MA Thesis: Refined Research Proposal

Background and Motivation

The world's third largest economy, Japan has been the leading site of innovation and growth for several years. However, currently, the Japanese economy is facing challenges such as growth in productivity not meeting labor force decline, concentration of economic growth in major metropolitan areas and uneven distribution of aged population (OECD, 2016). With statistics that indicate that "no less than 38% of Japanese will be aged 65 and over by 2065, making it the world's leading 'super-aged society'", Japan is proactively addressing issues population decline and demographic shift. (Contributor, 2019). The government is focusing on policies that include participation of women and elderly, leveraging technology to improve productivity and services rendered, and harnessing spatial planning and spatial policies to tackle regional disparities.

The focus on spatial variation and policies to address them is an important one. As early as 1960s and 70s, scholars and government had recognized that "for the population problems the increase of elderly people and the uneven distribution of population are thought to be the most important" (Kawabe, 1980, p. 192) Since then, the problem has only intensified. Japan is an island nation with mainly mountainous terrain that constrains most of the inhabitable area to low lying plains leading to high density cities. For instance, the "Population per 1 k㎡ of total land area" in 2010 is 343.4 but "Population per 1 k㎡ of inhabitable area" is 1048.4. In 2015, those values are 340.8 and 1036.4. This shows that the population is declining but still the inhabitable areas are very dense. The map below shows the distribution of population per 1km^2 of inhabitable area across prefectures.

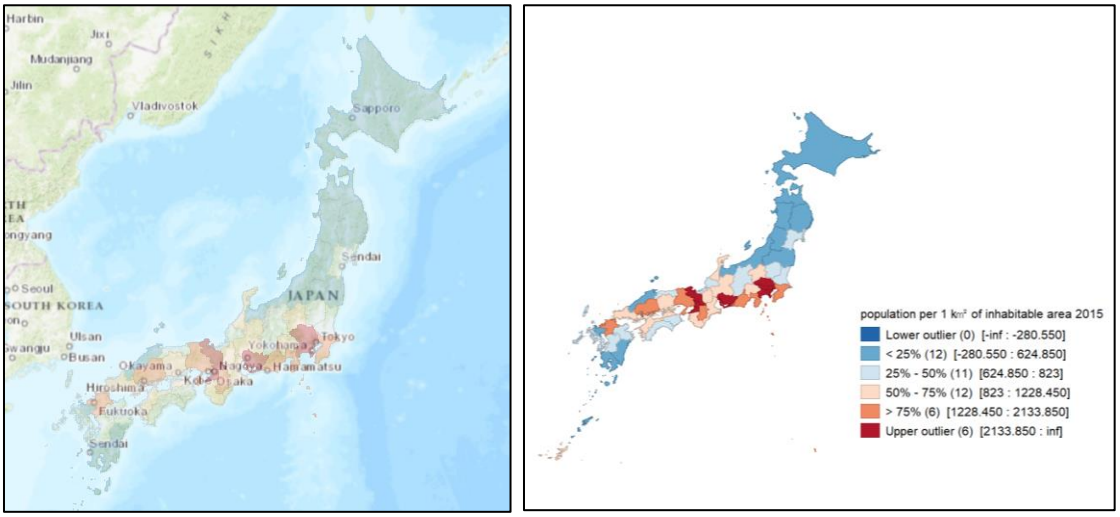

Figure 1 Population Concentration across Inhabitable Lands

From this map, it is evident that prefectures with major cities like Tokyo, Nagoya, and Osaka are the upper outliers in population concentration while the further out northern and southern regions are less dense. The regions with large concentration of population have high economic activities, prosperity and innovation. However, the dense cities could lead to pressures on the environment in the area, high cost of living and depopulation of rural areas. Japanese government's commitment to infrastructure and service provision has ensured that "despite

increasing concentration of activity and population, Japan in 2010 recorded the second lowest inter-regional Gini co-efficient for GDP per capita in the OECD and the lowest disparities in the OECD between predominantly urban and rural regions" (OECD, 2016, 11). Yet, it becomes an issue to address while face of changing demographics.

Just like there is uneven distribution of population, there is variation in the distribution of aging population. However, the pattern is different. In the map below, unlike population concentration, the high outliers of aging index in 2015 are in the rural and mountainous regions of country.

