oriented industries is smaller. The textile industry most probably fits this description – and the Lower Yangtze had by the eighteenth century long been known for its production of, and trade in, textiles. According to my preliminary analysis in previous studies (YANG, upcoming), yarn and undyed cloth were mainly produced by women in a domestic setting, while men’s participation in textile production was confined to occupations that required high upper-body strength such as dyeing. As map 6 suggests, when discounting women’s participation in textiles and textile by-employment, the share of the local labour force employed in manufacturing in the Lower Yangtze seems on par with that of core areas in North China and the Middle Yangtze. This further suggests two important aspects of the Chinese manufacturing sector. First, women made a significant contribution to the Chinese manufacturing sector through their dominant role in the textile industry and, relatedly, their work played an important part in distinguishing the Lower Yangtze from the rest of the country. Second, other industries, which presented lower levels of gendered division of labour and did not rely on by-employment to the extent that the textile industry did, were relatively well spread across the different regions of China: when focussing on these industries or on the *male* labour force, areas of manufacturing concentration other than the Lower Yangtze become evident, long before China opened to the West.

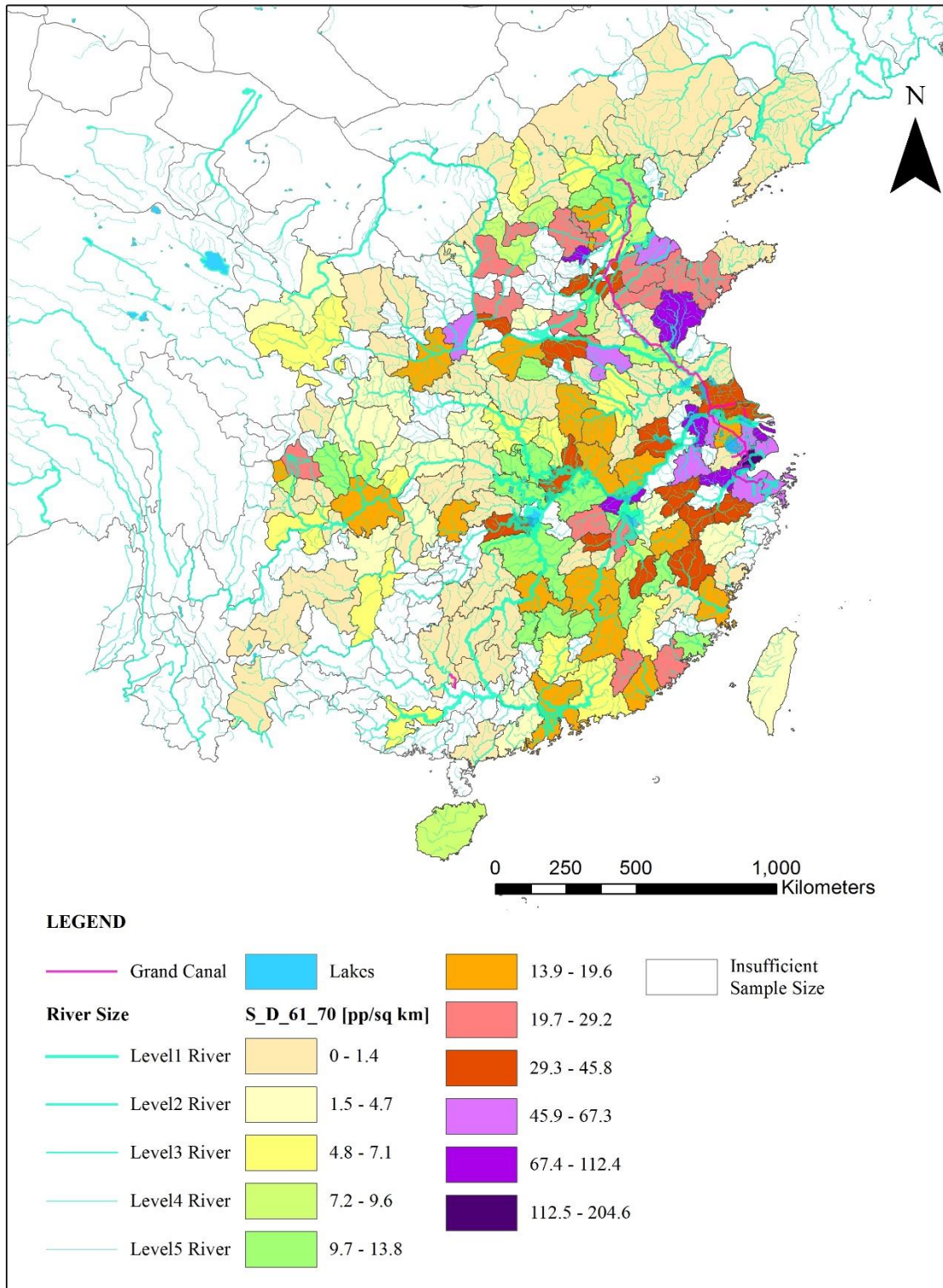
2.2.2. Manufacturing population density

In my current estimate, the Lower Yangtze does not significantly distinguish itself from the rest of the country in terms of its manufacturing employment share - although, as discussed above, this was most probably in part due to gender bias and by-employment bias. From this perspective, therefore, the economy of the Lower Yangtze appears less “advanced” than previously thought. However, when focusing on male data alone, and discounting the potential impact of textile by-employment, the Lower Yangtze does remain the most prominent manufacturing centre in China in terms of the *intensity* of manufacture. As shown in map 7, the number of men employed in manufacture per unit of land was much higher in the Lower Yangtze than in the rest of the country. And as we can see in table 1, the Lower Yangtze alone, despite representing only 2.6% of the total area of the country, provided as much as 29.4% of the national male manufacturing labour force in 1761-70. In this respect, what is most impressive about the economy of the Lower Yangtze is not that its labour force presented the highest share of manufacturers of the country, but rather the fact that the region was able to maintain a *relatively* high share in a period when its population density, which was the highest in the country and already reached 303 people per square kilometres (pp. per sq. km) by 1761-70, rose rapidly to 425 pp. per sq. km until the Taiping Rebellion in 1854.³⁰ Rapid population growth may have promoted the accumulation of manufacturing skills and knowledge, as well as the development and adoption of new technology, among the working population of the region. This may have come to truly distinguish the Lower Yangtze from the rest of the country. Apart from the external opportunities for development offered by the opening of treaty ports later in the year and the wealth brought by people who moved to Shanghai during the Taiping Rebellion (1850-1864), this accumulated wisdom most probably also played an important part in the rise of Shanghai in the second half of the nineteenth century, when the city was able to successfully resist the Taiping Army and gain prominence despite many parts of the Lower Yangtze having suffered greatly from the devastating effects of the Taiping Rebellion. In my

³⁰ Yang, “[MPhil Dissertation]Long Run Regional Economic Development and Population Density in Imperial China.” p.67.

other research on the Lower Yangtze, additional long-run *XKTB* data for the Lower Yangtze will enable a closer examination of the region's economic trajectory.

Prefectural manufacturing population density in 1761-70



Map 7 Manufacturing population density at the prefectural level, China, 1761-70.

SUMMARY OF MANUFACTURING POPULATION BY REGION IN CHINA 1761-70

Regions	Share of Total Area of the Country	Share of the national population	manufacturing labour force
<i>Lower_Yangtze</i>	2.6%	25.9%	29.4%
<i>North_China</i>	4.9%	22.1%	26.4%
<i>Middle_Yangtze</i>	4.0%	16.1%	17.5%
<i>Northwest_China</i>	6.7%	11.6%	10.3%
<i>Southeast_Coast</i>	2.8%	10.3%	7.4%
<i>Upper_Yangtze</i>	4.5%	5.4%	4.9%
<i>Yungui</i>	4.3%	4.4%	2.1%
<i>Lingnan</i>	1.6%	2.5%	1.9%
<i>Northeast_China</i>	14.6%	0.3%	0.2%
<i>Inner_Asia</i>	54.1%	1.4%	0.0%
<i>total</i>	100%	100%	100%
<i>Total Size</i>	13.9 million sq. km	311.47 million	39.9 million

Table 1 Manufacturing population by region, China, 1761-70.

Leaving aside the Lower Yangtze, the levels of manufacturing population density in North China and the Middle Yangtze are also worth noticing. Although the absolute manufacturing population density levels in these two regions are not as high as those observed in the Lower Yangtze, they do represent a large proportion of the national manufacturing labour force (see table 1). The industries and manufacturing labour force of North China will be examined more closely in my other research, using the long run *XKTB* sample for Beijing and Tianjin. Regarding the Middle Yangtze, although the spatial patterns identified so far would suggest a relatively high level of development of the manufacturing sector in the areas surrounding Dongting Lake and Poyang Lake, and more generally in the prefectures located on the Yangtze River, the sample size of the current dataset does not allow us to examine the region at a finer level of spatial accuracy than the prefectural level. In future research, increasing the sample size in the areas identified above would most probably provide valuable information as to the origins of the relatively high observed level of manufacturing development.

2.2.3. Manufacturing sector industries

So far, my discussion has focused on the manufacturing sector as a whole. However, because the development of certain industries often depended upon a specific set of prerequisites such as the availability of particular raw materials, transport conditions, the availability of workers with a particular skill set or physical strength, or connections to consumer markets; and because

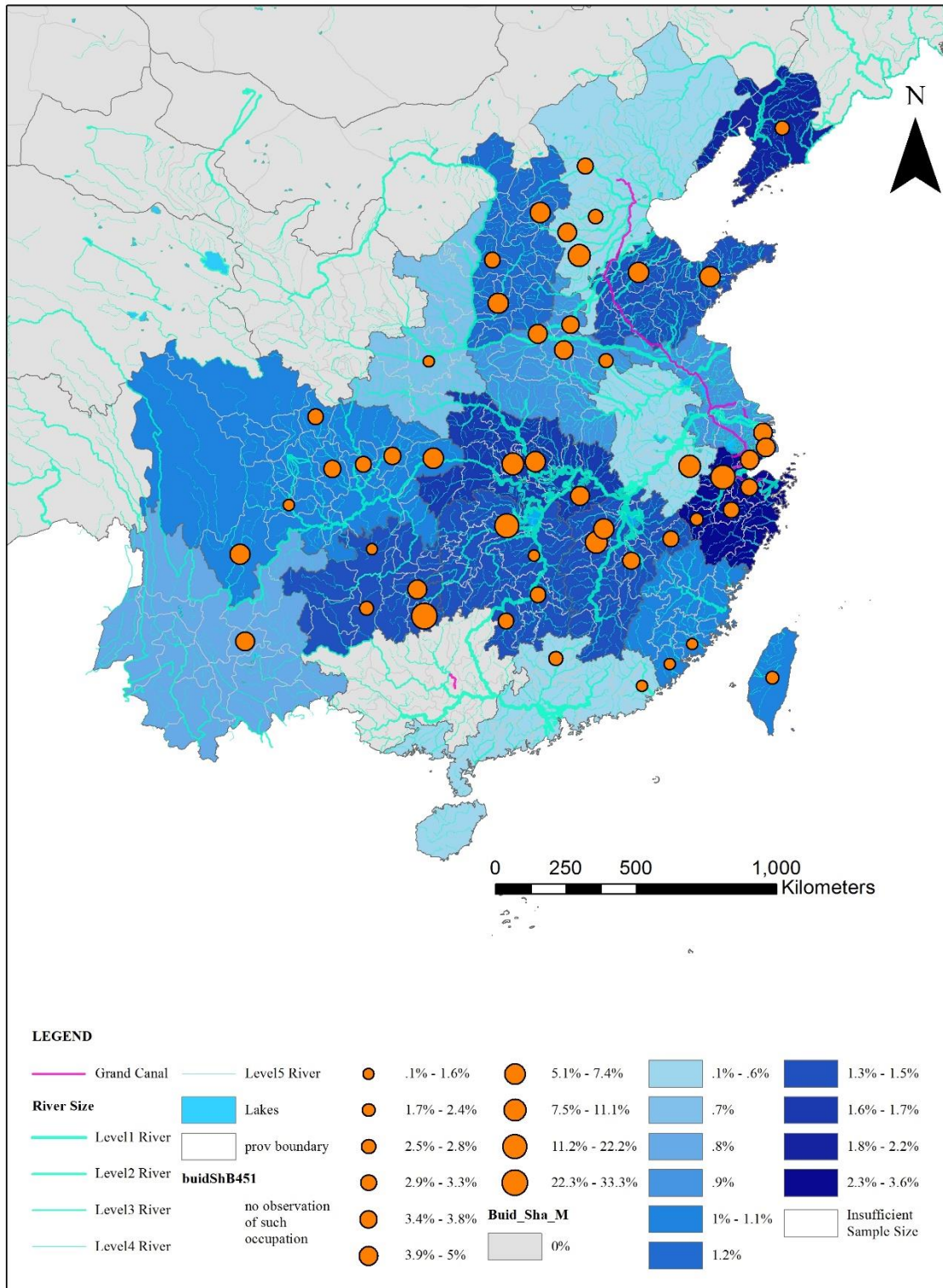
these conditions varied across space, the spatial patterns of concentration of different industries are often distinctive. In order to more fully examine spatial patterns within the manufacturing sector of late Imperial China, it is therefore necessary to examine individual industries within the sector as well as the sector as a whole. Because of the limitations imposed by the current sample size of the *XKTB* dataset, it was not possible, at this stage in the research, to identify and examine spatial patterns in all industries – but the data did reveal spatial patterns for several industries for which a relatively large amount of observations were available. Four of the top ten industries identified in the current national estimate were thus selected to demonstrate the degree of spatial variation of these industries: building and construction, wood industries, textile industries, and metalworking. It ought to be remarked that the sample size for these industries remains small, such that the results reported here are tentative and subject to possible revision as the sample size is increased in the future. Nonetheless, since the dataset was created through random sampling, the relative sizes of the different regional estimates should reflect actual size differences.

By producing furniture and infrastructure that provided and defined functional spaces for daily life and other socio-economic activities, the building and construction industry played an important part in shaping the living standards of any given population. As the products of the building and construction industry were either immovable assets or bulky goods that were expensive to ship across long distances, the development of the industry mainly relied on demand from local markets. In the *XKTB* national dataset, the occupational group classified as belonging to the building and construction industry includes carpenters (66.5%), masons (15%), builders (9%), and plasterers (9%). The *XKTB* dataset suggests that before 1851, the share of building and construction employment in the local labour force was overwhelmingly larger in the Lower Yangtze than in the rest of the country (see map 8). Shares in North China and the Middle Yangtze were smaller than in the Lower Yangtze, but nonetheless much higher than in the Southeast Coast and the inland areas. I also notice that the high levels in North China and the Lower Yangtze were confined to the core areas. For North China, this consisted mainly of the prefectures located to the north of the Jishui River (济水) and to the east of the Middle

Yellow River (黄河中游). This core area is hereafter referred to as Huang-Ji (黄-济地区, marked in yellow). For the Middle Yangtze, this consisted mainly of the prefectures located on or close to the Yangtze River, the Poyang Lake, and the Dongting Lake. Since the technology available to this industry was quite similar from one region to another, labour productivity should not exhibit a significant amount of regional variation. The observed spatial variation in the share of building and construction employment across the different regions therefore mainly reflects variation in the local demand for functional space for accommodation and other purposes, which can be considered a proxy for standards of living.³¹ As such, and although they are not sufficient to prove it on their own, the observed spatial patterns strongly suggest the existence of a disparity in average standards of living across the different regions of China, with the Lower Yangtze appearing to have benefited from the highest standards of living, the core areas of North China and the Middle Yangtze coming not too far behind, and standards being significantly lower in the rest of the country.

³¹ It should be stressed that a higher share in building and construction does not necessarily denote higher productivity. It may also reflect specialisation – how prepared and able people were to build or more likely repair their dwellings. Of course, building as autoconsumption is likely to lower productivity.

Building and Construction employment share at provincial and prefectural levels in 1761-1851



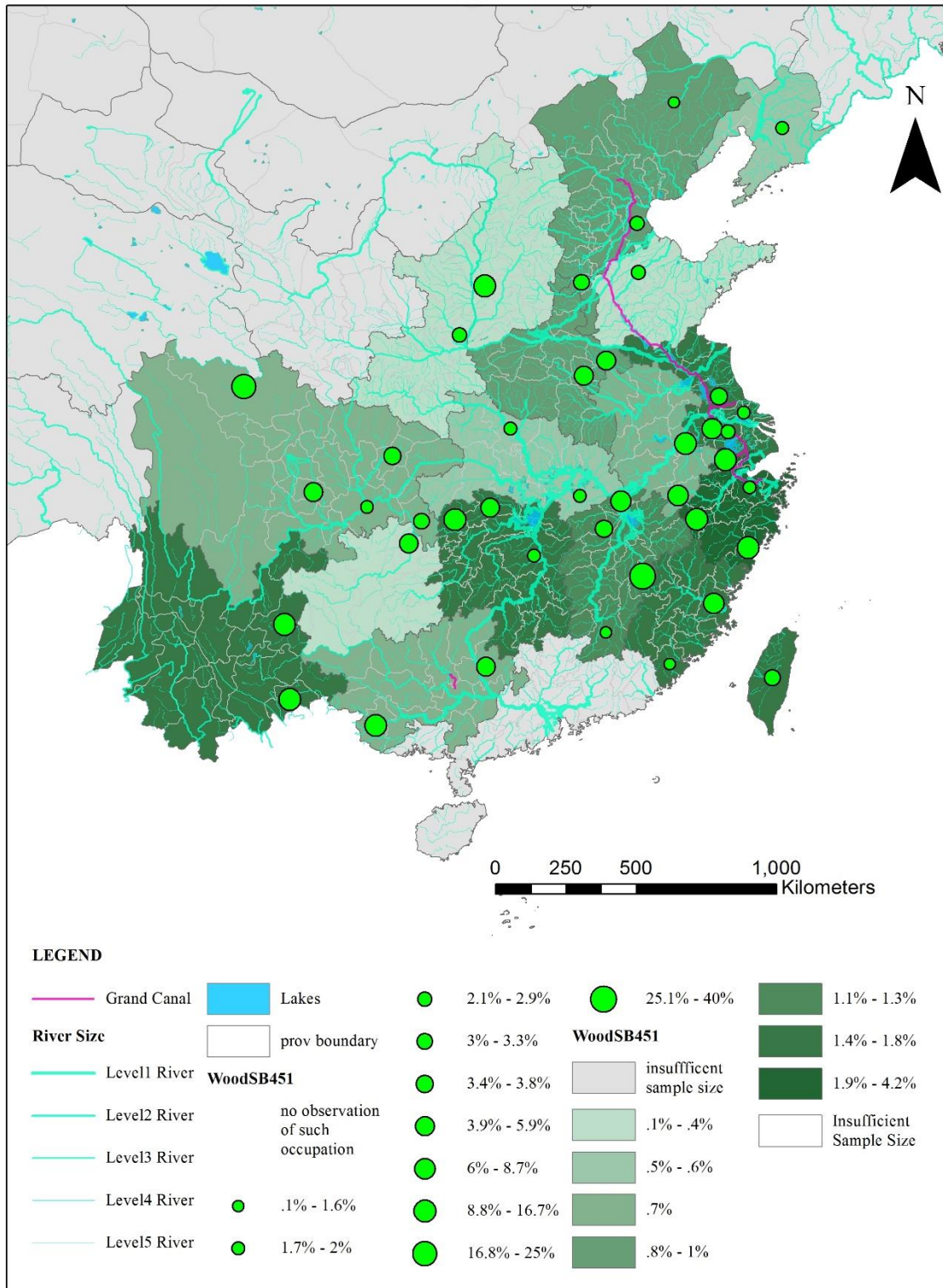
Map 8 Building and construction employment shares of the male labour force at the prefectural and provincial levels, China, 1761-1851.

