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Rural Household Income in China: Spatial-Temporal Disparity and Its Interpretation

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Abstract

This paper investigates the spatial-temporal disparity evident in rural household incomes at the provincial level in China in the period 1978-2007. The research is introduced through a framework comprising the transitional processes of decentralization, marketization, urbanization, and globalization. The research uses Moran's I index and the spatial regression model. Research results show a clear spatial-temporal disparity in rural household incomes in China in the post-reform era, whereby the eastern provinces possess higher rural household incomes in comparison to the lower rural household incomes of the inland provinces. This disparity is attributed to the joint influence of processes of marketization, urbanization, and globalization upon household incomes derived from the non-agricultural industries. Decentralization proves to be non-significant in explaining the disparity in rural household incomes across China, as a result of the agricultural income generated from the limited household land allocated to each rural household.

*JEL Classification:*N95, O11, R11, R58

Keywords: Rural household income, spatial-temporal, Moran's I, transitional process, China

1 Introduction

China has achieved rapid growth in rural household incomes since the reform and opening-up in 1978. In fact, according to the National Bureau of Statistics of China (2010), the per capita rural household income increased from 133.6 yuan in 1978 to 4760.6 yuan in 2008. This achievement has, however, resulted in clear spatial-temporal differences in household incomes between the provinces. At present, the eastern provinces evidence a much higher rural income than the central and western provinces, despite the fact that the income difference between the three regions was relatively small in 1978. How has the spatial-temporal difference in rural income evolved in the post-reform era? What are the driving factors? Rural household income essentially consists of productive income (from agriculture) and wage income (from off-farm employment). A cluster of studies have addressed the issues surrounding rural household income in China in recent years, noting that the driving factors in productive income growth include industrial restructuring (Li 2005; Yang et al., 2007), the improvement of modern production methods (Wang 2004), and changes in government subsidies (Zhang 2005). Limitations to the amount of "household land" allocated to each rural household (Wen 2005), labor skills (Zhu and Cai 2004), and the increased price of agricultural inputs (Tang 2006) have all been found to contribute negatively to the growth of rural household incomes in China.

Off-farm employment is believed to provide better earning opportunities than those generated from farming. The number of male members in a household (de Brauw et al., 2002); the number of household laborers (Fan et al., 2002; Xia and Simmons 2004); laborers' educational level (Rozelle et al., 2002); and land productivity (Cuddy et al., 2008) were all found to influence peasants' participation in off-farm activities. In the period 1978-1992, the number of laborers employed in village and township enterprises, as well as private rural enterprises, increased from 306.4 million to 438 million (National Bureau of Statistics of

China, 1993). Yao (1997) notes that per capita rural income increased by 7.1% annually during the period 1978-1992, and attributes much of this growth to increases in the number of employees working in village and township enterprises.

Research into China's rural income distribution began being undertaken in the late 1980s. In 1988, Aguignier pointed out that China's uneven development strategy since 1978 had led to income inequalities between the eastern and western regions. Khan et al. (1992) subsequently showed that wages from rural industries were the most disequalizing component of rural household income in 1988. Following these observations, Hare (1994), Rozelle (1994), Khan and Riskin (1998), and Tsui (1998) used household data to analyze the role of the emerging non-agricultural sector in explaining income inequality. These studies all emphasized the close relation between changing patterns of inequality and the development of non-agricultural industries in rural areas. Bramall (2001) identified an increase of almost 50% in the Gini coefficient in rural China, which rose from 0.24 in 1980 to 0.35 in 1999. Bjorn and Li (2002), using household data covering 18 provinces in 1988 and 1995, found that most income inequality in rural China in 1995 was spatial, and that the uneven development of mean income across counties stood for most, but not all, of the rapid increase in income inequality. Similarly, using the village data of 36 counties and 216 townships in 6 provinces, a study by Yu et al. (2007) revealed that approximately two-thirds of the total rural inequality in China was attributed to the difference in average income across counties in the period 1997-2002.

A general conclusion shared by these recent studies is that non-agricultural activities are significant to both rural household incomes and rural income inequality in China. However, how rural household income is spatially and temporally distributed at the provincial level in China doesn't seem to be so clear, since most studies base their findings on selected provinces or regions, across a limited time period. In fact, provinces in the eastern, central and western parts of China differ significantly in terms of both socio-economic and geographic conditions, and rural income. Further, whilst recent studies have examined the various factors behind

rural income levels in China, analyses of these driving factors has not been made within a unified framework. Questions of how the driving factors jointly influence rural household income, and how those factors might be brought within a research framework, have not yet been properly addressed.

China has experienced a transition toward decentralization, marketization, urbanization, and globalization following the reform and opening-up. In this process, a series of policies and measures have been implemented in rural areas, which have undergone a shift from supporting agriculture-based economies to a diversified and non-agriculture dominated economy. Generally, the driving factors behind rural household income in China are embedded in this transitional process. However, rural household income differs widely between provinces in China, as the provinces have each reacted differently to the transition. The growth of rural household income and its spatial-temporal distribution during China's post-reform era can therefore be analyzed within the framework established by the transitional process. This paper investigates the spatial-temporal disparity in rural household incomes present at the provincial level in China, between 1978 and 2007. The driving factors in terms of the transitional processes of decentralization, marketization, urbanization, and globalization will also be examined. The structure of the paper is organized as follows: section two provides a historical review, and describes the analytical framework used to address the rural economy in the post-reform era; the third section introduces the methodology and data; and the results of the study follow. Concluding remarks based on the research findings are presented in the final section.

