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Visualizing income disparity in Japan with spatial statistic method

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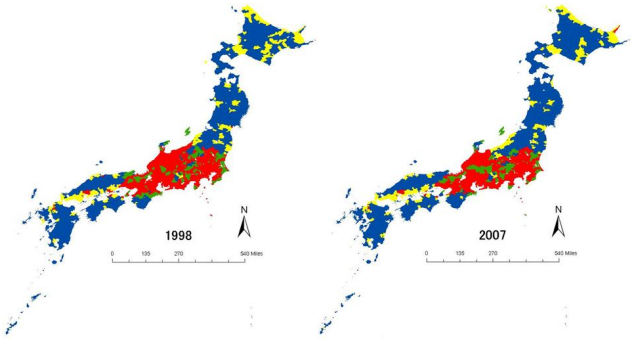
With the collapse of the bubble economy in the early 1990s, economic disparities have arisen both among the people and among the different regions in Japan. Well known tools for analyzing income disparity are the coefficient of variation and the Gini coefficient, which are widely used such as in the reports of the government or standard economic textbooks, but they can only grasp the overall degree of income disparity. Advancements in spatial analysis have led to the development of strong tools to explicitly consider spatial dependence and heterogeneity; however, no significant research has been carried out using such tools for analyzing the economic disparity at the municipal level in Japan. The objective of this study is to visualize the dynamic change of the regional income disparities in Japan during the period known as the ”lost decade.” The data used in the study are annual data collected at the municipality level during 1998-2007. Exploratory spatial data analysis (ESDA) and local indicators of spatial association (LISA) have been used to classify municipalities into categories and to identify local spatial clustering and spatial outliers composing the income disparity in Japan, respectively.

We first classify each municipality into four clusters according to the Moran scatterplot: high per capita income municipalities with high per capita income neighbors (hot spot), high per capita income municipalities with low per capita income neighbors, low per capita income municipalities with high per capita income neighbors, and low per capita income municipalities with low per capita income neighbors (cool spot). The hot spots are concentrated along the center of Japan, also known as the Pacific Belt Zone, and the cool spots are located in the north and south west of Japan. The regional distribution of the clusters seems to be stable during the decade; however, unstableness of the clusters in Hokkaido prefecture are indicated. We also calculated the Euclidean distances between the Moran scatterplot for each region to extract municipalities with peculiar movement in the Moran scatterplot through the decade, and succeeded in detecting not only regions with dramatic cluster transition but also regions with peculiar behavior staying in the same cluster.

To identify influential observations and spatial outliers, analysis based on LISA has been carried out. Local Moran’s I is efficient for identifying regions with similar and dissimilar values, thus it is a good indicator to spot strong spatial clusters, and local Geary’s c is efficient for the quantification of income inequality between each region, thus can be used to indicate the degree of (dis)similarity. During the decade, the distribution of the municipalities’ local Moran’ I value had become simple except the regions in Tokyo, Nagoya and Osaka still have high values. This means that the strong spatial clusters only exist in the main metropolitan areas. A similar result is confirmed in the distribution of local Geary’s c values, meaning that almost all municipalities do not differ compared to their neighbors, and the regions in Tokyo are identified to be strongly dissimilar to neighborhood regions.



Distributions of the clusters

Keywords: income disparity, Moran scatterplot, local Moran statistic, local Geary statistic