The occupational category classified as belonging to the wood industry in the *XKTB* national dataset includes timber and firewood labourers (86.4%), and basket makers using bamboo or fine wood splints (13.6%). As the wood industry drew resources directly from forest vegetation, its development involved a direct burden on the local environment. As shown in map 9, as with the building and construction industry, the share of wood industry employment in the local labour force was again highest in the Lower Yangtze. However, unlike the building and construction industry, and discounting some concentration in the Lower Yangtze, observations of relatively high shares were well spread across most regions of China, with many of them located near large forests with easy access to rivers for transporting timber. These spatial patterns strongly indicate, though do not prove, that the demand for timber and firewood in the Lower Yangtze was the highest in the country, as a result of which this region exerted much higher pressure on the environment.³² This suggests that the economic development of the Lower Yangtze was perhaps unsustainable given its high degree of exploitation of the environment. It also suggests that what happened in the Lower Yangtze in terms of environmental exploitation probably cannot be considered “a model for most of China”, contrary to what was suggested by Mark Elvin.³³

³² Although the higher share in the wood industry could be partially caused by specialisation in manufacturing using wood, in the Lower Yangtze cases, most of the timber and firewood labourers were working on local hills, rather than timber rafted down the river from other places. Increasing the sample size in the future could help further verify this observation.

³³ Mark Elvin, *The Retreat of the Elephants: An Environmental History of China* (New Haven: Yale University Press, 2004), p.203.

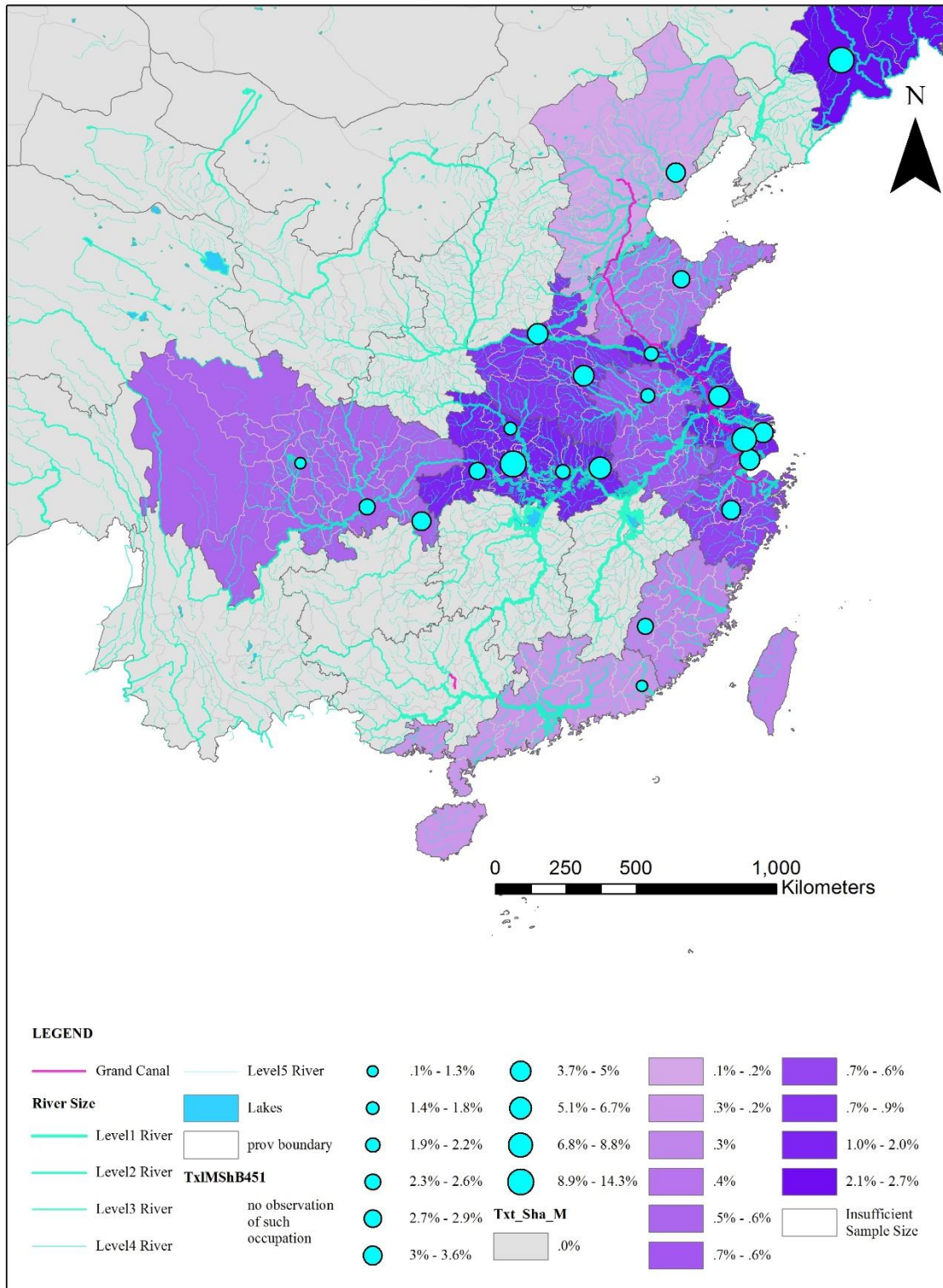
Wood industry employment share at provincial and prefectural levels in 1761-1851



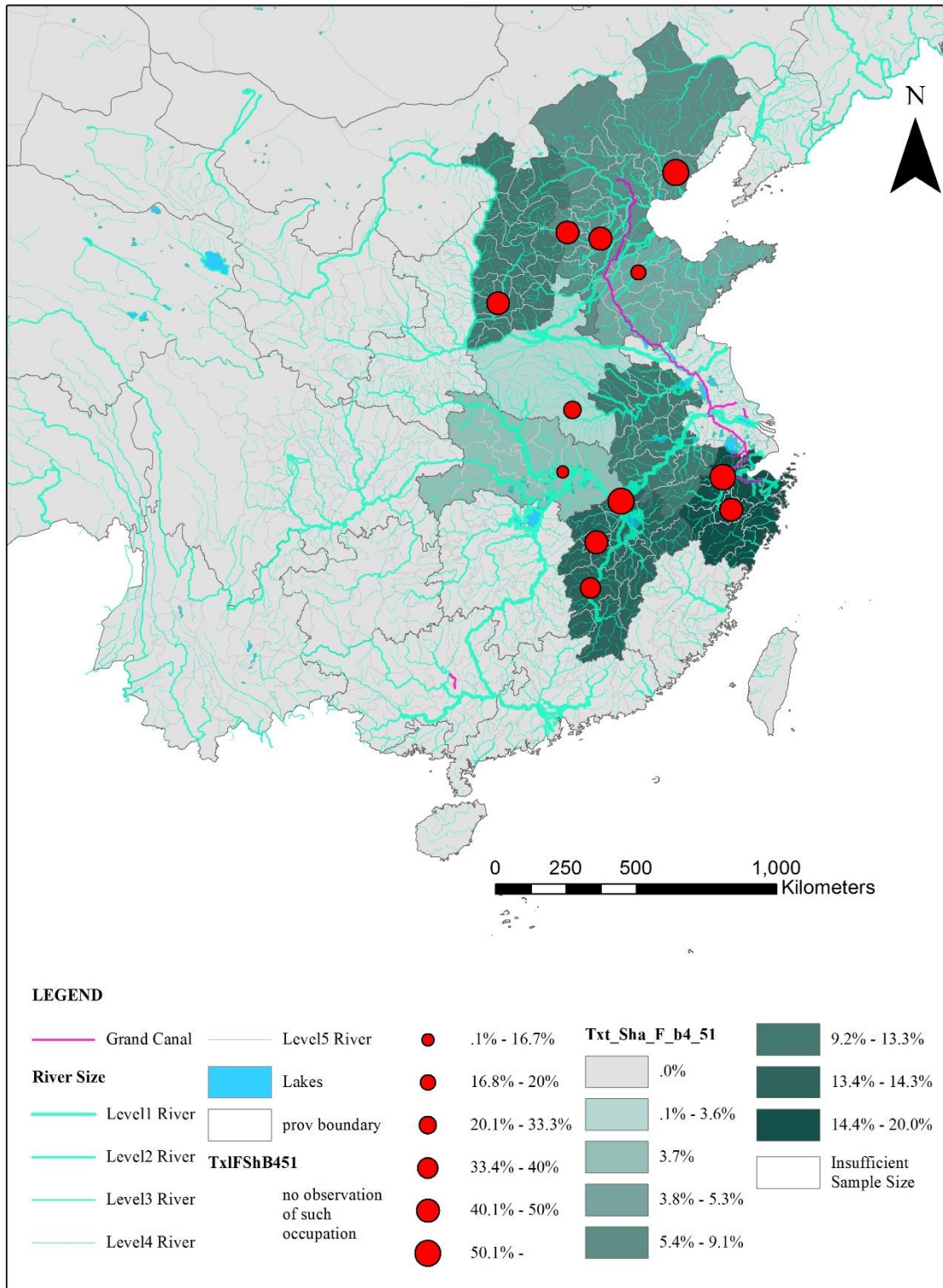
Map 9 Wood industry employment shares of the male labour force at the prefectural and provincial levels, China, 1761-1851.

Moving on to the textile industry, my previous study (Yang, upcoming) has shown that women played a dominant role in the industry, although some textile occupations, such as dyer and cloth kicker, were the preserve of men. As shown in maps 10-A and 10-B, the *XKTB* dataset suggests that gendered differences were also evident in the spatial concentration of the industry. The spatial analysis suggests that men's textile employment was mainly located along the Yangtze River and the Grand Canal, with particular concentrations around the Lower Yangtze, followed by the Middle Yangtze. Observations of female employment in textiles, on the other hand, were exclusively found in parts of North China, the Lower Yangtze, and Middle Yangtze. It is also noteworthy that the observed female shares were much higher than even the highest observable shares in the male data. Admittedly, the spatial patterns remain extremely tentative at this stage in the research, in large part because of a combination of significant undercounting of by-employment in the *XKTB* despite the importance of by-employment in textile production; low female representation in the *XKTB* data despite the dominance of women in textile production; and most importantly, the lack of reliable sources allowing for calibration of the data beyond what was achieved with the 1931 by-employment survey in Paper Three. However, the spatial patterns observed do suggest that besides the Lower Yangtze, North China and the Middle Yangtze also played an important role in the Chinese textile industry, and hence that further academic attention should be paid to these two regions in future investigations into this industry.

Male textile employment share at provincial and prefectural levels in 1761-1851



Female textile employment share at provincial and prefectural levels in 1761-1851

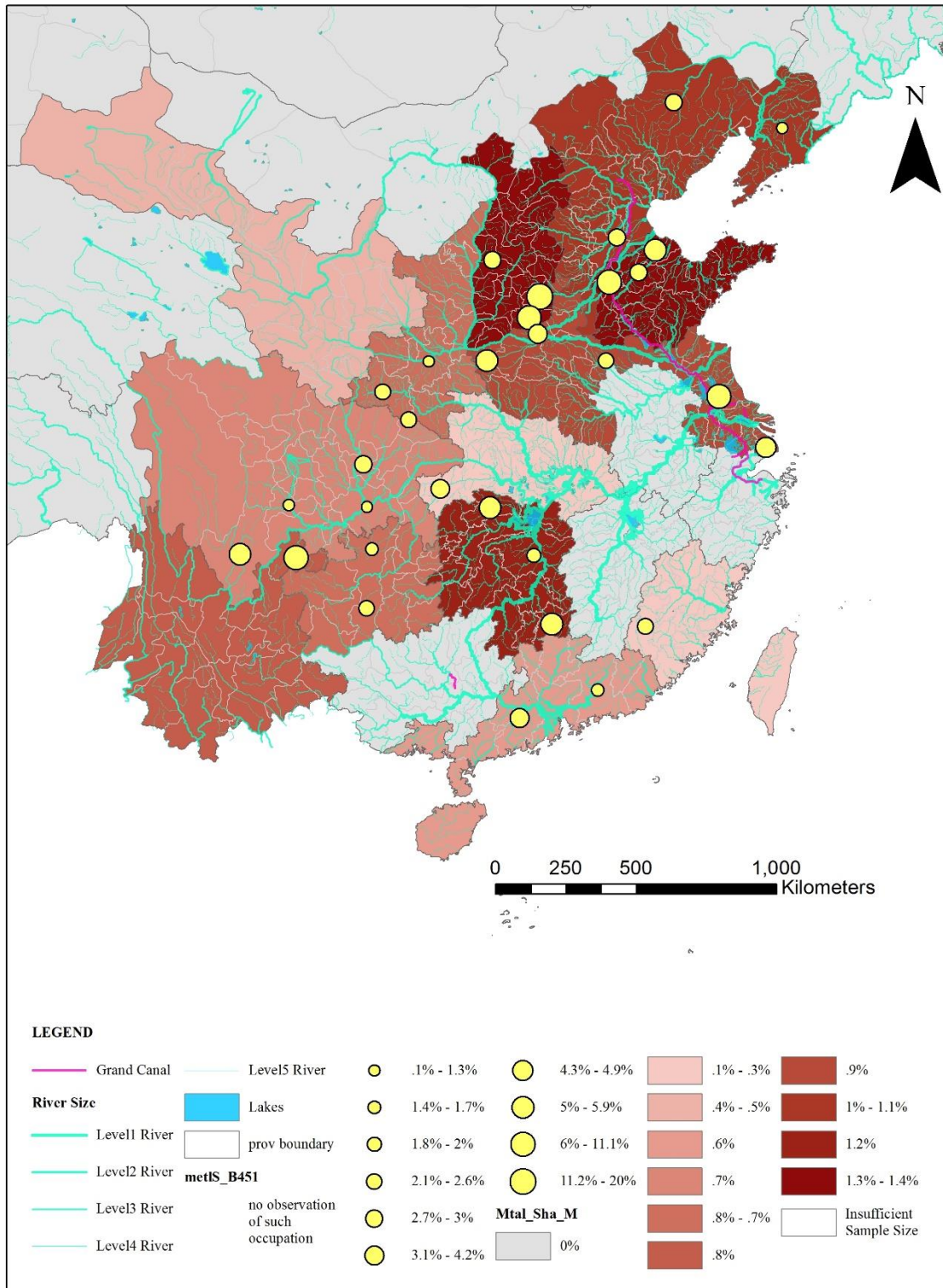


Map 10 Textile employment shares of the male and female labour force at the prefectural and provincial levels, China, 1761-1851 (A: men. B: women).

The occupational group classified as belonging to metalworking in the *XKTB* national dataset is comprised mainly of blacksmiths (94%), with only a few observations of metalworkers working on copper and lead (4%), and very few on silver and gold (2%).³⁴ The spatial analysis suggests that, before 1851, metalworking employment was concentrated in North China, particularly at the southeast of Shanxi Province and the northwest of Shandong province. This is followed by Hunan province in the Middle Yangtze. The level of concentration exhibited by the industry, the relatively high shares (as high as 20% of the local labour force) of the labour force it represented in the areas above, and the relative low shares in the rest of the country, clearly indicate, though do not prove, that the metalworking industry in these areas produced commodities for markets extending far beyond local consumption.

³⁴ Blacksmiths in late Imperial China worked on agricultural equipment, draft animals as well as domestic equipment such as iron pots. Expansion of the sample size can provide valuable information on the details of the tasks of the blacksmiths in the *XKTB*, which could probably indirectly show the distribution of draft animals used in farming.