2 Rural China in Transition: Historical Review and Analytical Framework

There are 31 provinces and provincial-level cities (Beijing, Tianjin, Shanghai and Chongqing) in Mainland China (Figure 1). These administrative units are grouped into three regions:

the eastern, the central, and the western. In general, the eastern provinces have better natural, geographic, and economic conditions than the central and western provinces. The central provinces possess an agriculture-oriented economy while the western provinces are less developed and sparsely populated.

[FIGURE 1 HERE]

After the P. R. China was founded in 1949, emphasis within national development was placed upon capital-intensive heavy industries. In the centrally planned economy, the government strictly controlled resource flows, allocating massive amounts of capital and materials to the cities. In 1953, a compulsory procurement policy was imposed in rural China. Peasants were obliged to sell a certain amount of their produce to the state at prices set by the government (Perkins, 1966). The Household Registration System (hukou)[1] was also established in the late 1950s, drawing a clear distinction between rural and urban areas. Attached to the social welfare system, the hukou system restricted rural-urban migration, confining the peasants to the countryside.

Collective farming in the people's commune[2]and local grain self-sufficiency were also implemented in the countryside. The commune system emphasized self-sufficiency over trade and, as a result, the rural markets were poorly developed. Rural industrial production activities concentrated on a narrow range of products – iron, steel, cement, chemical fertilizer, hydroelectric power, and farm implements – and these were termed the "five small" industries (Yang 2004). According to Findlay et al. (1994) and Naughton (1996), the orientation toward developing rural enterprises was established by government plans, instead of market forces. Statistics in the National Yearbook (1988) show that only about 7% of rural laborers were

[1]In 1958, the Chinese government officially introduced the family registry system (hukou) to control the movement of people between urban and rural areas. Individuals were broadly categorized as "rural" or "urban" workers. People seeking to move from rural to urban areas to take up non-agricultural work would have to apply through the relevant bureaucracies.

[2]Collective farming is a type of agricultural production through which the holdings of several farmers are run as a joint enterprise. This type of collective is essentially an agricultural production cooperative in which member-owners engage jointly in farming activities. In the people's commune, everything is shared. People work together and eat together in communal dining rooms.

engaged in non-agricultural employment in 1978, generating merely 7% of rural household earnings.

Compared to the rural development of the centrally-planned era, great changes took place in the rural areas following the reform and opening-up in 1978. In the market economy, decentralization, marketization, urbanization, and globalization have jointly reshaped the rural economy in China.

2.1 Decentralization

Decentralization didn't really take place in China until 1978. Administrative decentralization entailed the transfer of power from the central government to the provincial governments, which have shifted politically from being passive agents of the central government to active actors responsible for local prosperity (Zhu 2000). Decentralization in the countryside was marked by the disbanding of collective agricultural production, which was replaced by the household responsibility system. In this system, peasants were responsible for both profits and losses from their own household plots. This policy, which enabled peasants to deal with their surplus, triggered their enthusiasm for agricultural production greatly, increasing grain output from 304.8 million tons in 1978 to 446.2 million tons by 1989, a rise of 46.4% (National Bureau of Statistics of China 1990).

After 1979, the government also increased the procurement prices for major farm products. According to Kueh (1984), grain procurement prices in China increased by 20% for compulsory delivery quotas and the additional price premium for above-quota sales were raised from 30% to 50%. Procurement prices for other farm products like cotton and oil also increased substantially. McMillan and Zhu (1989) and Lin (1992) argued that the household responsibility system and the increases in state procurement prices were the major sources of income growth in rural China prior to 1985.

The influence of decentralization on rural China is also evident in increased inputs to agricultural production. Such inputs include governmental budgetary expenditure on agri-

culture, investment in rural fixed assets, and increases in the power of agricultural machinery. Governmental budgetary expenditure on agriculture alone increased from 7.7 billion yuan to 340.4 billion yuan in the period 1978-2007 (National Bureau of Statistics of China 2010).

2.2 Marketization

Market liberalization in China witnessed the dismantling of the central planning and allocation system and its replacement by market mechanisms. This replacement was, however, achieved gradually, through a process that established an incentive mechanism in place of the egalitarian income distribution system. After 1985, changes in the planned procurement of farm products, market expansion, reduction in trade restrictions, commerce for agricultural products, and an altered rural commercial environment led to a great surge in market-oriented activities in rural China. In the period 1980-1992, trade in the rural free markets increased by 12% per year, outstripping the annual growth both in retail sales (8%) and GDP (9%) (Sicular 1995).

Under the household responsibility system, increased agricultural productivity released many laborers from farming and enabled them to undertake non-agricultural jobs which could provide higher incomes. Township and Village Enterprises (TVEs) emerged and developed quickly in rural China. Lin (2004) considers the development of TVEs in China as both a response to the reform of resource allocation mechanisms and a way of mechanizing agriculture. Both the central and local governments encouraged and praised TVEs, which were a growing source of government revenue and could provide opportunities for cash income in the countryside (Hare 1994). In 1992, 106 million workers (52 million in collective enterprises and 54 million in private enterprises) were employed in TVEs, compared to 145 million in the state and urban enterprises. In fact, in the same year, TVEs accounted for about 40% of the total per capita rural income (compared with 7.6% in 1978) (National Bureau of Statistics of China 1993).