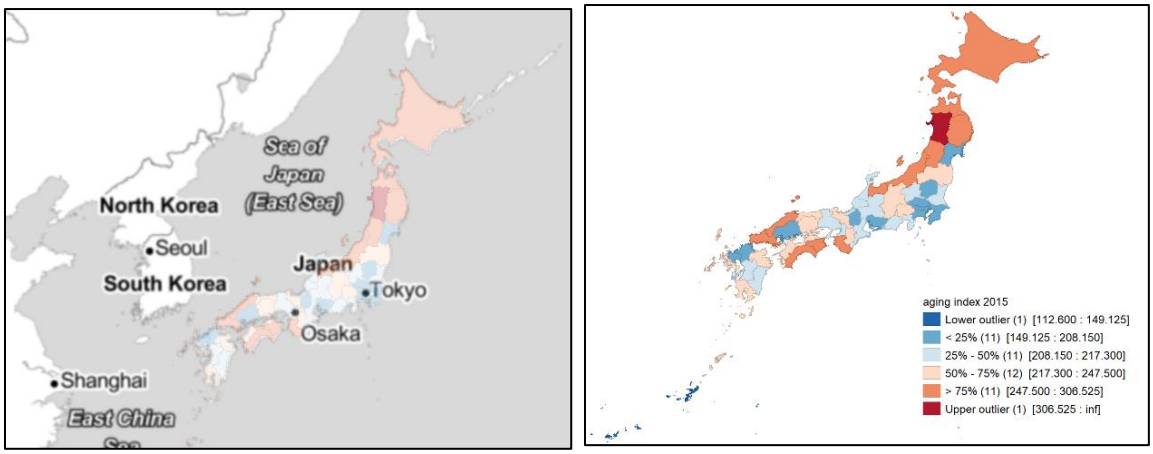

Figure 2 Distribution of Aging Index in 2015

Given that regions would have access to different resources and different needs, a spatial analysis of factors in the concentration of aging population would help guide effective policies to address them regionally. The Japanese government is already considering spatial policy as an important aspect for national economic well-being. "The new National Spatial Strategy (NSS) aims to sustain a settlement pattern that facilitates the realization of agglomeration economies while avoiding the abandonment of large parts of the national territory" and encourages regional focus on unique assets to attract and retain population (OECD, 2016, 12). The government is collecting and publishing spatial and regional data to continue building the understanding of spatial differences.

Question

In this paper, a spatial analysis will be conducted using Japanese government data on prefectures to address two main questions:

- Which prefectures in Japan have high concentration of aging population? How has that changed between 2010 and 2015?
- What factors explain the patterns in concentration of aging population?

Data

The primary source of data is government published statistics for 47 prefectures (first level of jurisdiction and administrative division) in Japan, available on e-stat (Statistics of Japan). The data spans 12 different topics with several variables available in each of the topic. The chart below summarizes the distribution of available variables across topics.

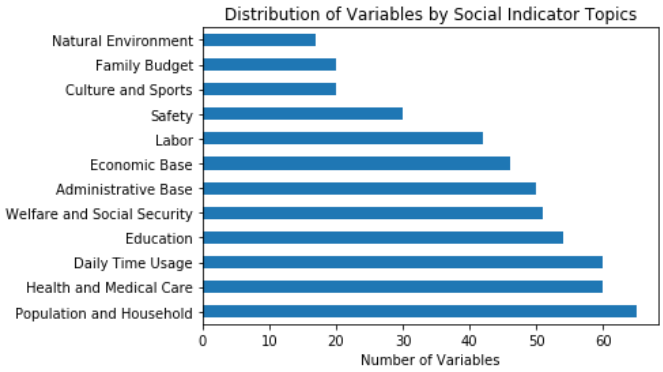

Figure 3 Chart of Topics and Variables Available

From the data published, the most complete data is available for year 2010 and 2015 – hence, those are the main years in consideration for analyzing any temporal variation. A subset data frame for each year with only variables that are available for both 2010 and 2015 is created for analysis. This is a list of 453 variables in total that characterizes various features of the 47 prefectures.

For spatial analysis, since the data is available for prefecture level, a geopackage files, with layers for national, prefecture boundary and municipalities, is downloaded from GADM maps and data. Additionally, shape files for each individual prefecture with town lines is also available for granular analysis, if needed.

The data files are available here

Methodological Approach

The analysis methodology is separated into three steps: feature selection, exploratory analysis, and iterations of spatial regression model.

Feature selection

Of the 453 variables, it is important to select impactful variables in the spatial regression model that are not multicollinear. I will use principle component analysis to select the most relevant variables.

Exploratory Data Analysis (EDA) and Exploratory Spatial Data Analysis (ESDA)

Having an initial understanding of the data and hypothesis, I will focus on the characteristics of the explanatory variables through EDA. In addition, given the spatial nature of analysis, I will establish the spatial relevance of the selected attributes through exploration of spatial clusters and outliers

Spatial Regression with Tentative Model Specification

I will use open source software, Geoda to conduct spatial regression analysis.

The outcome variable will be concentration of aging population. Of the available choices, ratio of aged population, aging index and ratio of population [65 years old and over], the last one will be used. A choropleth map of this variable in 2015 is shown below.

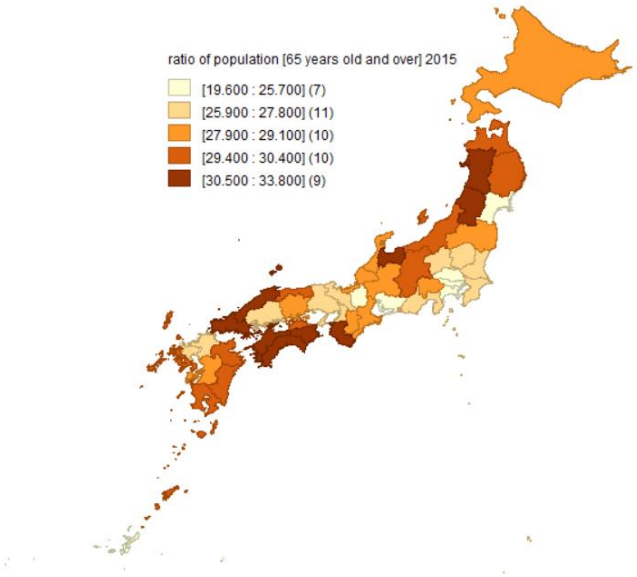

Figure 4 Distribution of Population over 65

The explanatory variables will be selected based on exploratory analysis, feature selection, and theoretical understanding. I would hypothesize that variables that might explain aging concentration would include outward migration, low economic activity, low fertility rate in the region, etc.

References

Contributor, Japan. *Japan Brand Voice: Why Japan's Aging Population Is An Investment Opportunity*. 19 Mar. 2019, www.forbes.com/sites/japan/2018/11/12/why-japans-aging-population-is-an-investment-opportunity/.

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