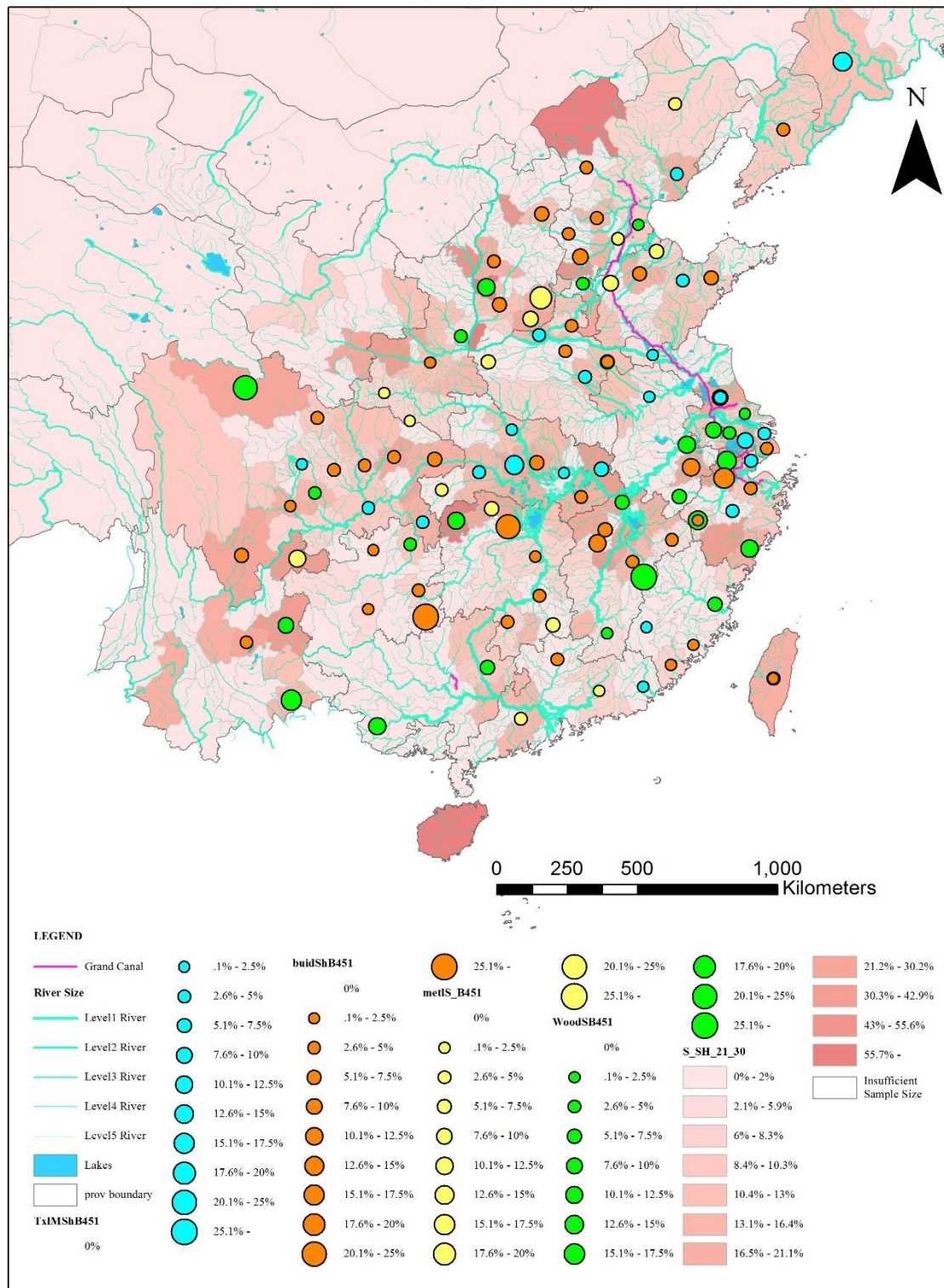
Metalworking employment share at provincial and prefectural levels in 1761-1851



Map 11 Metalworking employment shares of the male labour force at the prefectural and provincial levels, China, 1761-1851.

Overall several important findings emerge regarding the spatial concentration of the manufacturing sector in the period before China's opening to the West. In order to demonstrate these, I combined the employment shares of the local labour force for all of the industries discussed so far, plotted them, and overlaid them with the shares of the overall manufacturing sector in map 12. First, when all major industries are considered together, the secondary sector was clearly more extensively developed in the Yangtze River Basin and North China than in the rest of the country (see map 12). The growth of the manufacturing sector was also spatially concentrated in the core areas of these two regions. More specifically, in North China, it was largely concentrated in Huang-Ji, particularly around Beijing and Tianjing. In the Yangtze River Basin, the more extensively developed areas were concentrated in the Lower Yangtze, and around the Poyang Lake area and Dongting Lake area in the Middle Yangtze. In the Middle Yangtze, the spatial pattern suggests that the growth of the area's manufacturing sector long preceded the impact of foreign trade following the opening of the treaty ports after the 1860s, although, as we will see in the next section, this may have been a temporary growth caused by the release of population pressure following the White Lotus Rebellion.

Employment share of secondary sector (polygons) and selected industries (dots) in 1761-1851



Map 12 Employment shares of the secondary sector and selected industries in the male labour force at the prefectural and provincial levels, China, 1761-1851.

Second, the area between the two core manufacturing regions of North China and the Lower Yangtze was characterised by a very low level of manufacturing development, even though the Grand Canal passed through the area, thereby connected North China and the Lower Yangtze (see map 12). Such underdevelopment was most probably due to frequent flooding from the Yellow River, just as this may explain the region's high agricultural employment share as discussed previously. Additionally, the level of development of the Lower Yangtze and the core area of North China may have created strong incentives for manufacturers from the region to emigrate.

Lastly, the Southeast Coast was characterised by a very low level of development of the manufacturing sector. The strict control over foreign trade imposed by the Qing Government is probably the primary reason behind this underdevelopment.

On the whole, the development of the Chinese manufacturing sector was incredibly heterogeneous across space, and it is evident that several areas with high levels of manufacturing employment existed that were previously overlooked in the Great Divergence debate. As these core areas have now been identified, examining them at a finer spatial level, over a much longer period, and using larger sample sizes, could potentially reveal much about the manufacturing sector and the nature of economic development in Late Imperial China. My other working paper will explore these core areas in further details using the long-run *XKTB* sample for two cities in North China (Beijing, Tianjin) and for the Lower Yangtze. For now, I will turn to an examination of the other major components of the non-agricultural sector: sellers/dealers, transports, and services and professions.

2.3. Tertiary sector

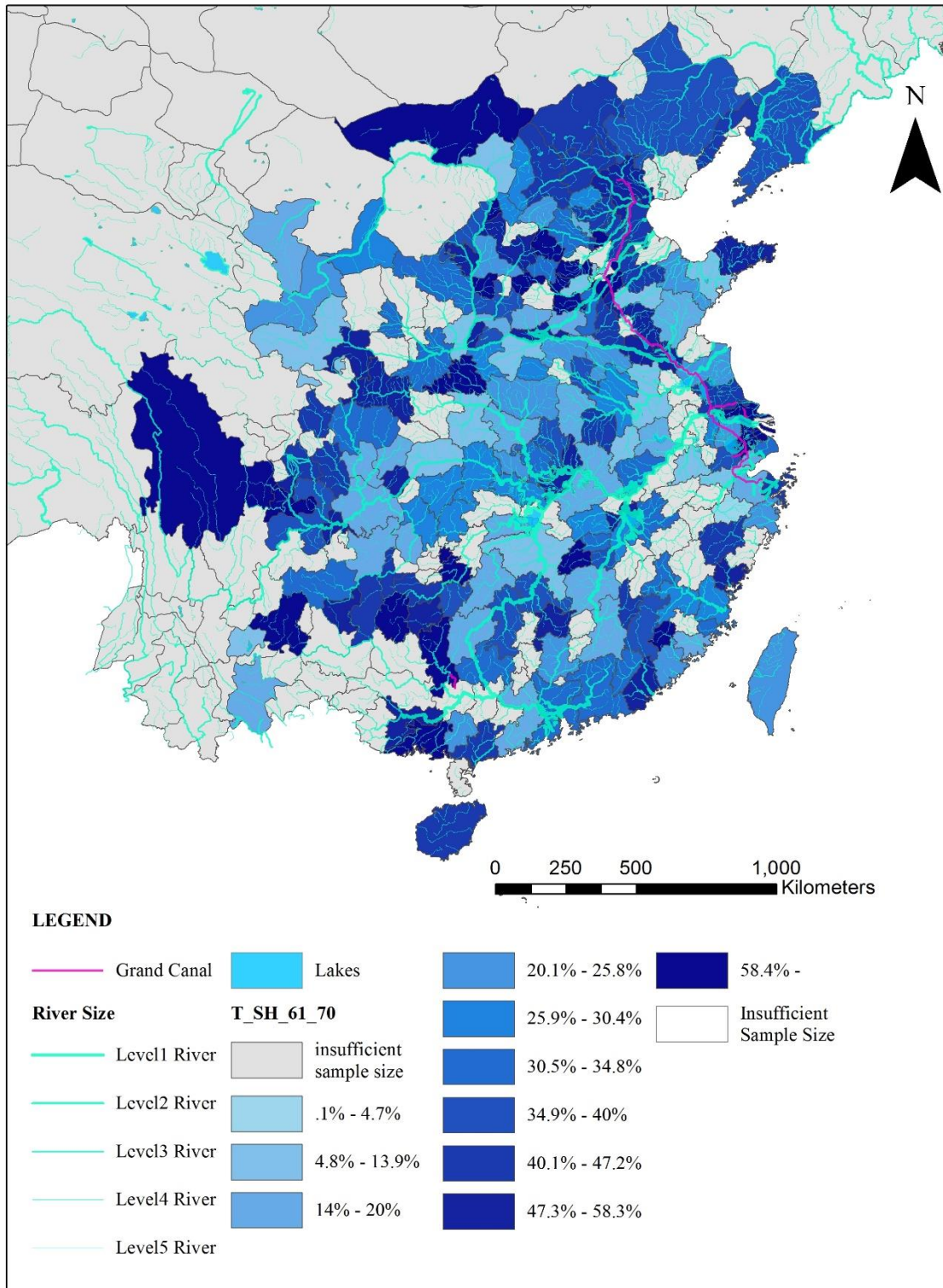
Just like the agricultural sector and manufacturing sector, the tertiary sector also exhibited high spatial heterogeneity. However, unlike with the primary and secondary sectors, the tertiary sector share of the labour force was highest in Huang-Ji in North China (see map 13). The other core areas with high shares of tertiary-sector employment are much smaller in geographical

size, although their shares of tertiary-sector employment are comparable to that of North China. The Lower Yangtze only stands out when spatial variation in population size is accounted for. Once this is taken into account, the region presents the highest estimated tertiary-sector population density (see map 14). As to the core area of the Middle Yangtze is even smaller, the observed shares of tertiary-sector employment in the area to the west of Poyang Lake and Hanyang prefecture on the Yangtze River are relatively high compared to surrounding area (see 13), but lower than both the levels in North China and the Lower Yangtze.

I also notice that the area along the coastline of South China featured relatively high tertiary sector shares, although the share of secondary-sector employment in this area was very low (see map 12). Meanwhile, the few prefectures in Yungui, Inner Asia and Northeast China for which I have *XKTB* data were characterised by high tertiary sector shares (see map 13). Outside these larger core areas presenting high shares of tertiary-sector employment in the local labour force, tertiary sector employment shares were quite even across the rest of China, with some additional small patches presenting high tertiary-sector employment share relative to immediately surrounding areas.

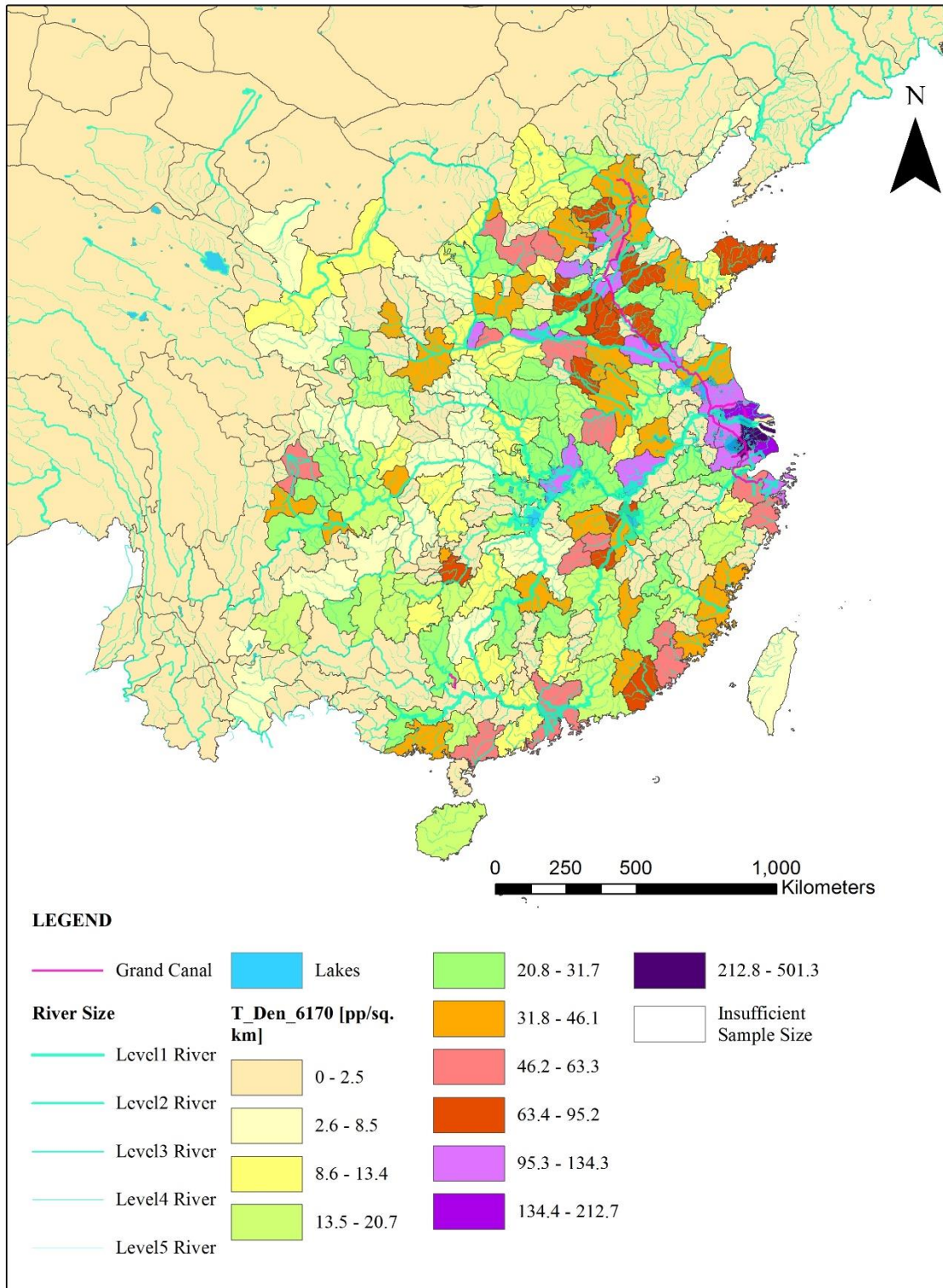
To explore these spatial patterns in tertiary sector employment further, the next part of this section examines the three major occupational groups that formed part of the sector in turn: sellers and dealers, transport, and services and professions.

Prefectural tertiary sector employment share in 1761-70



Map 13 Prefectural Tertiary sector employment share in China, 1761-70

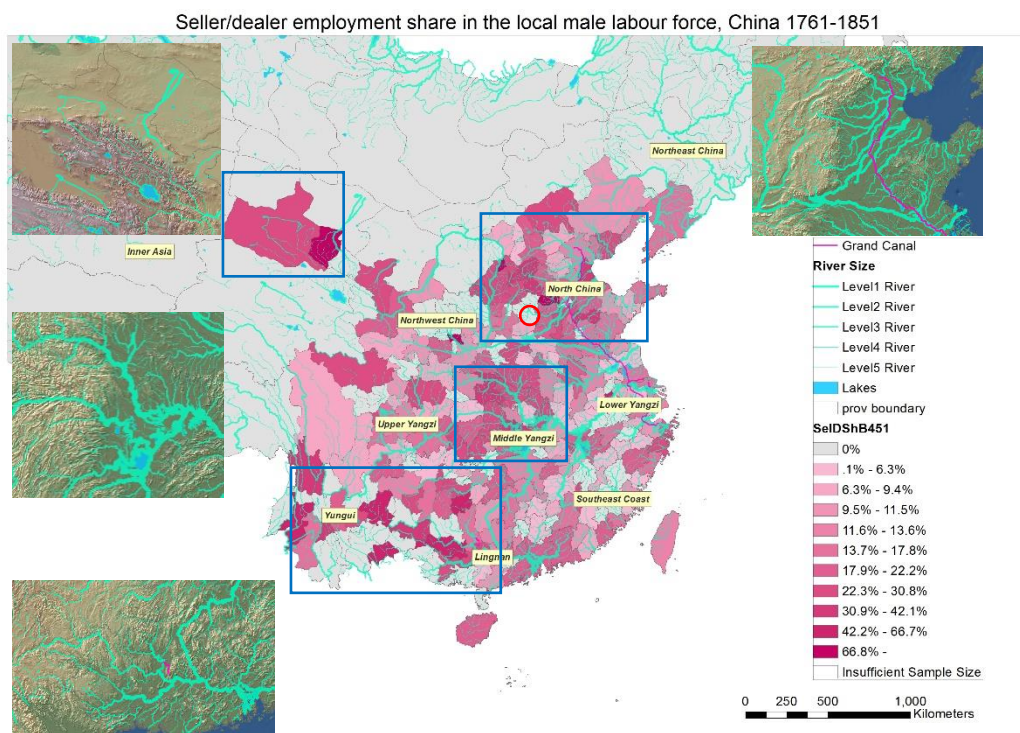
Prefectural tertiary sector population density in 1761-70



Map 14 Tertiary sector population density at the prefectural level, China, 1761-1770.