2.3 Urbanization

Urbanization emerged as an inevitable result of the reform and opening-up in China. In 1984, the migration policy issued by the State Council allowed peasants and their families to be permanently registered in towns and cities if they were engaged in industrial or commercial activities. Peasants were also allowed temporary registration in small and medium-sized cities. As a result, large numbers of peasants migrated to the cities to work in non-agricultural industries. Over 60% of annual urbanization growth in the period 1978-1989 can be attributed to rural-urban migration (National Bureau of Statistics of China 1999).

As a strategic way of "urbanizing from below", the government aims to "strictly control the growth of large cities, rationally develop medium-sized cities, and to vigorously promote the growth of small cities and towns" (City Planning Law of the People's Republic of China 1989). Upon the basis of this policy, peasants have been encouraged to work in TVEs in small towns and medium-sized cities instead of migrating to the large cities. According to the National Statistical Yearbook (2005), employment in the rural non-farm sectors expanded from 9.2 million in 1980 to 191 million in 2004, its proportional share increasing from 3% to 38.4% of total rural employment.

Urbanization development greatly influenced China's rural economy. The absorption of rural laborers into the TVEs, as well as mass migration to the cities, has fundamentally changed income sources in rural China (Taylor et al., 2003). The remittances sent to the rural areas served as an important source of investment capital and contributed to enhanced household consumption (Snyder and Chern 2009). Further, more people moving into the non-agricultural sectors induced greater and more diversified demand for agricultural products like vegetables, fruit, and meat. This led to a significant boost in rural food processing and marketing industries as well as changes of agricultural structure. In the period 1978-2007, the gross value of outputs from farming production decreased from 80% to 50.4% of total agricultural production, while the proportion of total agricultural production attributed to forestry, animal husbandry, and fishery increased from 20% to almost 50% (National Bureau

of Statistics of China 2010).

2.4 Globalization

Since the reform and opening-up, globalization has become an important external force, transforming the rural economy in China. As a result of its cheap and sufficient labor force, China gradually became the "world's factory". From 1979 to 1999, the actual inflow of foreign direct investment (FDI) in China amounted to 306 billion dollars, 10% of worldwide direct investment and about 30% of investment for all the developing countries (OECD 2000). Around 60% of the FDI went into the labor-intensive manufacturing field in 1998, followed by the share (24.4%) invested in real estate. In the post-reform era, TVEs also attracted a substantial amount of export-oriented FDI and high levels of production demand from the world market. In 1999, TVEs in China exported 94 billion dollars' worth of manufactured goods while exports from foreign-invested enterprises were valued at 89 billion dollars. These two types of enterprises contributed to 94% of China's total export in 1999 (Fu and Balasubramanyam 2005). As a consequence, a huge number of job opportunities were generated in these types of enterprises, attracting large numbers of rural laborers.

The influence of globalization on the rural economy went further, following China's entry into the World Trade Organization (WTO) in 2001, after which Chinese agriculture and the rural economy were opened to the global market and forces of competition. As a WTO member, China was forced to open its domestic agricultural market and reduce agricultural subsidies. Fear exists that globalization may hinder rural household income growth and exacerbate rural-urban income inequality (Fewsmith 2001; Blum 2002). Given that most rural households in China are small holders of tiny plots of land, the cost of producing some types of grain might be higher than the world market. Imports of a large amount of cheap grain will further depress rural income growth in China. An anxious estimation by Wen (1999) held that around 21.8 million tons of commodity grain – constituting over 20% of commodity grain in China – would be imported from the United States. Such a scenario

would impact Chinese agricultural production severely. Yu and Zheng (2000) also estimated that China would, in accordance with the WTO agreement, increase imports of cheap, high-quality wheat from 2 million tons to 5 million tons, bringing about an income loss of 5.5 billion yuan to rural China.

The above analysis provides a general scenario of how the rural economy in China has developed in the transitional period since 1978. The eastern, central and western parts of China have, however, reacted quite differently to the process of transition and, as a consequence, socio-economic differences between these three regions emerged and enlarged in the post-reform era (Table 1). Generally, eastern China has reached a higher socio-economic level, followed by the central and western provinces. Based on the above analysis, the paper offers two hypotheses: there is a spatial-temporal disparity in rural household incomes at the provincial level in China; such a disparity can be explained by the transitional process and the factors of decentralization, marketization, urbanization, and globalization.

[TABLE 1 HERE]

3 Research Methodology and Data

3.1 Exploratory Spatial Data Analysis

The research used exploratory spatial data analysis (ESDA) to investigate the spatial patterns of rural household incomes at the provincial level in China from 1978 to 2007. According to Anselin et al. (2007), the central aspect of ESDA is the notion of spatial autocorrelation (or spatial association): the phenomenon through which similarity of location (observations in spatial proximity) is matched by value similarity (attribute correlation). Moran's I is the primary means of testing spatial autocorrelation. Global Moran's I measures the overall clustering and is assessed by examining a null hypothesis, whereby rejection of the null hypothesis suggests a spatial pattern or spatial structure. Local Moran's I examines the spatial autocorrelation and shows where the clusters or outliers are located, and what

kinds of spatial correlation are most important (Anselin 1995). The calculation of Moran's I is made by using GeoDA 095 software (Anselin et al., 2006).

