# Spatial analysis of population change focused on topographic and social conditions from Meiji era to today.

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**1. Introduction**

The purpose of this study is to clarify the spatial characteristic of population change from Meiji era to today in terms of topographic and social conditions. Authors have analyzed the correlation of the population and topographic condition using modern statistics from the viewpoint of the correlation of population and natural environment (Fujita et al 2005; Watanabe et al 2006.). At the same time, the limit of explaining population change only on topographic conditions has also been pointed out. Therefore, in this study, social conditions, such as a transportation or proximity to urban area, are taken into consideration, and the regulation factor of population change is examined in Kanto region and Kinki region, Japan.

**2. Data and research method**

The procedure was as follows. First, polygons of municipalities in 1890 was generated (Fujita 2005), and the population in 1890 and 2000 were re-distributed to 5km mesh by area proportion method. And, the numbers of population change from 1890 to 2000 were computed for every mesh. The data source of population in each year was 'Requisition Order List in 1891(censused in 31st December, 1890)' and 'National Census in 2000'.

Next, the social data was computed. Specifically, the maximum proximity distance from each mesh center point to the line/point of main ways, main rivers (navigable), urban areas, and stations was adopted as a variable.

Urban areas were adopted from a 'city' or a 'town' indicated in 'Requisition Order List in 1891' and the population was beyond 10000 or the population density was beyond 4000/km2. For data creation, the Digital National Land Information (road (line), river (line), lake (line), station (point)) was used. In addition to these, average altitude, an average inclination, and population in 1890 were added, and all the 7 variables were adopted. And these 7 variables were made into the independent variable, and multiple linear regression analysis (stepwise method) was conducted by making population change into a dependent variables. Besides the analysis of the multiple regression expression, the change portion which is not explained by the independent variables was examined by mapping residual.

**3. Result**

The outline of a result is as follows.

1) The coefficient of multiple correlation was 0.429, the coefficient of determination was 0.184, and the multiple regression expression was significant with the 1% level.

2) In the independent variable, the standardized partial regression coefficients of an average inclination are -0.258 and the highest. Hereafter, it continues with the distance (-0.169) to urban areas, and the distance (-0.119) to main ways, and although it is secondary, social conditions are also considered to have specified population change.

3) When the mapped residual is examined according to region, in both the Kanto district and Kinki district the area of plus of a residual excels in a round form centering on big cities, such as Tokyo and Osaka. The former is distributed over the outer edge part of the area of plus of a residual, and the latter is distributed from the area of plus in the shape of a sector in the shape of a belt by the area whose residual is minus.

**4. Acknowledgements**

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**5. References**

Fujita, K., Murayama, Y., Morimoto, T., Yamashita, A., and Watanabe, H. 2005. A Spatial Analysis of Population Change in Tokyo Metropolitan Area from Meiji Era to Today -By Using a Requisition Order List 1891 and DEM Data-. Papers and Proceedings of the GISA 14: 61-66.

Watanabe, H., Murayama, Y., Morimoto, T., Yamashita, A., and Fujita, K. 2006. Analysis of population distribution by using modern historical statistics focused on topographic condition. Papers and Proceedings of the GISA 15: 329-332.