2.3.1. Sellers and dealers

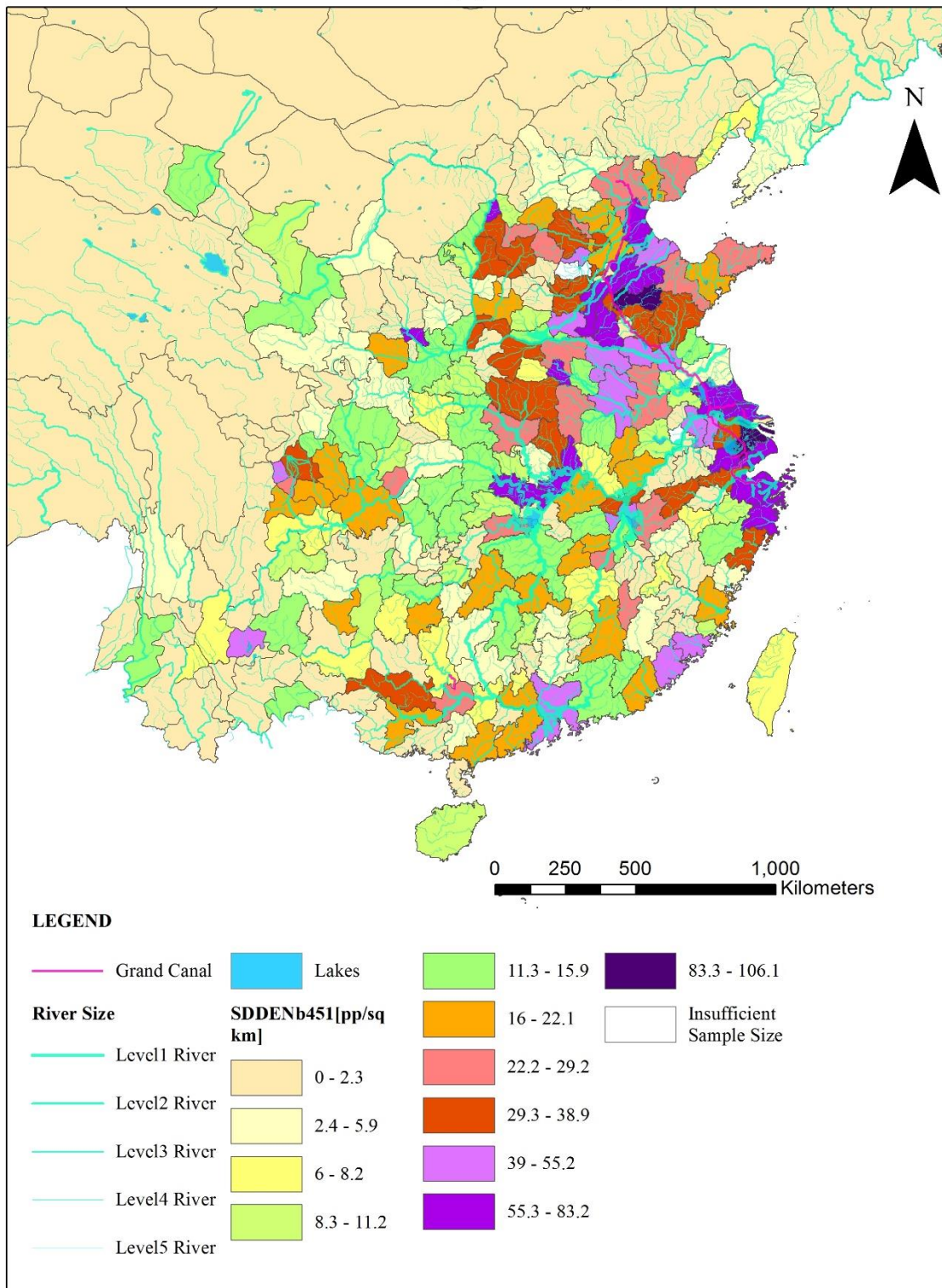
Beginning with sellers and dealers, their share of the local labour force before 1851 was highest in parts of the Middle Yangtze, North China, Yungui, and Northwest China (Map 15). Surprisingly, the share of seller/dealer employment in the Lower Yangtze was just about comparable or even lower than the shares in these areas, although its density of sellers and dealers (Map 16) was the highest in the country due to its high overall population density.



Map 15 Seller/dealer employment shares of the male labour force at the prefectural level, China, 1761-1851.³⁵

³⁵ For the vast majority of prefectures, the results presented in this map are consistent with qualitative evidence. However, a few prefectures, such as the Lu'an prefecture (潞安府) in Shanxi province (marked by a red circle on map 15), appeared to have very low shares of seller/dealer employment in the local labour force, although the prefecture was known to be the home prefecture for the most influential merchant group of North China, the Shanxi Merchant Group. A possible cause of this low observed level is that most of these merchants operated in other parts of North China or in parts of the Lower Yangtze rather than in their home prefecture or home province. This would not affect the overall accuracy of my analysis, as these individuals would have been registered in the places in which they operated when they were involved in homicide cases. Second, the current sample size of the *XKTB* data is still relatively small for some few prefectures once it is spatially disaggregated, such that the results of spatial disaggregation could suffer from random effects. As the sample size of *XKTB* is expanded in future research, this potential error will be eliminated.

Prefectural seller/dealer population density in 1761-70



Map 16 Seller/dealer population density at the prefectural level, China, 1761-1851.

Geography most probably played a critical role in determining this observed spatial pattern: almost all of the prefectures exhibiting a high share of sellers/dealers are located at pivotal

topographical locations in intermediate areas between mountains, plateaus, major rivers, plains, and deserts. Meanwhile, the *density* levels of sellers/dealers in these prefectures are much lower than in the prefectures of the Lower Yangtze and the Grand Canal (see map 15 and map 16). These areas hence probably mark the locations of small-scale but well-developed market towns that supplied regional markets and/or functioned as intermediate stations at the crossroads of key trade routes. Together, these towns formed a network of inter-regional trade routes, connecting different regions of China (including Northwest China, the Middle Yangtze, and North China) that were otherwise separated by geographical barriers. For example, the areas with high seller/dealer employment shares in the northern part of the Middle Yangtze (roughly the present-day northern province of Hubei) connected the Middle Yangtze to Northwest China and North China via mountain passes. The high-share areas in North China, on the edge of the Loess Plateau, connected Northwest China to North China through a hilly road running along the side of the Yellow River. It is worth noticing that the observed levels of seller/dealer employment shares in these areas are as high as, or even higher than, those of main commercial and transport hubs on the Yangtze River and the Grand Canal, such as Wuhan prefecture in the Middle Yangtze or Suzhou prefecture in the Lower Yangtze. It would therefore appear that the settlements in these areas were highly specialised in trading, and in general very well developed. However, as we will see in the next section, it is possible that most of these traders were in fact itinerant traders who operated on very small amount of capital and represented very low productivity levels, similar to the pedlars that were frequently found in mountainous Europe in the same period.

The known primary sources on late Imperial China's trade networks are quite limited and information on the relative scale of business in the different market towns even scarcer.³⁶ The observed spatial patterns discussed here can therefore serve as a basis for new spatial

³⁶ Xu's recent work made use of taxation and donation records to provide new estimates of the relative size of trade in selected market towns in North China in the Late Imperial period. See Tan Xu, "Ming Qing Shiqi Huabei de Shangye Chengzhen Yu Shichang Cengji (Market Towns and Structure of Market Network in North China in the Ming and Qing Dynasties)," *Social Sciences in China*, no. 11 (2016): 187–204. However, because Xu's source only recorded the trading activities of merchants from Shanxi and Shaanxi provinces, the spatial coverage and socio-economic representativeness of the study remains to be improved.

knowledge and quantitative understandings of the trade routes of Late Imperial China, and of interconnectivity among Chinese regions. As the *XKTB* dataset expands through further sampling in the key areas thereby identified, it is expected that the spatial and quantitative accuracy of the preliminary patterns found so far could be further refined.

2.3.2. Transport

As the backbone of trade, the development of transport is decisive in determining the extent of markets and, through this, the division of labour (in a Smithian economic model).³⁷ Although Adam Smith rightly pointed out the negative repercussions of insufficient international transport and foreign trade on the Chinese economy, Smith did acknowledge that inland navigation in China was highly developed. He further suggested that the Chinese home market was “perhaps, in extent, not much inferior to the market of all the different countries of Europe put together.”³⁸ Overall, in contemporary literature as well as in existing studies, the significance of transport in Late Imperial China, particularly in inland navigation, is well established. What is less well known, however, is the extent of spatial variation in the development of transport in different parts of China. For example, the development of the canal networks in the Lower Yangtze was well-known to informed Western readers through the letters of French Jesuits and publications derived from them as early as the early eighteenth century, but, to this day, we have not yet found much quantitative evidence regarding how developed the Lower Yangtze’s transport was in the wider context of the Qing Empire, especially in comparison to other regions such as the Middle Yangtze.³⁹ Further, because not all parts of China benefit from easy access to navigable rivers, and because many areas are highly mountainous, land transport is also vital for economic development in these areas. Thus, sources on the extent of land transport development could be valuable to our understanding of the local economy. However, in the existing literature, the extent of land transport development in Late Imperial China is much less known than that of inland navigation, and the studies

³⁷ Adam Smith, *The Wealth of Nations*, Book, 1776.

³⁸ *Ibid.*

³⁹ Du Halde et al., *A Description of the Empire of China and Chinese-Tartary*.

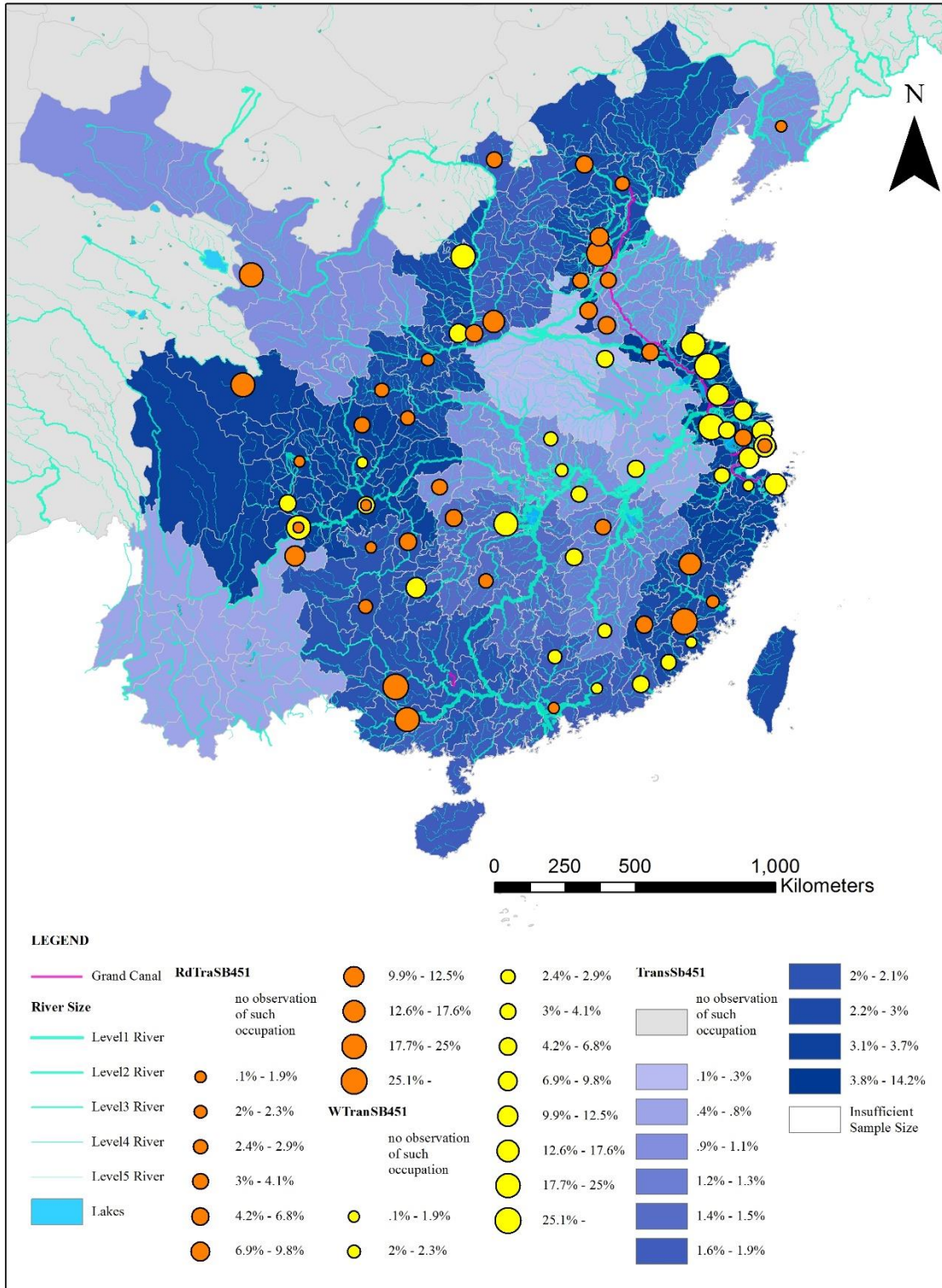
usually focus on the transport routes or equipment used in transport (e.g. vessels, carts), but much less is known about the transport labour force.⁴⁰

Using the *XKTB* dataset, I produced preliminary estimates of the spatial patterns of river transport and land transport in China, 1761-1851, as reflected by their regional shares of employment in the local labour force (see map 17). In this new estimate, the vast majority of the prefectural-level shares of river transport employment (yellow dots on map 17) in the Lower Yangtze and the southern part of the Grand Canal area (in purple) were much higher than those in the rest of the country. This strongly suggests that river transport was significantly more developed in this region. With regards to land transport (orange dots on map 17), it appears to have been more developed in the northern part of North China, particularly along the northern part of the Grand Canal. The high share of transport employment in the Lower Yangtze and along the Grand Canal means that manufacturers had easier access to source materials for production and that consumer goods were able to reach markets further afield more easily. As a result, the extent of the market accessible to these regions would have been larger, and its degree of division of labour higher.⁴¹ Overall, a high share of transport employment strongly indicates that these two regions exceeded the rest of the country in transport development, a prerequisite for economic growth.

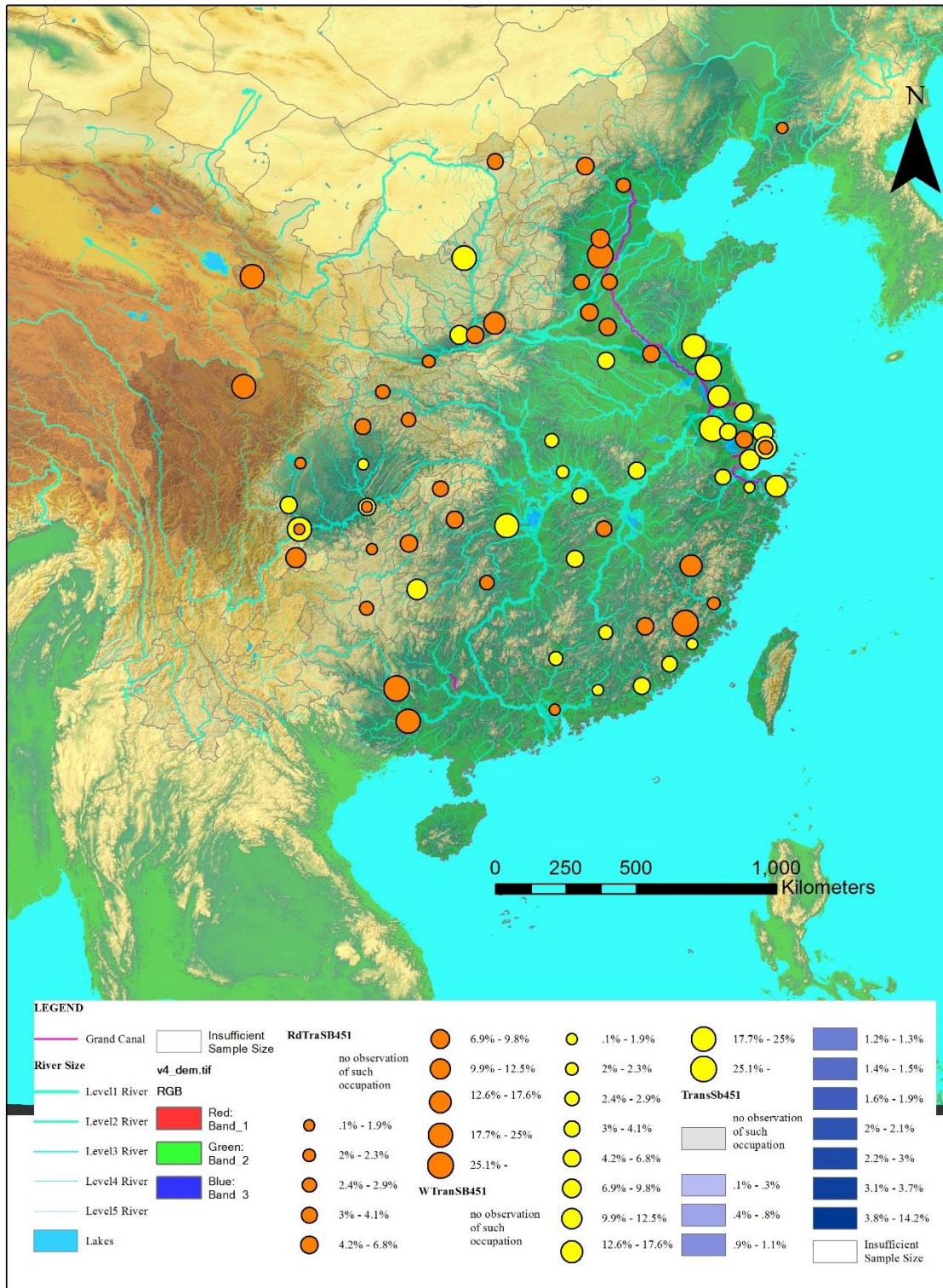
⁴⁰ Akira Matsuura uncovered an exceptionally rich gazetteer in Zhejiang province for studying the various vessels used in inland navigation in the Qing dynasty. See Akira Matsuura, *Shindai Naiga Suiunshi No Kenkyū (Inland Navigation in China in the Qing Dynasty)*, ed. Ke Dong [Translator] (Nanjing : Jiangsu ren min chu ban she, 2010). Tan Qixiang and his associates' historical atlas of China, built on careful work utilizing many historical maps and gazetteers, is an important work documenting the routes of inland navigation. See Qixiang Tan, ed., *Zhongguo Li Shi Di Tu Ji (The Historical Atlas of China), Historical Atlas of China* (Shanghai: Shanghai : Cartographic Publishing House, 1987). Recent study by Xu Tan on market network also made important progress on evaluating the size of business carried by inland navigation by utilizing rich tax records of inland customs (que guan, 榷关), see Tan Xu, "The Formation of the Urban and Rural Market Network and Its Significance during the Ming and Qing Dynasties," *Social Sciences in China* 3 (2001).