Global Moran's I is defined as follows:

$$MoranI = \frac{n\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i - x_a)(x_j - x_a)}{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}\sum_{i=1}^{n}(x_i - x_a)^2} = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(x_i - x_a)(x_j - x_a)}{s^2\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}} \tag{1}$$

$s^2 = \frac{1}{n}\sum_{i=1}^{n}(x_i - x_a), x_a = \frac{1}{n}\sum_{i=1}^{n} x_i$

x_i is the ith obervation's value (i=1,2..n), n is the number of observations, w_{ij} is a binary system of an n*n spatial weight matrix. Moran's I ranges from -1 to +1. Positive values of Moran's I indicate spatial clustering of similar values while negative values suggest that high values are found in the vicinity of low values.

The paper uses the Z score to test the statistical significance that decides whether or not to reject the null hypothesis. The critical Z score values range between -2.58 and +2.58 standard deviations when using a 99% confidence level. If, in such a case, the Z score is within (-2.58, +2.58), the research can't reject the null hypothesis, meaning that the overall clustering is very likely to be a random pattern. If the Z score falls outside (-2.58, +2.58), then the null hypothesis should be rejected and the overall clustering displays a significant, clustered pattern. The formula of a Z score is wrtten:

$$Z = \frac{I - E(I)}{\sqrt{VAR(I)}} \tag{2}$$

$$E(I) = -\frac{1}{N-1}, VAR(I) = \frac{n^2 w_1 + n w_2 + 3w_0^2}{w_0^2(n-1)(n-2)(n-3)} - E^2(I)$$

$w_0 = \sum_{i=1}^{n}\sum_{j=1}^{m} w_{ij}, w_1 = \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{m}(w_{ij} + w_{ji})^2, w_2 = \sum_{i=1}^{n}(w_{i.} + w_{.i})^2$

$w_{i.}$ and $w_{.i}$ are the sum of the figures in ith column and ith row respectively.

Thus, local Moran's I can be written:

$$LocalI = z_i \sum_{j=1}^{n} w_{ij} z_j \tag{3}$$

$z_i = x_i - x_a$, $z_j = x_j - x_a$ are the deviation of the observed value and the mean value.

3.2 Spatial Regression Model

The paper uses the spatial error model (SEM) and the spatial lag model (SLM) to examine the driving factors in the distribution of rural household incomes in China. SEM means that space matters only in the error process, not in the substantive portion of the model; while SLM indicates that the dependent variable is affected by the values of the dependent variables in nearby places.

Generally, the SEM and the SLM are two important ways in which spatial interaction is modeled in spatial regression analysis. SEM is written:

$$Y = X\beta + \varepsilon,\ \varepsilon = \lambda W \varepsilon + \mu \tag{4}$$

β is the coefficient of the explanatory variable X. $\varepsilon$is the random error term, and $\lambda$is the auto-regression parameter which measures the spatial dependence.

The spatial dependence means the influence direction and degree from the observed value Y of the adjacent provinces. W is the spatial weights matrix, and μ is the random error term of normal distribution. SLM is written:

$$y = \rho W_y + X\beta + \varepsilon \tag{5}$$

ρ is the spatial auto-regression coefficient, and W_y estimates the spatial correlation degree of the model and adjusts the influence of other explanatory variables.

First, the research needed to adopt a model which better fitted the conditions of the distribution of rural household incomes in China. This could be done according to the Lagrange Multiplier tests LM(lag) and LM(error). If the LM(lag) is not as significant as LM(error), then the spatial error model is more suitable, and vice versa. Secondly, the driving factors needed to be placed within the framework established by the transitional process in China. As such, the research selected a series of measures – namely, budgetary expenditure on agriculture (BEA); rural fixed assets investment (RFI); the power of agricultural machinery (PAM); the ratio of non-agricultural employment to total employment (NAE); the ratio of non-agricultural production to total production (NAP); the urbanization level (U); and foreign direct investment (FDI) – to represent decentralization, marketization, urbanization, and globalization. The data used in this research comes from the Comprehensive Statistical Data and Materials on 60 Years of New China (2010).

4 Empirical Results

4.1 The Spatial-Temporal Distribution of Rural Household Incomes

Table 2 lists the computation results of the Global Moran's I of rural household incomes at the provincial level in China in the period 1978-2007. Generally, the Global Moran's I statistics experienced an increase between 1978 and 1984, after which it dropped until 1992. Since the second half of 1990s (and up to 2007), the Global Moran's I statistics increased and stayed at 0.31. The test of statistical significance is in line with the changes found in the Global Moran's I statistics. From 1978 to 1982, there was a random distribution of rural household incomes in China that neither clustered nor dispersed. However, a highly-clustered pattern (significance level 0.01) emerged in the period 1984-1988. The period 1990-1992 showed a clustered pattern with a significance level of 0.05, and since 1994 the clustered pattern of rural household incomes has maintained at significance level 0.01.