⁴¹ The next paper will cover more details on the division of labourers in these two regions.

Transport employment share at provincial and prefectural levels in 1761-1851



Transport employment share at provincial and prefectural levels in 1761-1851



Map 17 Shares of river transport employment and land transport employment at the prefectural level, China, 1761-1851.

The sharp contrast between the high level of development of *river* transport in the *southern* part of the Grand Canal and the high level of development of *land* transport in the *northern* part of the Grand Canal is also noteworthy.⁴² This suggests the existence of contrasting regimes for the distribution of consumer goods at the two ends of the Grand Canal. At the southern end, where there existed a well-developed canal network and where we found much higher river-transport employment share than the rest of the country, boatmen (56.4% of the river-transport labour force, see table 2) were the ideal choices for the task.⁴³ At the northern end, where inland navigation was less advanced but land transport employment share was much higher than the rest of the country, road transport labourers (58.6% of the road-transport labour force, see table 2), who worked in or near docks on the Grand Canal, became the obvious choice instead.⁴⁴ Operating as a boatman required a small initial investment, which was not the case for road transport labourers. On the other hand, boats were a much more efficient means of carrying goods. This means that the transport labour force in the Lower Yangtze would have been more capital-oriented, but also significantly more efficient, than that in North China, despite both being connected to the Grand Canal. Moreover, the transport cost per unit of consumer goods would have been much higher in North China than in the Lower Yangtze. In short, with regards to transport costs and efficiency, the Lower Yangtze seems to have had an unparalleled advantage over the rest of the country, which facilitates but not guarantees economic growth.

⁴² Based on our general knowledge of North China and on our case study of Tianjin County, we already know that river transport employment existed in North China. Hence, the fact that river transport employment does not show in the national *XKTB* sample, on which map 17 is based, does not mean that river transport did not exist in North China, but instead, suggests that its share of regional employment was so low that small samples (here, 10% of the *XKTB* reports in 1761-70, 1821-30) fail to capture it.

⁴³ Small boat operators in Chinese: 船夫 *chuanfu*, 撑船度日 *chengchuan duri*, 穿剥 (驳) 船生理 *chuanbochuan Shengli*.

⁴⁴ Road transport labourers in Chinese: 脚夫, *jiaofu*, 肩挑度日 *jiantiao duri*, 挑货 *tiaohuo*.

Composition of river-transport labour force in China, 1761-1851

Group of river-transport occupations	share
<i>boatman</i>	56.4%
<i>ships' crew</i>	29.1%
<i>waterways labourer</i>	6.8%
<i>boatman/Animal fodder</i>	2.6%
<i>support, transport or communications</i>	2.6%
<i>boatman/fisherman</i>	1.7%
<i>waterways clerk</i>	0.9%

Composition of road-transport labour force in China, 1761-1851

Group of road-transport occupations	share
<i>road transport labourer</i>	58.6%
<i>drivers</i>	29.3%
<i>palanquin road transport labourer</i>	8.6%
<i>management, animal powered road transport</i>	1.7%
<i>road transport, other</i>	1.7%

Table 2 Composition of the river-transport labour force and road-transport labour force, China, 1761-1851.

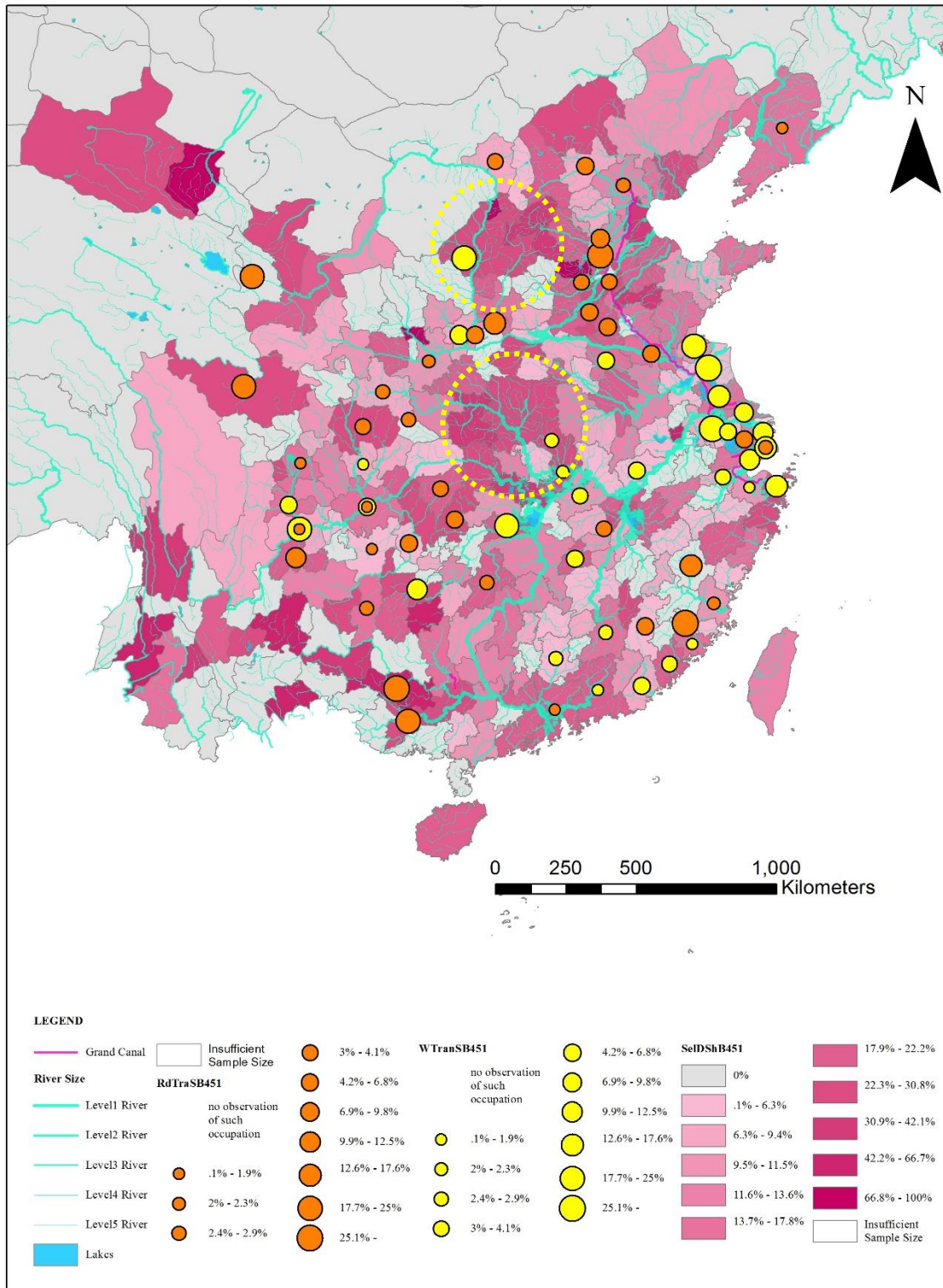
The third noticeable feature in the spatial distribution of transport employment is that the shares of transport employment in two of the areas identified in the previous section as presenting high shares of seller/dealer employment (marked by circles on map 18) are very low. As I previously discussed, these two areas both present difficult geographical terrains, such as the Loess Plateau (see figure 9) and the Dabie Shan Mountain (figure 10). Transporting consumer goods on or across these difficult terrains often required special skills or equipment, making transport an indispensable part of trading in these areas. As a result, transport occupations were not clearly distinct from seller/dealer occupations, but became an integral part of the trading professions. The existence of “hybrid” traders who combined transport, manufacturing, and trading occupations was a frequent occurrence in pre-industrial China. For example, logging sites were usually situated close to rivers, and an essential part of Chinese timber labourers’ work in Late Imperial China was transforming the felled trees into large rafts (木排, *mupai*) which the timber labourers then used to transport the rest of the felled trees

downstream towards markets.⁴⁵ The existence of these “hybrid” traders can even be traced back to the Silk Road, and can still be found in some parts of the mountainous regions of the Middle Yangtze or Manchuria. Indeed, modern transport was only able to reach these areas only very recently – often after substantial investment and improvements in technology, and at the cost of adverse impacts on the environment (see figure 11). By contrast, in Late Imperial China, the sellers and dealers in these regions were the main providers of land connections between the Middle Yangtze, Northwest China, and North China.⁴⁶

⁴⁵ Known as “zhamupai” in Chinese. This was commonly mentioned in *XKTB* cases in which timber labourers were involved.

⁴⁶ My limited historiographical research has not yet found sufficient secondary literature that can provide rich evidence for land transport in these areas. Perhaps local gazetteers and genealogy books of the Shanxi and Shaanxi merchants in the Qing dynasty could provide evidence on this.

Prefectural Seller/dealer employment and transport employment share in 1761-1851



Map 18 Shares of river transport employment and land transport employment at the prefectural level, overlapped with shares of sellers/dealers employment, China, 1761-1851.



Figure 9 Loess Plateau in Shaanxi and Shanxi Province (source: Xu Zhaochao, 2010).



Figure 10 Dabie Shan Mountain in the northern part of the Middle Yangtze (source: www.news.cn).



Figure 11 Shijiazhai Interchange on the Yongji Highway in western Hunan, Middle Yangtze and the world's highest bridge of Duge Beipanjiang Bridge in Guizhou (565m deck height, 720m span (source: Hunan daily, 2017. chinanews.com).

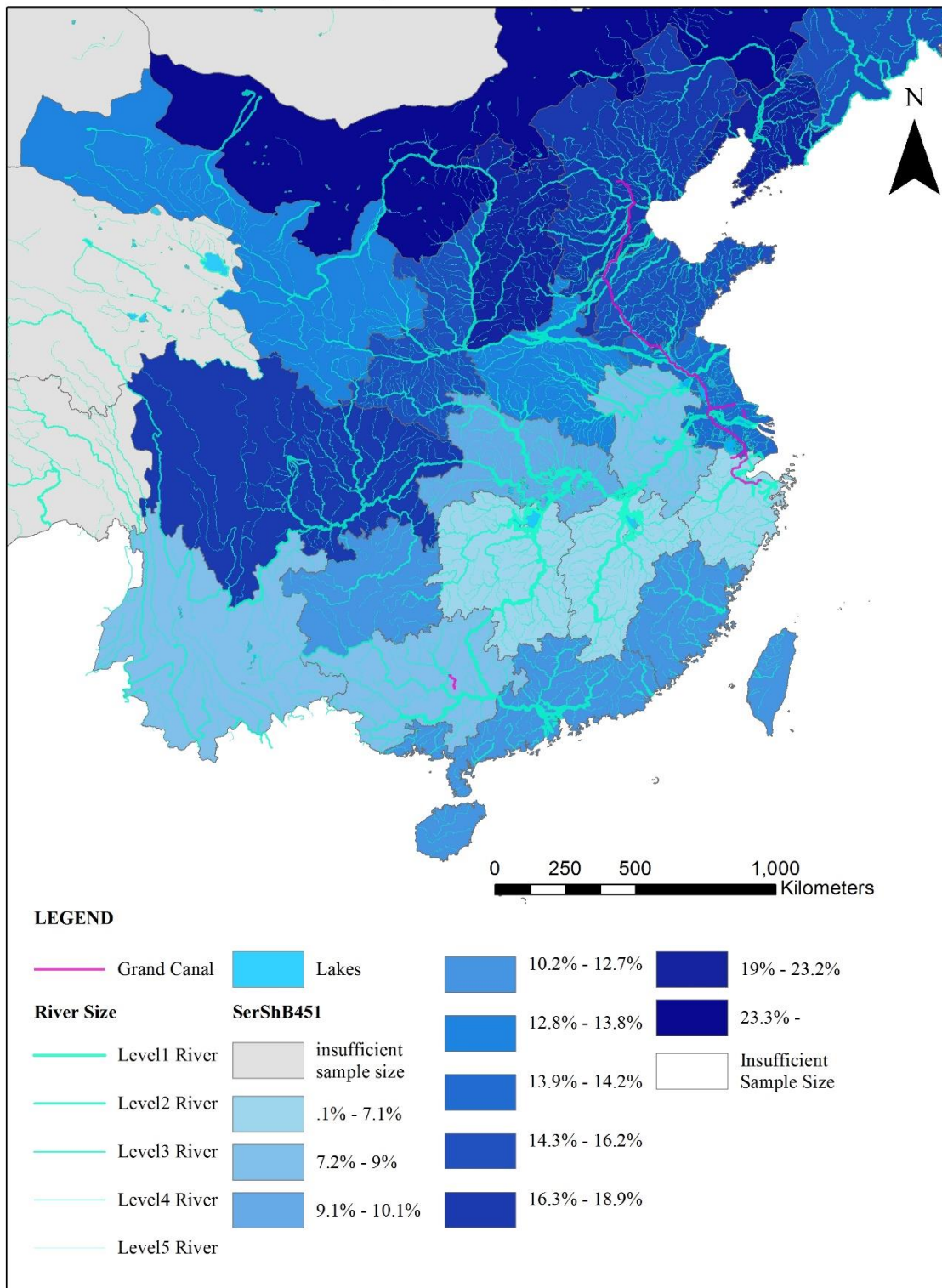
2.3.3. Services and professions

All tertiary sector occupations that could not be classified as belonging either to the sellers/dealers group or transport workers group were categorized as 'services and professions'. This large group included a wide range of occupations, including those providing food and accommodation, the distinguished, titled gentlemen (commonly referred to as 'literati' in the existing literature), shop owners and owners of capital more generally, soldiers and military officials, those employed in domestic service, those providing financial services, and those providing minor services such as barbers, massagers, laundrymen, and fortune tellers. Together, these represented over 12% of the national male labour force, and an even higher proportion of the female labour force. In the last paper, the national trajectories of the shares of domestic servants, gentlemen, and possessors of capital in the labour force suggested an overall decline in standard of livings among both the more affluent groups and the labouring poor.⁴⁷ The trajectories of the shares of food sellers and accommodation providers in 1761-1890 at the regional level further suggest that these temporal changes had strong spatial characteristics. In this section, I explore these spatial characteristics at a much finer level of geographical detail.

⁴⁷ Yang, "A New Estimate of Chinese Male Occupational Structure during 1734-1898 by Sector, Sub-sector Pattern, and Region."

Taking the whole group into account, the northern provinces, the Lower Yangtze, and the Upper Yangtze present much higher shares of services and professions in their local labour force than the rest of the country (see map 19). But which occupation(s) in particular drive this spatial pattern? Does this North-South divide hide other spatial patterns specific to certain occupational groups? What do these spatial patterns tell us about the patterns of regional economic development? In order to answer these questions, we now turn to a detailed examination of the major occupational categories within the services and professions group.

Prefectural services and professions employment share in 1761-1851



Map 19 Shares of services and professions at the provincial level, China, 1761-1851.

As the largest occupational category in the services and professions (23.1% in 1761-70, 30.7% in 1821-30), the food and accommodation group exhibited a spatial pattern very close

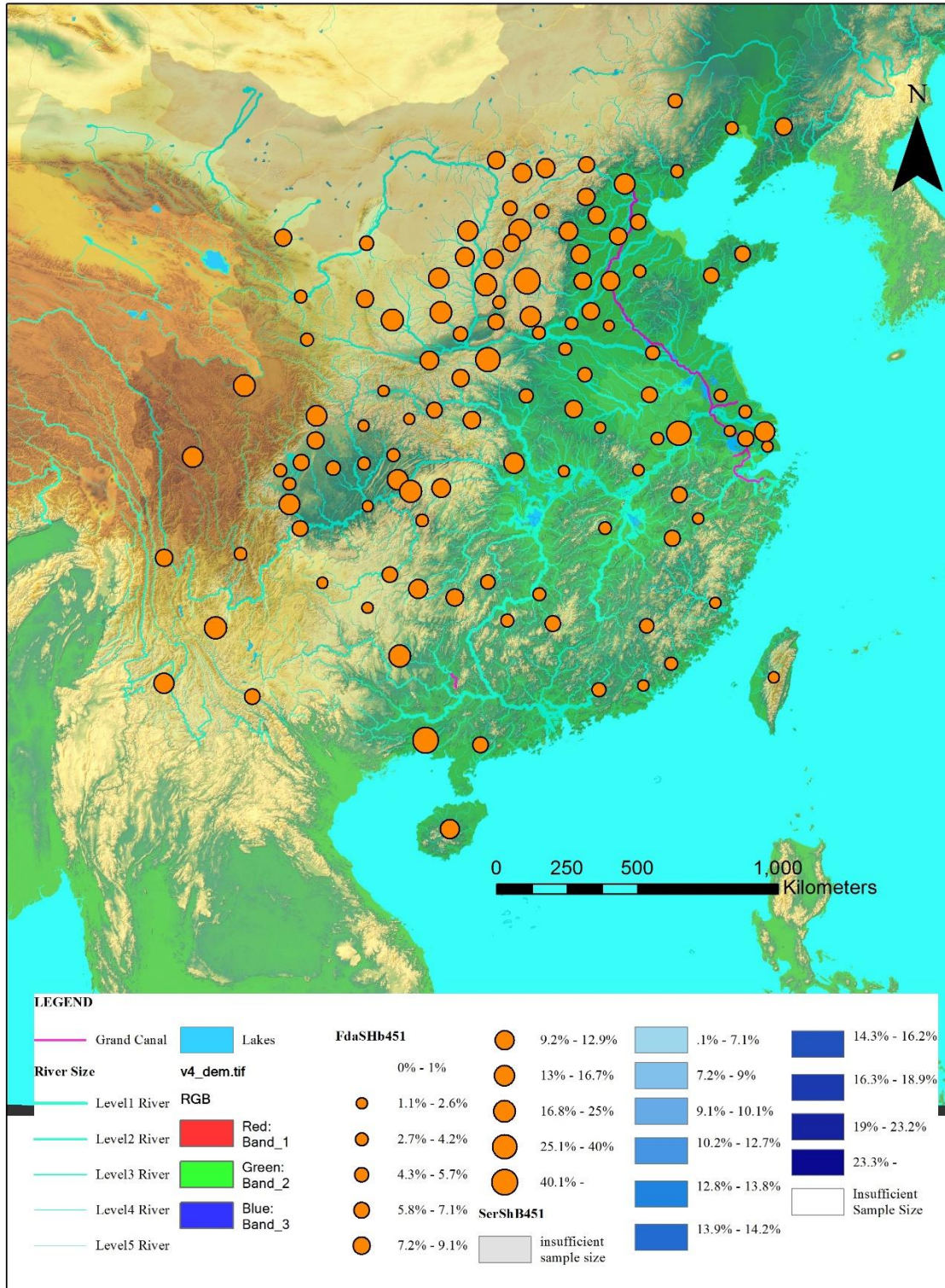
to that of the services and professions as a whole. Rivers once again played an important role in shaping this spatial pattern. As shown in map 20-A, pre-1851 shares of those working in restaurants and those providing accommodation were significantly higher than the rest of the country in Huang-Ji (marked in yellow) and at the two extremities of the Yangtze River (marked in red).⁴⁸ Note that the pattern is primarily driven by the share of restaurant employment (marked in red in map 20-B), as its share is much larger than that of accommodation. Note too that the spatial pattern highlighted above is roughly comparable to that of transport employment (marked in red in map 20-B). Overall, the much higher share of restaurant employment in the Huang-Ji area, the Lower Yangtze, and the Upper Yangtze suggest larger local demand for restaurant consumption. However, this pattern alone does not necessarily denote higher standards of living in these regions. The greater demand for prepared food could be a consequence of different occupational patterns, especially for women, such that people had less time to prepare food at home, or, a consequence of lower prices of prepared food. Expansion of the *XKTB* sample size for female occupations in the future and more studies on market prices are needed before I can draw any firm conclusion about this pattern.