[TABLE 2 HERE]

The Global Moran's I statistics indicate a shift from a random to a clustered distribution pattern in relation to rural household incomes in China in the post-reform era. However, how incomes became spatially distributed across China at different times remains unclear. The paper computes the local Moran's I to show where the clusters or outliers are located and what kinds of spatial correlation are most important. Besides the Moran's I, the LISA (local indicators of spatial association) significance cluster map is used to further reveal the hot spots (High-High) and blind spots (Low-Low) in terms of rural household incomes at the provincial level in China.

As shown in Figure 2, the LISA cluster map (local Moran's I -0.19) in 1978 implies a random distribution pattern in which provinces of different significant types are mixed. However, local Moran's I increased to -0.02 in 1988 when a clustered distribution pattern of rural household incomes emerged in China. The LISA cluster map shows that the eastern provinces (Jilin, Liaoning, Beijing, Tianjin, Jiangsu, Shanghai, Fujian and Guangdong) are of a high significance level, while the far-western provinces are blind spots of a low significance level. In 1998, the clustered distribution pattern of rural household incomes became more evident (local Moran's I 0.22) and Beijing, Tianjin, Hebei, Shandong, Jiangsu, and Shanghai register as hot spots, while Jilin, Liaoning, Fujian and Guangdong are of high significance level, being surrounded by the low-significance provinces. The major western provinces are still blind spots. The LISA cluster map (local Moran's I 0.24) for 2007 shows that Liaoning is added to the hot spots while Zhejiang becomes a province with a high significance level. Hunan and Hubei provinces, however, become blind spots.

Generally, the LISA cluster map bears much resemblance to the Global Moran's I statistics. In the early stages after the reform and opening-up, the distribution of rural household incomes in China is random, while a clustered distribution pattern emerges after the mid-1980s and becomes more evident since the mid-1990s. The eastern provinces are the places of high rural household income, while the western provinces have low rural household income.

[FIGURE 2 HERE]

4.2 Regression Results of the Driving Factors

This section of the paper describes the spatial regression and investigates the driving factors behind spatial-temporal disparity in rural household incomes in China. A suitable regression model was chosen by comparing the significance of LM (lag) and LM (error). As shown in Table 3, neither of these two models fit the year 1978 due to their non-significance tests while the spatial lag model suits the years 1988, 1998, and 2007. This indicates that the distribution of rural household incomes at the provincial level is affected by the rural income of nearby provinces.

[TABLE 3 HERE]

The OLS (Ordinary Least Squares) regression is made for the year 1978 and the spatial lag model is run for the remaining three years. Before regression, a correlation analysis is conducted to test for autocorrelation among the variables. The variables of high autocorrelation with other variables are removed from the spatial regression analysis.

Table 4 shows the regression results of the driving factors. In short, spatial-temporal differences in rural household income at the provincial level in China are attributed to the marketization, urbanization, and globalization which jointly influenced those household incomes derived from non-agricultural industries. Marketization is significant across the whole research period. These findings indicate that the non-agricultural industries have become the major source of rural household income in the post-reform era. Differences in non-agricultural production between the three regions contribute to spatial-temporal differences in household income at the provincial level in China. Generally, urbanization has played a role in enabling peasants to gain access to non-agricultural employment in either the big cities or in the TVEs located in small towns and medium-sized cities. Globalization, which brings huge investments in labor-intensive manufacturing industries, has contributed to the development of non-agricultural industries in China. However, as shown in Table 1, large differences in terms of both the development of non-agricultural industries and FDI are

present between the regions of eastern, central and western China. Such differences finally lead to differences in rural non-agricultural income at the provincial level.

[TABLE 4 HERE]

The non-significance of decentralization could be explained by the agricultural income generated from the limited amount of "household land" belonging to households. The household responsibility system in the early 1980s allocated the arable land to each rural household in China. Thus, the per capital area of arable land is the same in each household. Although this system triggered peasants' enthusiasm for investing more in agricultural production, the increase in agricultural income is restricted due to the limited area of household land. The agricultural income of each household does not therefore noticeably differ between each province.

5 Concluding Remarks

This paper reveals a spatial-temporal difference in the rural incomes of households living in different provinces in China. This difference increased as the reform and opening-up of China progressed, a relation which corresponds to the paper's hypothesis, which was based on the literature review. In short, the spatial-temporal difference present in the rural household incomes of various provinces is deeply embedded in the China's transitional process of decentralization, marketization, urbanization, and globalization; processes which began in 1978. Provinces in the eastern, central and western parts of China responded differently to the transition, and these different responses in turn contributed different levels of increase in rural household incomes across the three regions. In the transitional process, the development of non-agricultural industries – which generated major increases in rural income – has been found to be the main driving factor behind the identified spatial-temporal difference in rural household incomes. This finding is in line with current research surrounding rural income inequality in China.

The research contribution of the paper constitutes the introduction of an analysis of the transitional process experienced by China since 1978. Dealing with spatial-temporal differences in rural household incomes at the provincial level is a task which will continue with respect to future transitional processes. The implications of this research lie in the notion that policy makers attempting to reduce such differences must find ways to support of development of non-agricultural industries in inland China. In this sense, the question of how to develop the non-agricultural industries in inland China – particularly in the face of competition from eastern China and the world – lie at the core of this challenge. Further, given that each rural household has limited arable land in China, ways to increase agricultural incomes by means of instigating changes to the agricultural structure and increasing the scale of agriculture also represent critical challenges for policy making.

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TABLE 1 Socio-Economic Differences among Eastern, Central and Western China

Items	Year	East	Central	West
Per capita GDP (yuan/person)	1978	462.6	311.1	263.9
	2007	30803.9	20918.3	12298.1
Annual average increase (%)		52.2	52.3	46.8
Ratio of non-agricultural production (%)	1978	77	65	62
	2007	93	87	86
Urbanization (%)	1978	18.4	17.9	15.9
	2007	52.2	51.7	36.2
FDI (million dollars)	1978	99	19	12.5
	2007	890.9	343.8	50.7
Annual average increase (%)		24.6	33.6	15
Rural household income (yuan/person)	1978	152	126	124
	2007	5627	3869	2960
Annual average increase (%)		43.5	40.8	37.3

Data source: National Bureau of Statistics of China (2010)

TABLE 2 Global Moran's I of Rural Household Incomes at the Provincial Level in China

Year	1978	1980	1982	1984	1986	1988	1990	1992
Moran's I	-0.02	0.06	0.07	0.21	0.19	0.16	0.15	0.14
Z score	0.24	1.2	1.45	3.27	2.98	2.62	2.45	2.35
P	Random	Random	Random	0.01	0.01	0.01	0.05	0.05
Year	1994	1996	1998	2000	2002	2004	2006	2007
Moran's I	0.18	0.28	0.29	0.30	0.29	0.30	0.31	0.31
Z score	2.96	4.16	4.29	4.37	4.31	4.4	4.6	4.59
P	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Note: P denotes the significance level; the test of statistical significance indicates that the results are strongly significant at the significance level of 0.01 (0.05). This means that there is less than 1% (5%) likelihood that this clustered pattern could be the result of random chance.

TABLE 3 Results of the Spatial Regression Model

Year	LM (lag)	Robust LM (lag)	LM (error)	Robust LM (error)
1978	0.76	0.45	0.46	0.15
1988	6.05*	11.16**	1.68	6.79**
1998	5.86*	8.3**	1.53	3.97*
2007	2.72*	4.36*	0.22	1.86

Note: LM means Lagrange Multiplier; ** and * indicate the significance levels of 1% and 5%.

Numbers in bold indicates higher significance level

TABLE 4 Regression Results of the Driving Factors

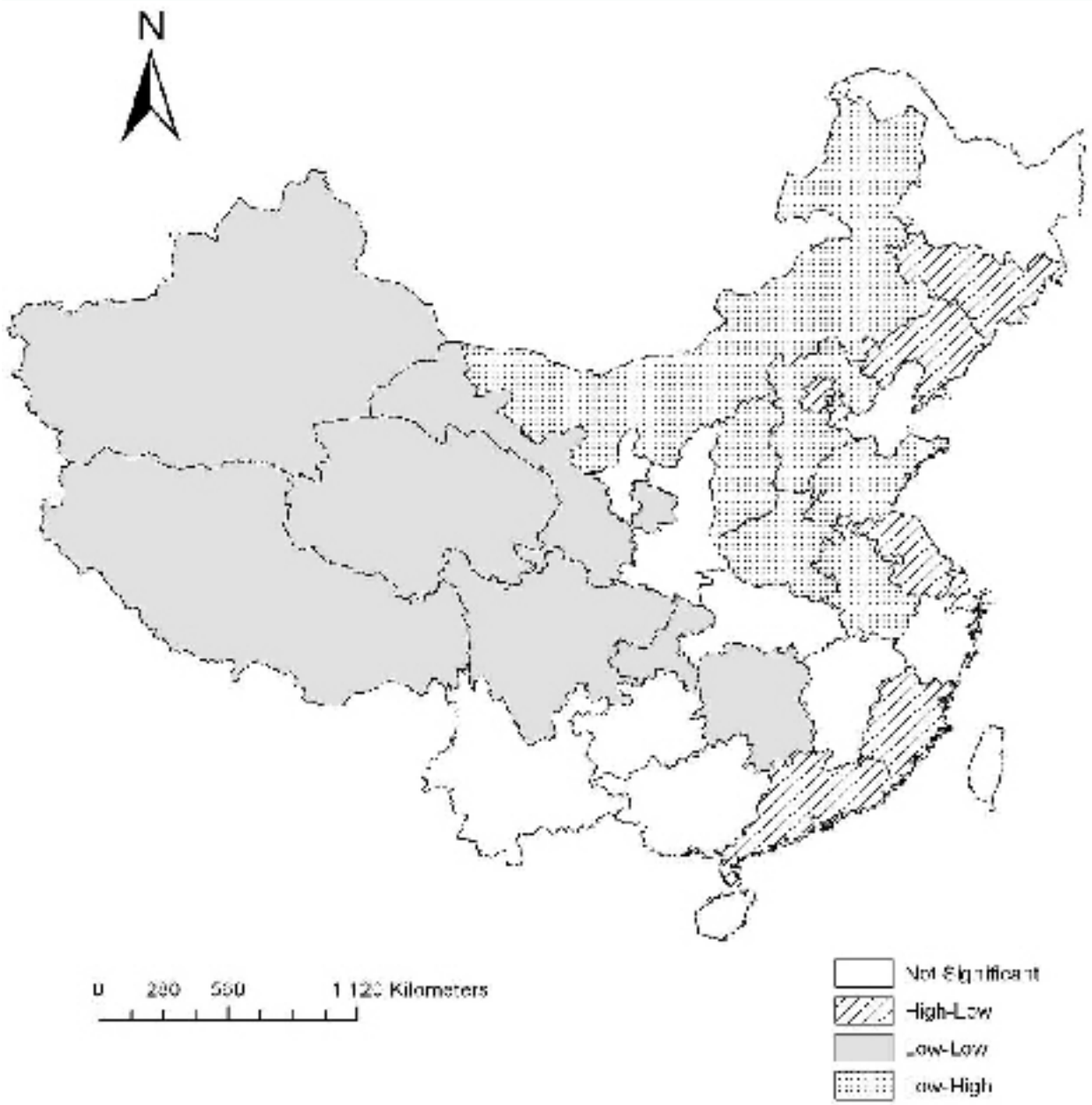
Year		Decentralization			Marketization		Urbanization	Globalization	R^2
		BEA	RFI	PAM	NAE	NAP	U	FDI	
1978	Coef	-8.15	0.27	-0.03	—	141**	—	0.02*	0.49
	T	-1.22	0.93	-0.12	—	2.7	—	2.06	
		LogL =148.26, AIC=-308.52, SC=-317.12							
1988	β	-13.4	—	0.04	—	195.1*	44.6**	0.005**	0.64
	Z	-1.5	—	1.04	—	1.9	2.23	3.55	
		LogL =194.63, AIC=-403.27, SC=-413.3							
1998	β	11.43	—	0.04	50.51**	—	36.25	0.001**	0.89
	Z	1.17	—	0.55	9.21	—	1.48	3.53	
		LogL =223.34, AIC=-460.68, SC=-470.71							
2007	β	-3.7	—	0.06	—	135.6**	50.9**	0.001*	0.73
	Z	-0.7	—	0.54	—	3.03	3	2.1	
		LogL =260.47, AIC=-534.93, SC=-544.97							