In other regions, what is rather surprising is that the share of restaurant employment in the Middle Yangtze is very low (see map 20-B). My analysis of the employment shares of other sectors in previous sections has suggested that the Middle Yangtze presented a lower share of employment in agriculture, and a higher share of employment in manufacturing, selling/dealing, and transport, than the three regions that stand out with respect to restaurant employment shares – all of which are indicators that the Middle Yangtze was one of the better-off regions in the country. The low share of restaurant employment therefore seems to contradict other findings about the region. Without further evidence, we may hypothesize that the Middle Yangtze was an intermediate “station” for inter-regional trade and travel, rather than a starting point or end destination where most travellers and traders on route just passed by without staying for long,

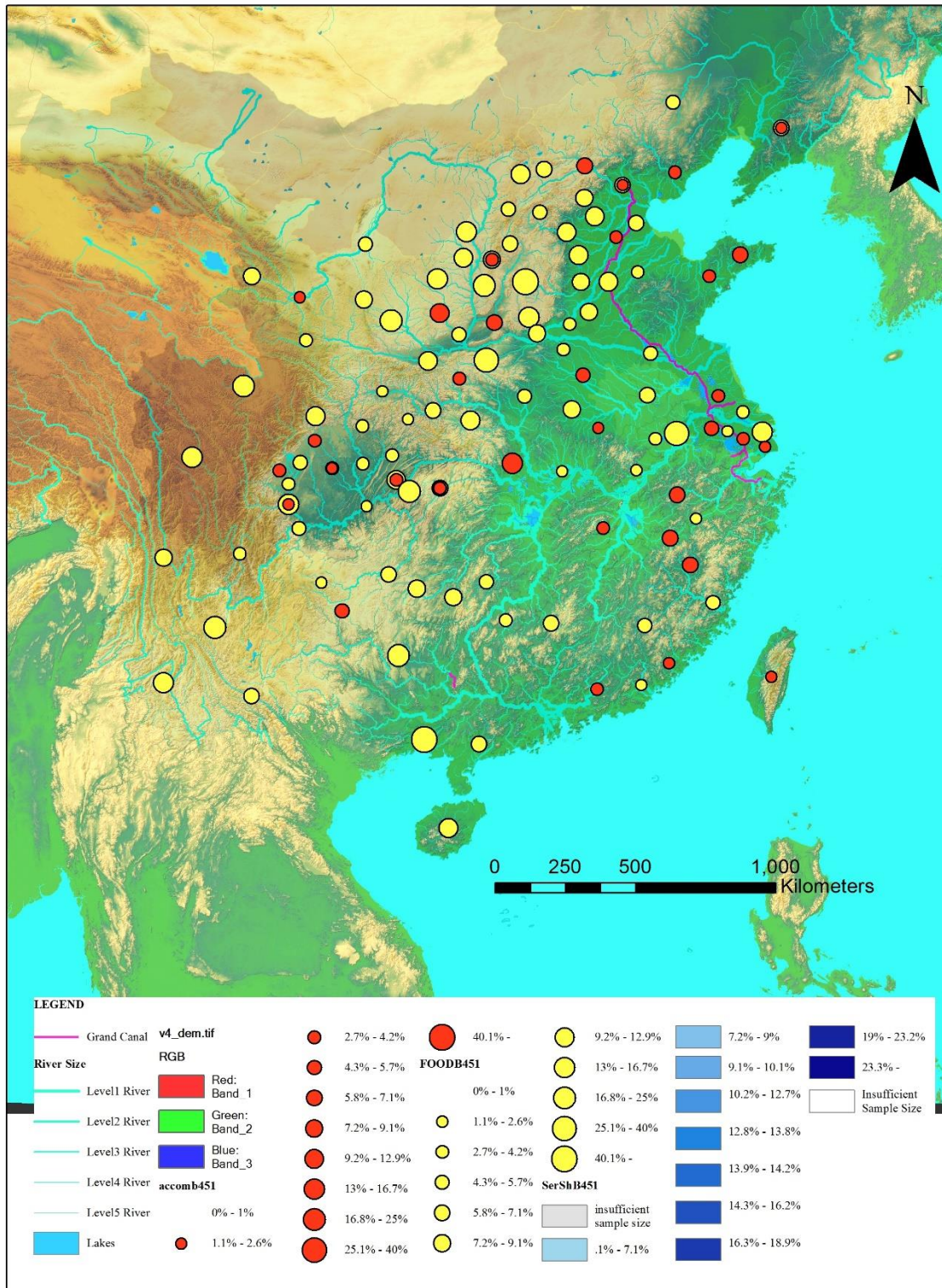
⁴⁸ Jishui became the lower segment of the Yellow River following the flooding of Yellow River in 1854.

with the city presenting the largest traffic flow, but not necessarily benefitting from more demand for local consumer goods.

Food and Accommodation employment share in 1761-1851



Food employment share and Accommodation employment share in 1761-1851



Map 20 Shares of food and accommodation employment at the prefectural level, China, 1761-1851 (A: food and accommodation as a whole; B: food and accommodation respectively).

Next, we move on to the second largest group in the services and professions: titled individuals who were also active in the labour force. These include three groups: literal-art literati, martial-art literati, and Bannerman.⁴⁹ The first two titles could normally be earned by passing the Imperial Exams (*Keju*, 科举), with the lower ranks of the titles even acquirable through simple donations to the government.⁵⁰ By contrast, the third type of title was reserved for hereditary servants of the Royal Court. Individuals in all three groups usually took on other active employments as farmers, labourers, tutors, doctors, or other - however, these were seldom recorded in the *XKTB* as titles would normally suffice to establish one's identity in court. I further note that, since the first two types of titles required early investment in education or large monetary donations, and since the third type guaranteed secure employment and, in the case of Manchuria Bannerman, the right to land ownership, titled individuals constituted an affluent group within the labour force. Although the geographical distribution of this titled group was more spread-out than that of the previous services and professions sub-group, geography still played an important role in shaping the spatial pattern. As shown in map 21-A, the share of the titled group in the local labour force was higher in the Huang-Ji (in yellow) and in prefectures located on the Grand Canal, including the Lower Yangtze (in red), than in the rest of the country. Meanwhile, the Upper Yangtze appears less prominent, and the Southeast coast area (in green) more prominent, then when looking at the shares of food and accommodation.

Further, as map 21-B suggests, this overall spatial pattern is primarily driven by the spatial distribution of the literal-art literati (in green) rather than that of the less-common martial-art literati (in pink), who were more present in the north than in the south. As earning a literati title was the first and indispensable step in becoming a governmental official, this pattern suggests that social mobility was higher in the Huang-Ji area, the Grand Canal area, and the Southeast

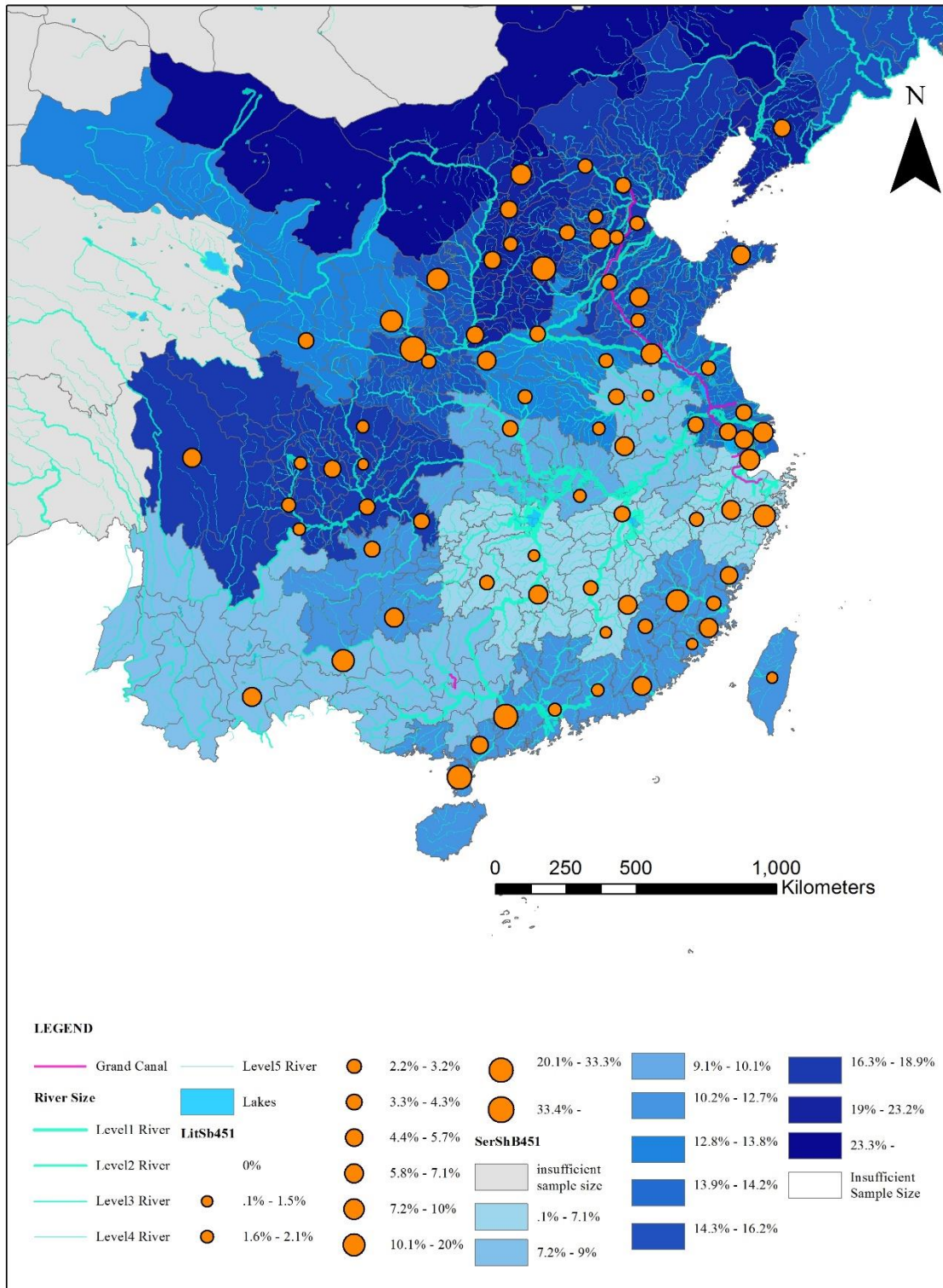
⁴⁹ Literal-art literati in Chinese: jiansheng, gongsheng, wensheng, juanjian, lijian. Martial-art literati in Chinese: wusheng. Bannerman in Chinese: qiren, qi.

⁵⁰ For a comprehensive, non-Eurocentric overview of the imperial examination system, see Benjamin A Elman, "Political, Social, and Cultural Reproduction via Civil Service Examinations in Late Imperial China," *Journal of Asian Studies* 50, no. 1 (1991): 7–28.

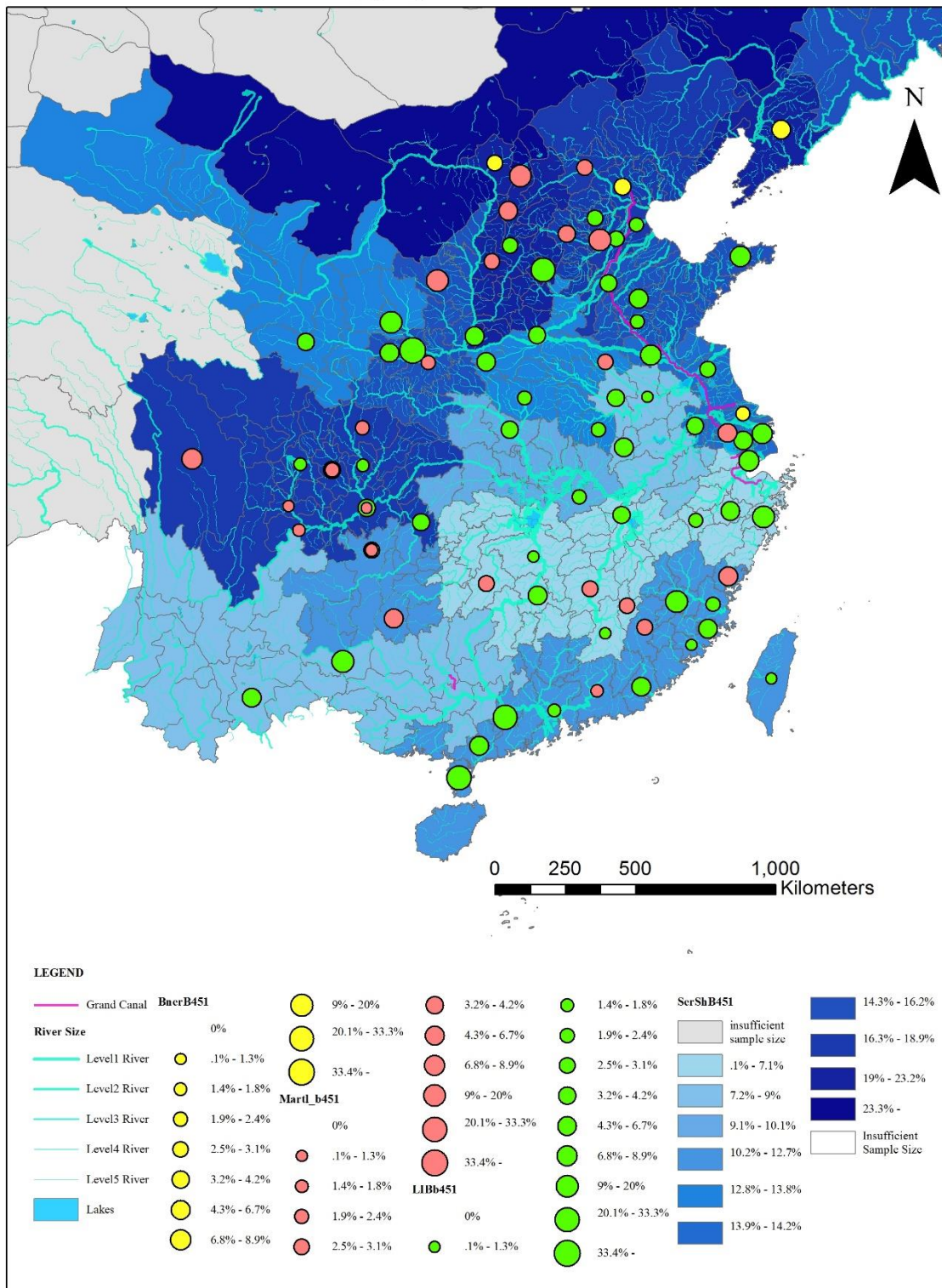
Coast, than in the rest of the country. Additionally, the Bannerman population (in yellow) was much scarcer and spatially confined.⁵¹

⁵¹ James Z Lee and F. Wang, *One Quarter of Humanity: Malthusian Mythologies and Chinese Realities* (Harvard University Press, 2002).

Share of the titled in the male labour force in 1761-1851



Share of the titled by group in the male labour force in 1761-1851

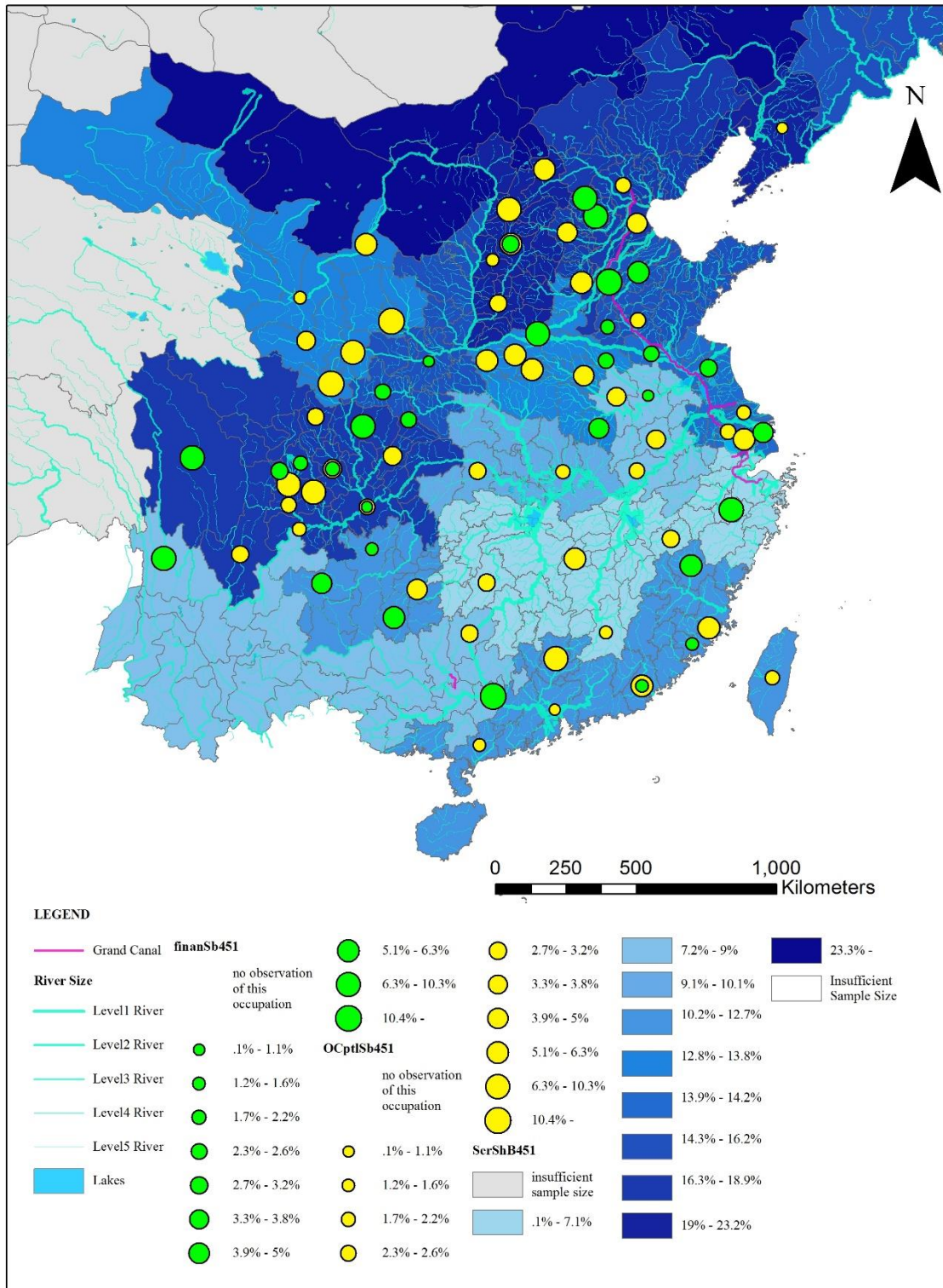


Map 21 Shares of titled individuals in the male labour force at the prefectural level, China, 1761-1851. (A: all titled individuals; B: titled individuals by sub-group).

The third sub-group within the services and professions that exhibits noteworthy patterns is a combination of two closely related occupational groups: owners of capital (mainly shop owners) and providers of financial services (bankers, brokers and moneylenders).⁵² As shown in map 22, the shares of these two groups were both overwhelmingly higher in the prefectures to the north of the Yangtze (in red) than to the south. The levels were particularly high in the Huang-Ji area (in orange), and in the Lower Yangtze and Upper Yangtze at the extremities of the river (in red), with all prefectures with high levels closely concentrated in these areas. Without further evidence, this strongly suggests – though is insufficient to prove – that commerce and finance were more developed and thriving in these areas than in the rest of the country. The Middle Yangtze and the region to the south of the Yangtze, including the Southeast Coast, significantly lagged behind by 1851.

⁵² The shop owners in the XKTB dataset refers to those who owned a shop on the market, rather than a temporary stand. They typically showed clear signs of ownership of sizable capital and employed a crew of shop workers. Unlike shop owners, the sellers/dealers in the XKTB dataset refers to those who trade things for living but did not show clear signs of large capital ownership in the trial reports, even though it is possible that some of the sellers/dealers also owned shops.

Prefectural Share of financial service employment and owners of capital in 1761-1851

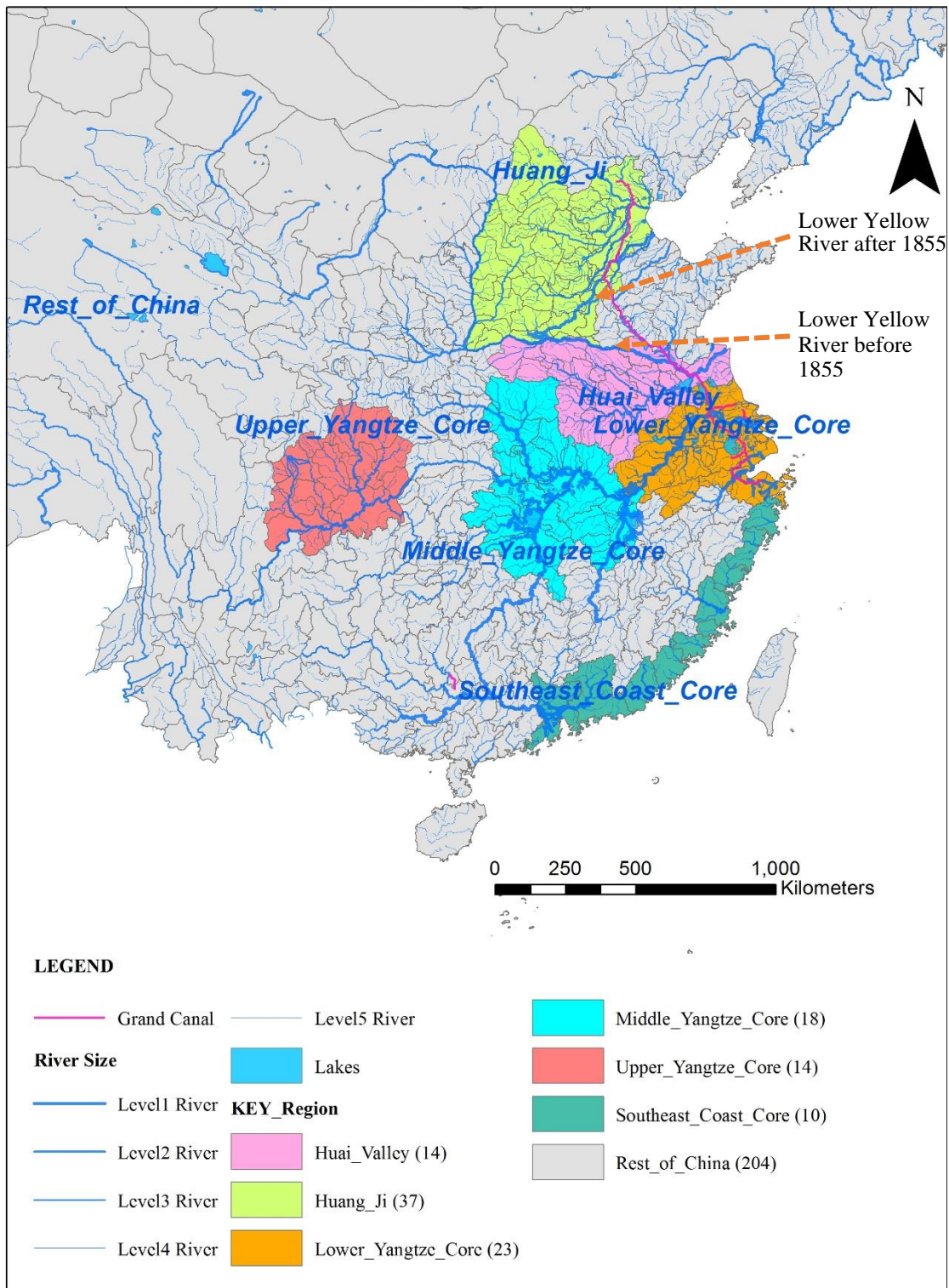


Map 22 Shares of owners of capital and providers of financial services in the male labour force at the prefectural level, China, 1761-1851.

3. Key economic regions of Late Imperial China

Through a spatial analysis of the occupational structure of China in 1761-1851, we have identified several important spatial patterns in the concentration of economic functions in different regions of China. First, geography, and particularly rivers, played an extremely important role in shaping the spatial variation of regional economic development in Late Imperial China. Second, North China (divided by the Yangtze River) and the Yangtze River Valley significantly exceeded South China and the less populous Northwest China and Inner Asia in levels of economic development. Third, as an empirical revisit to Skinner's pioneering framework, this new data context strongly suggests that there existed other key areas of significant economic development besides the widely discussed, economically advanced region of the Lower Yangtze (see map 23). These regions have rarely attracted academic attention in the existing literature so far. While each of these regions had a unique regional occupational structure, the Huang-Ji, Middle Yangtze and Upper Yangtze all seem to have benefitted from favourable geographical conditions for agricultural development, which in turn stimulated manufacturing and trade, and all of which was facilitated by favourable transport conditions. On the other hand, adverse geographic and climactic conditions, along with unfavourable trade policies, greatly restricted the economic development of the flood-prone Huai Valley, mountainous South China, and the Southeast Coast, where potential for economic development was hindered by the suppression of maritime trade. As the first step in a more detailed spatial analysis of the Late Imperial Chinese economy, these spatial patterns in regional occupational structure already reveal a large degree of spatial heterogeneity in economic development in eighteenth- and nineteenth-century China. Greater academic attention towards the key regions thereby identified, which will tremendously widen the scope of research and deepen current understandings of the economy of Late Imperial China, is long overdue.

Key economic regions of eighteenth- and nineteenth-century China



Map 23 Key economic regions of eighteenth- and nineteenth-century China.

4. Disparate trajectories of economic development in key regions, 1761-1890

By analysing regional occupational structure, the last section has shown the existence of a large degree of spatial heterogeneity in economic development in Late Imperial China. On the basis of these spatial patterns, it further identified and defined several key economic regions. However, in the course of the long eighteenth and nineteenth centuries, the balance of economic forces between these key regions evolved over time, with their regional economies developing at different speeds and on different trajectories. Table 3 outlines temporal changes to the occupational structures of these regions, compared with both the rest of China and China as a whole, in the eighteenth and nineteenth centuries. I note that sample size dropped in most regions between 1821-30 and 1881-90 – sometimes quite drastically in selected regions such as the Southeast Coast Core – which may have affected the reliability of the 1881-90 estimates. In the future, targeted expansion of the current dataset in less represented regions will enable this to be corrected.

MALE OCCUPATIONAL STRUCTURE OF THE KEY ECONOMIC REGIONS OF LATE IMPERIAL CHINA
IN 1761-70, 1821-30, AND 1881-90 (%)

PST SECTOR	YEAR	HUANG-JI	LOWER YANGTZE CORE	MIDDLE YANGTZE CORE	UPPER YANGTZE CORE	HUAI VALLEY	SOUTHEAST COAST CORE	REST OF CHINA	ALL OF CHINA
<i>Primary</i>	1761-70	44.6	53.5	62.5	54.2	64.4	58.0	62.7	58.1
<i>Secondary</i>	1761-70	13.9	17.0	14.7	13.5	10.9	11.8	12.6	13.9
<i>Tertiary</i>	1761-70	41.5	29.5	22.8	32.3	24.8	30.2	24.7	28.0
<i>Primary</i>	1821-30	43.8	56.4	54.9	51.4	61.1	73.1	60.9	59.2
<i>Secondary</i>	1821-30	13.6	14.2	21.6	10.3	6.9	5.7	10.0	12.0
<i>Tertiary</i>	1821-30	42.6	29.3	23.6	38.3	32.0	21.2	29.0	28.8
<i>Primary</i>	1881-90	55.0	59.5	58.3	54.4	60.9	75.5	56.3	58.3
<i>Secondary</i>	1881-90	12.5	9.7	11.5	11.3	8.3	10.6	12.7	12.0
<i>Tertiary</i>	1881-90	32.5	30.8	30.2	34.3	30.8	13.9	31.0	29.6
<i>Total</i>		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<i>Sample Size</i>	1761-70	1411	1158	572	691	501	557	3140	8030
	1821-30	1114	886	646	900	727	430	4195	8898
	1881-90	1212	296	242	764	322	77	2446	5359

Source: XKTB dataset

Table 3 Occupational structures of the key economic regions of Late Imperial China, 1761-1890.

We see again the presence of diverging change at the regional level. As shown in table 3, with less than 45% of the working force employed in the primary sector, 14% in the secondary

sector, and over 41% in the tertiary sector, the regional economy of the Huang-Ji area in 1761-1830 was highly advanced and heavily service-oriented. The fact that this long-overlooked region's primary sector share is even lower than that of the Lower Yangtze demands further academic attention. Further, despite being relatively stable in 1761-1830, the region's economy changed significantly between the 1830s and 1880s, with its primary sector share surging to 55%, and its tertiary sector share falling by 10%. Among the many possible political, demographic and military explanations for such dramatic change, the devastating flood and course change of the Yellow River in 1855 (see map 23, and consequently the silting of the Grand Canal, stands out as the most likely cause of the Huang-Ji's decline. Paper seven will delve deeper into the long-run occupational structure of two core urban areas of the region, Beijing and Tianjin, in order to explore this trajectory of economic development further.

By contrast, the economy of the Lower Yangtze, with the highest secondary sector share of the country in 1761-70 (19.7%), was, as expected, manufacture-oriented (see table 3). Moreover, unlike the economy of the Huang-Ji, which remained relatively stable up until the second half of the nineteenth century, that of the Lower Yangtze began to decline in the eighteenth century, with its secondary-sector share dropping from 19.7% in 1761-70, to 15% in 1821-30, and 14.4% in 1881-90. In the meantime, its tertiary sector share dropped from 29.2% in 1761-70, to 21.5% in 1821-30, before rising back to 24.0% in 1881-90. Nonetheless, although it may appear so at the aggregate regional level, the economic development of the eighteenth- and nineteenth-century Lower Yangtze was not a simple story of economic decline but rather that of a simultaneous process of rural deindustrialisation and urban industrialisation, deeply entangled with high population pressure, the devastating effects of the Taiping Rebellion, and trade treaties. In the next paper, data with much finer spatial accuracy and longer temporal coverage will provide a comprehensive overview of the long-run occupational structure of the region.

A further region of interest sits between the two advanced regions of the Lower Yangtze and Huangji: the Huai Valley. Although the waterways in this region were connected to the

Grand Canal, and through this, the region connected to the markets of two of the country's most advanced regions, its economy was dwarfed by those of neighbouring regions (see table 3). With its primary sector shares in all three of the examined periods higher than that of the rest of China and of China as a whole, while in the case some of its prefectures, close to or higher than that of Burundi (89%), Ethiopia (84.7%), Rwanda (83.1%), and Laos (81.9%) in 1991, the region was probably an economic backwater with extremely high population pressure, despite its specialization in agriculture for export.⁵³ As discussed previously, the region was under the constant threat of Yellow River flooding until the river changed course northward in 185. The region's occupational structure in 1761-1890 confirms this: before the river's course change, the region's secondary sector share dropped from 10.9% of the labour force in 1761-70, to 6.9% in 1821-30. After 1855, it rose to 8.3% in 1881-90.⁵⁴ The region is also noteworthy for its critical location between the two advanced regions of the Lower Yangtze and Huang-Ji. It is worth noting that existing studies on the Lower Yangtze often lack discussions of its wider geographical context, and the Huai Valley, as its closest neighbouring region and yet a contrasting, backward economy, is rarely ever mentioned at all. A sound understanding of this region's economy will thus benefit studies of the Lower Yangtze. Moreover, although the Grand Canal served both of the two identified advanced regions, the Huai Valley prevented further and wider connections beyond the Grand Canal by sitting between the two. This is most probably the main reason why the Huang-Ji and Lower Yangtze appear to have been semi-autarkic regions with disparate trajectories in 1761-1890, rather than an integral whole. The thousand-miles-long Grand Canal, albeit a thousand years-old engineering miracle, cost dearly to maintain, charged heavily for usage, but constituted the one-and-only 'highway' connecting two advanced regions, each larger in size than England.

Last, this region is also important from a population perspective. In my previous study on spatial concentration of population in 1776-1910 based on Cao Shuji's data, I have found that despite regional population growth, the relative weights of regional population remained

⁵³ Again, see *Jining zhou zhi* (Gazetteer of *Jining Zhou*, edited in *Daoguang* Reign) for the dire situation of population pressure in this region.