Note: LogL means Log likelihood; AIC means Akaike info criterion; SC means Schwarz criterion;

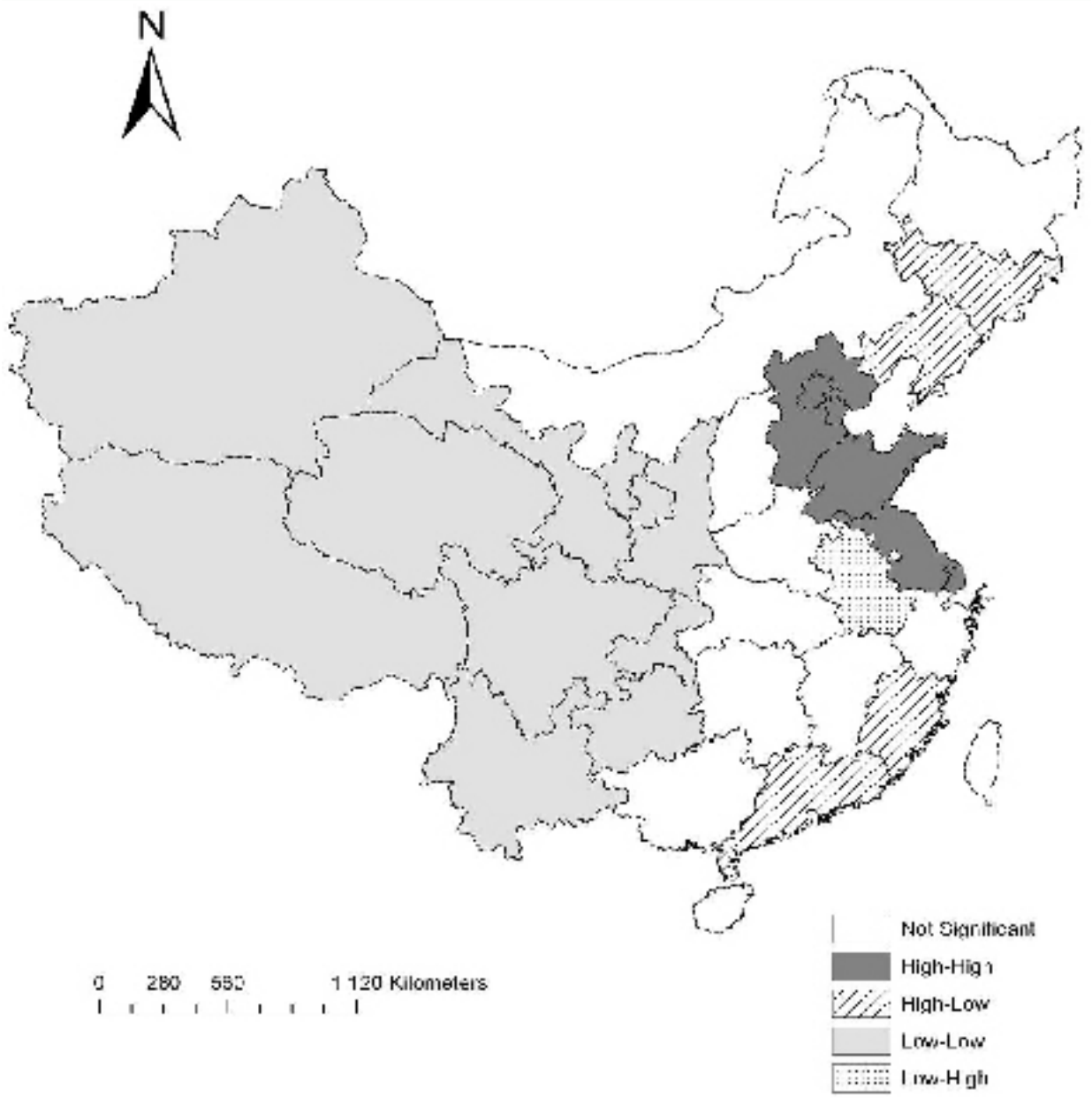
** and * indicate the significant level of 1% and 5%

FIGURE 1 Provinces and The Three Regions in China

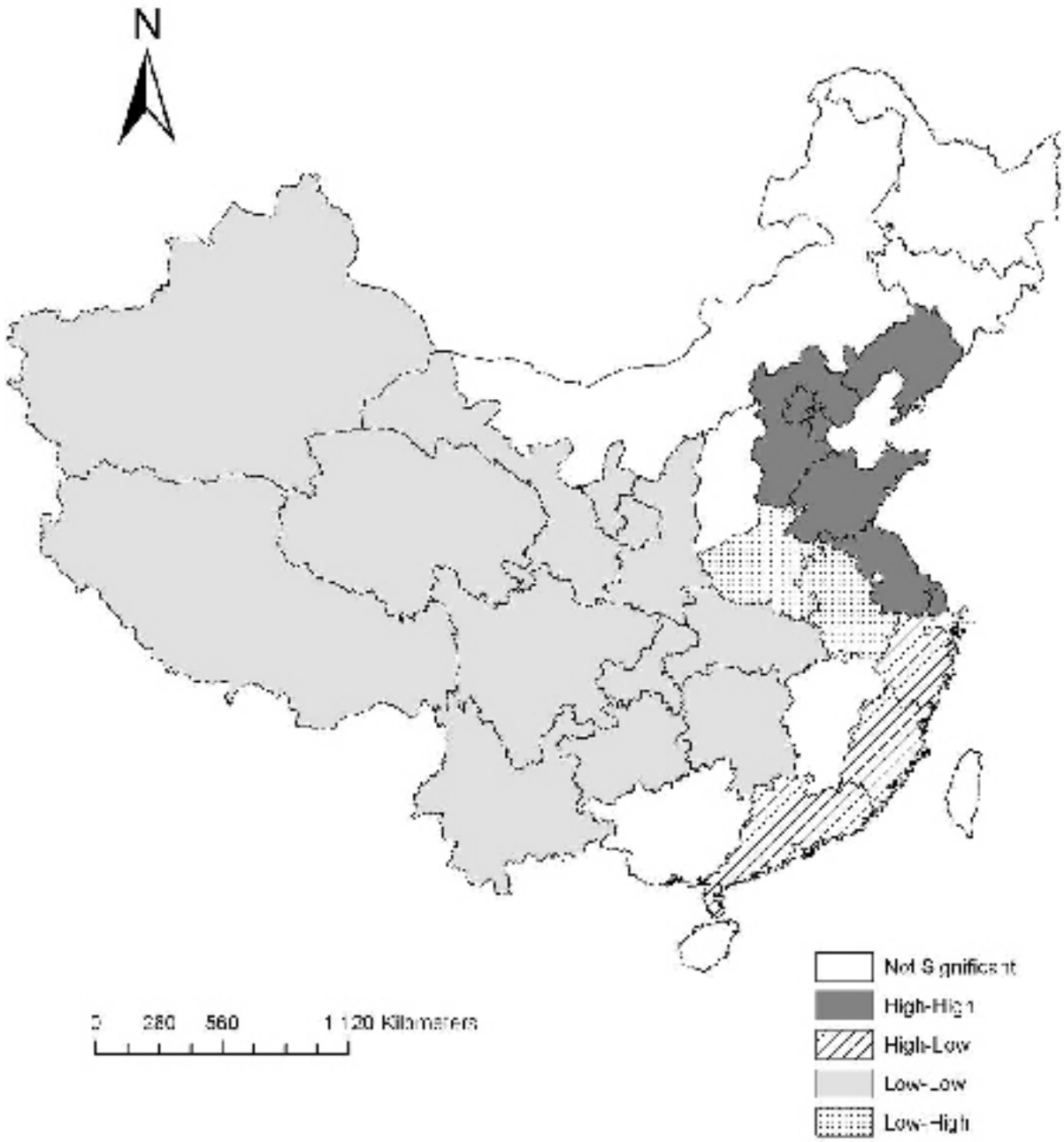
(1978, Moran's I=-0.19)



(1988, Moran's I=-0.02)



(1998, Moran's I=0.22)



(2007, Moran's I=0.24)

FIGURE 2 LISA Cluster Map of Rural Household Iincome in China, 1978-2007