⁵⁴ The current small sample size for the 1881-90 period made this finding highly tentative.

relatively stable before 1851 (see map 24. North China, Lower Yangtze and Middle Yangtze together formed a big triangular zone with the highest population weight in the whole country, where over half of the national population resided. In the centre of this zone is the Huai Valley, connected to the core of North China and the Lower Yangtze by the Grand Canal, and to the core of Middle Yangtze over land routes through the Nanyang Basin. Although the benchmark dates of Cao Shuji's population data only goes back to 1776, this spatial structure probably came into shape before 1776. Although many factors can influence population density and the relative population weight among regions, economic development is an important factor.⁵⁵ This spatial structure probably reflected a state of equilibrium of regional economic development in pre-1860s China. However, this structure permanently changed after the 1860s.⁵⁶ As the population weights of the prefectures in the Lower Yangtze and the Middle Yangtze greatly decreased and those of prefectures in North China rapidly increased, the "centroid" of this zone greatly shifted toward the North. Behind this great shift of spatial structure are perhaps major changes to balance among these regional economies, as well as their economic relations between one another.⁵⁷ Located at the centre of both structures before and after 1860s and directly connected to all of the triangular structures' core areas is the Huai Valley. What role did this region play in the two spatial structures of regional economic development? Did it change overtime? Further understanding this region is clearly important for our understanding of this important economic zone that encompass North China, Lower Yangtze and Middle Yangtze in a critical period in modern Chinese history.⁵⁸ Our preliminary findings on this region's occupational structure seem to be a promising improvement to our

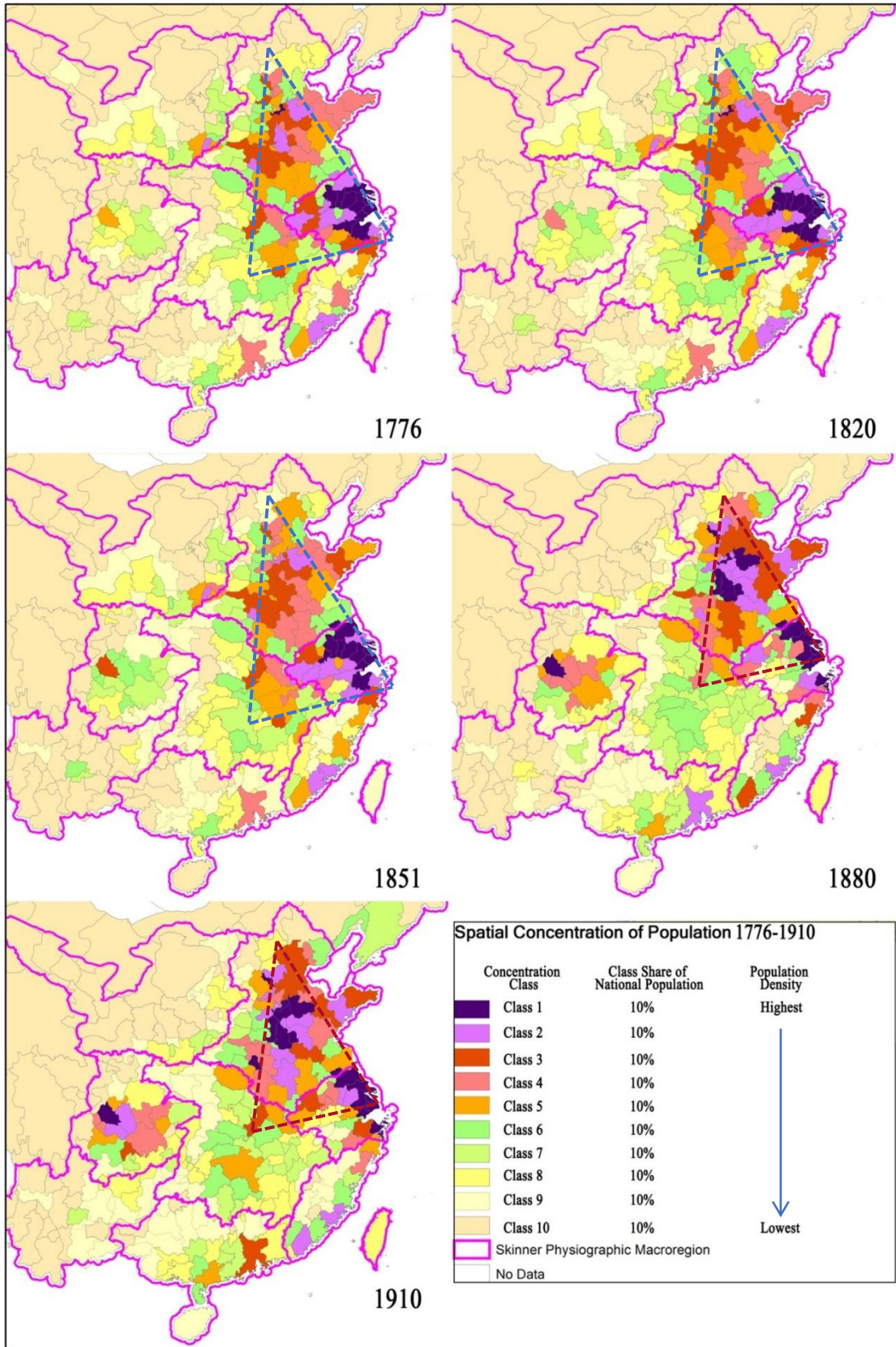
⁵⁵ For further details on the relationship between population density and regional economic development in late imperial China, please see Yang, "[MPhil Dissertation] Long Run Regional Economic Development and Population Density in Imperial China." Paper three. [Cambridge Mphil dissertation]

⁵⁶ The spatial concentration of population in present-day of China is still very similar to the post-1860s structure shown here.

⁵⁷ Huang-Yun area (Huang River-Grand Canal Area), located between Huang-Ji and the Huai Valley, presents an excellent example of such changes. See Pomeranz, *The Making of a Hinterland: State, Society, and Economy in Inland North China, 1853-1937*.

⁵⁸ Compared to the Lower Yangtze literature, there are much fewer studies on this region's long-run economic development in the late imperial period. Utilising a wide range of sources including gazetteers, grain price data and population estimates, scholars are making important progresses. For example, see Gao, "Qingdai Huaihe Liuyu Hanlao Zaihai de Renwei Yinsu Fenxi (A Study of Artificial Elements on Drought and Flood in the Huaihe River Valley in the Qing Dynasty)."

empirical basis for delving into this region's economic past, but clearly more evidence is desirable.



Map 24 Spatial Concentration of Population of China 1776-1910 (Cheng Yang, 2015 MPhil Thesis)⁵⁹

The next two key regions of the Middle Yangtze and Upper Yangtze were both affected by a major war in the period under study. Well connected to the Lower Yangtze via waterways and to the Huang-Ji via land, the Middle Yangtze has seldom been discussed in the existing literature except for its post-1858 development after the opening of Hankou as a treaty port.⁶⁰ However, as we see in table 3, the region seemed to have experienced positive economic change in 1761-1830, with its primary sector share dropping from 62.5% in 1761-70 to 54.9% in 1821-30, and its secondary sector share rising from 14.7% in 1761-70 to 21.6% in 1821-30. The large-scale shrinking of the primary sector and rapid expansion of the secondary sector, in the same period in which the Huang-Ji area was stagnating and the Lower Yangtze experiencing economic decline, certainly deserve further academic attention. Among possible explanations for this phenomenon, we may cite the devastating effects of the White Lotus Rebellion (1796-1804), which began in the mountainous area between the Upper Yangtze Core and the Middle Yangtze Core, and affected both regions. Suppression of this rebellion forced the Qing government to deploy troops from sixteen provinces into the two regions, and cost the national reserve over 200 million silver taels, equal to the total of five years' governmental revenue. Although unquantified in formal official documents, the war must have resulted in population loss of unknown scale in both regions, and might therefore have temporarily released population pressure on the land.⁶¹ For future research, targeted expansion of the sample size in prefectures affected by the White Lotus Rebellion will help further quantify the impact of the war on the regional economy. After 1830, the trajectory reversed, with the primary share rising from 54.9% in 1821-30 to 58.3% in 1881-90. At the same time, the economy shifted from being manufacture-oriented to being service-oriented, with the secondary sector share dropping drastically from 21.6% in 1821-30 to 11.5% in 1881-90, and the tertiary sector share rising

⁵⁹ The prefectures with a higher class of spatial concentration on these maps have higher population density than those with a lower class. The total population of all prefectures in each class are equal to ten per cent of national population. Yang, “[MPhil Dissertation]Long Run Regional Economic Development and Population Density in Imperial China.” p.68. The population data are extracted from Cao, *Zhongguo Renkou Shi (Chinese Population History)*, Vol.5.

⁶⁰ The Dabie Mountain separates the Middle Yangtze from the Huai Valley.

⁶¹ Actually, it's not clear that the White Lotus Rebellion did result in tremendous population loss, given how much of the fighting was in sparsely populated highlands,-- and how much of the “fighting” never occurred, with commanders not vigorously pursuing the rebels (and pocketing funds for supplies) through much of the war.

from 23.6% in 1821-30 to 30.2% in 1881-90. Without further evidence, a possible explanation is that an influx of foreign imports of manufactured goods following the opening of the treaty port led to the collapse of local handicraft industries, while creating new employment opportunities in trade and transport.

Next, the Upper Yangtze core in the Sichuan Basin, connected to the Middle Yangtze through the Yangtze River and to other regions by restricted mountain routes, was a rather geographically isolated area. This region suffered from tremendous population loss from the devastating effect of wars in the first half of the seventeenth century, after which governmental measures and the region's fertile land attracted large waves of migration from neighbouring regions that lasted from the late seventeenth century well into the end of the eighteenth century. After this period, the region, along with the Middle Yangtze, suffered from the destruction caused by the White Lotus Rebellion (1796-1804). In all three periods, its primary sector share of the labour force was relatively low compared to other parts of China and, as in the Middle Yangtze, temporarily decreased over the period 1770-1830 before rising back in 1830-1890, although on a more modest scale than in the Middle Yangtze. Overall, the relatively low primary sector share of the labour force in the Upper Yangtze suggests that the region was one of the more affluent economically in Late Imperial China. However, since the occupational structure of the region exhibited no major change across all three periods under investigation, it is very unlikely that continuous intensive economic growth had taken place in the region.

The last key region, the Southeast Coast, with its three famous seaports, Guangzhou, Fuzhou and Xiamen (Amoy), had been a well-known hub for global trade since the Song Dynasty, most notably trade in silk, tea, and porcelain.⁶² Before the mid-eighteenth century, Western vessels usually only called only on this region, but in the years before the Qianlong

⁶² Ningpo 宁波 as another important seaport in the late nineteenth century is recognised as part of the Lower Yangtze since this prefecture was connected to the Grand Canal through the Zhedong Canal. It is noted that this region includes coastal prefectures from two regions in Skinner's model (Southeast Coast and Lingnan). This preliminary spatial delimitation was made based on the homogenous patterns in occupational structure found in these coastal prefectures that was discussed in this paper. For the relatively narrow economic-history-oriented discussion, the economic ties among them might have been strong enough to qualify them as an integral economic unit rather than as two cores of two large physio-geographic and politico-economic units as in the Skinner's model.

restriction (the designation of Guangzhou as the only legal seaport for trade with Europeans in 1757), they began to sail north, including to Ningbo in the Lower Yangtze, for cheaper buying price of silk and porcelain and less fees demanded by the local brokers than at Guangzhou. The governor of the Liangguang (两广总督) complained to the Emperor Qianlong for the lost overseas trade opportunity. Qianlong's decree to restrict western trade to Guangzhou was meant to protect the overseas trade in the Southeast Coast while also keeping Western traders and vessels firmly in the south well away from the booming Lower Yangtze, the independent-minded elites, the Grand Canal, and Beijing. Current study suggests that the restriction was only short-lived and did not stop overseas trade carried in Chinese junks.⁶³ While it remains unclear how strictly the trade restrictions were implemented at the local level and to what extent the economies of the Southeast Coast and the Lower Yangtze were affected, the trajectory of the region's occupational structure can provide a preliminary estimate - preliminary due to the small size of the current *XKTB* sample for the region.

In 1761-70, with its occupational structure almost identical to the national average, the region was completely dwarfed by the two advanced economies of Huang-Ji and the Lower Yangtze. By 1821-30, it had most probably gone through a period of adverse economic development as its primary sector share rose from 58% in 1761-70 to 73.1% in 1821-30, its secondary sector share shrunk from 11.8% to 7%, and its tertiary sector share from 30.2% to 21.2%. The primary sector share in 1821-30 was the highest among the key regions, and much higher than the national average. It thus seems that Qianlong Emperor's plan to use the restriction to protect overseas trade in the Southeast Coast and help the local economy simply failed, the restriction was indeed short-lived and ineffective and overseas trade inevitably shifted to Ningpo and the Lower Yangtze. The bans were officially lifted following the opening of a series of treaty ports in the region, including Guangzhou (1842), Fuzhou (1842), Xiamen (Amoy) (1842), Shantou (Swatow) (1858), and Wenzhou (1876). In the 1980s, the Fairbank School scholars referred to treaty ports as an important aspect of the foreign "impact" required

⁶³ van de Ven, *Breaking with the Past: The Maritime Customs Service and the Global Origins of Modernity in China*. p.59-60.

to trigger “responses” in the Chinese economy, unable to grow further on its own.⁶⁴ However, the trajectory of this region’s occupational structure in the nineteenth century suggests that this “impact” induced widened the gap between the Southeast Coast and the Lower Yangtze in overseas trade; and this “response”, if it existed, was quite modest. The primary sector share of the Southeast Coast increased from 73.1% in 1821-30 to 75% in 1881-90, and the tertiary sector share dropped from 21.2% to 13.9%. Although the secondary sector share rose from 7% to 10.6%, it remained lower than the national average. Overall, therefore, the trajectory of the region’s occupational structure indicates that its economy declined significantly as it suffered from interregional competition for overseas trade and failed governmental intervention, and that the opening of treaty ports did not induce immediate positive economic changes, or at least did not induce any changes that were observable in the second half of the nineteenth century.

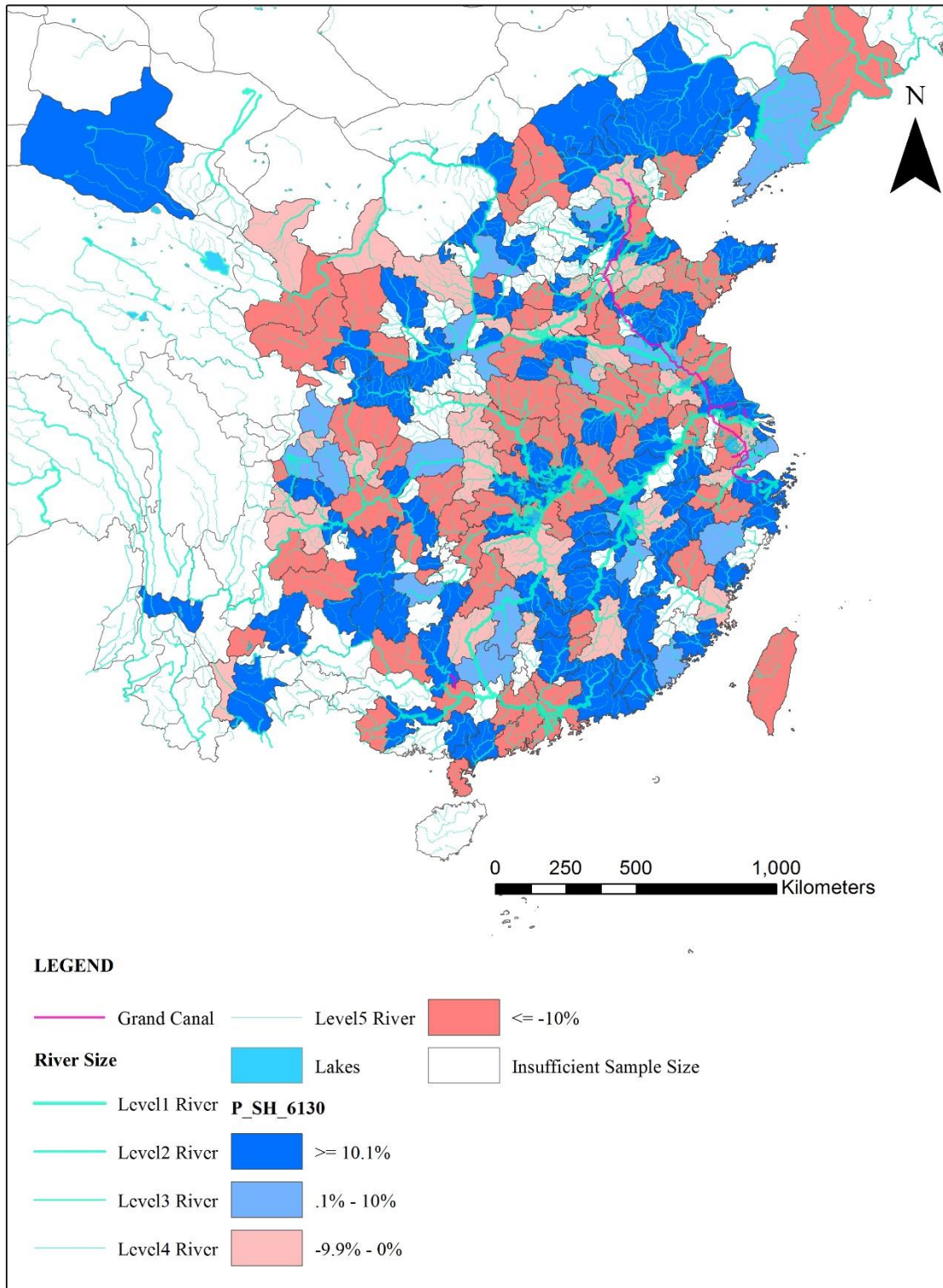
5. Conclusion

Through a spatio-temporal analysis of Chinese occupational structure at the regional level in the eighteenth and nineteenth centuries, this paper has shown that there existed a significant level of spatial heterogeneity in the economic development of the different regions of Late Imperial China. Based on the observed spatio-temporal patterns of regional occupational structure and as an empirical revisit to Skinner’s pioneering framework, the paper further identified and defined six key economic regions, including, but not limited to, a major advanced region outside of the Lower Yangtze, and an economic backwater that separated the two most advanced regions. The disparate trajectories of occupational structure found in all six key regions strongly suggested that a sound understanding of economic development in Late Imperial China must be based on a solid empirical understanding of the much wider spatio-temporal context than the one in which the field is currently trapped. It is hoped that this paper has made a first step towards bridging this gap, albeit on a preliminary basis due to the small sample size of the current *XKTB* dataset. In fact, the *XKTB* sample for the national dataset was only drawn for three decade-length periods (1761-70, 1821-30 and 1881-90), such that the

⁶⁴ J.K. Fairbank and Merle Goldman, *China: A New History* (Cambridge, Mass. ; London : Belknap Press of Harvard University Press, 2006).

current method has not yet fully utilised the potential of the source's exceptional temporal coverage (1734-1898). It is therefore possible that the present analysis missed important patterns of continuity and change in regional economic development if these took place in between the three cross-sectional periods. Moreover, as this paper discussed the key regions as integral wholes, heterogeneity within the regions was left out of the discussion, whereas the data has already indicated that there also existed spatio-temporal heterogeneity at the level of the prefectures in primary sector shares between 1761-70 and 1821-30 (see map 25). Lastly, this paper has relied on patterns of occupational structure at the prefectural level, although a prefecture could comprise both urban and rural areas. An understanding of economic development in urban areas, particularly in key cities, is indispensable to an understanding of the Chinese economy as a whole. Therefore, to close these unsatisfactory gaps, and since this paper has established the context for the economic development of the key regions, in future studies we will focus on an in-depth analysis of the two advanced regions identified and defined in this paper, the Huang-Ji and the Lower Yangtze, and will do so by discussing the long-run occupational structures of two urban cores in the Huang-Ji and of the entire Lower Yangtze, over the period 1734-1898.

Change of the primary sector share at the prefectural level between 1761-70 and 1821-30



Map 25 Change in primary sector shares at the prefectural level, China, 1761-70 to 1821-30.

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