An Empirical Analysis of the Effect of Fertility Measurement Choice on Subnational Population Projections: A Case Study of 47 Prefectures in Japan

Masakazu YAMAUCHI

The cohort component method is the most widely used method for making subnational population projections. Under this approach, three components of population change are included: births, deaths, and migration. Of these three components of subnational population projection, many researchers have been concerned with migration projections and their impacts on outcomes, but few studies have considered the fertility and mortality components. The significance of the fertility component regarding subnational population change has increased recently in Japan, because the population in most regions is declining, mainly due to a decrease in birth rates.

Some fertility measurements can be taken when projecting cohort component projection models. In this study, we consider four kinds of fertility measurements—age specific birth rate (ASBR), child woman ratio (CWR), general fertility rate (GFR), and standardized birth rate (SBR)—and investigate how the choice of fertility measurement affects the outcomes of subnational population projections.

We develop four different models of cohort component projections. These models are identical except for the fertility measurement. Actual survival and net-migration rates are used to provide projections of the population aged five years and older. The population below five years is projected by using actual survival and net-migration rates and assumed fertility measurement values. For each fertility measurement, we assume that regional variations from the respective national figure in the base period are stable over the projection period. Using data from the periods 1980–85, 1985–90, and 1990–95, we used these models to produce 15-year population projections in five-year age groups for 2000, 2005, and 2010 for each of 47 prefectures in Japan.

The 0–14 age group population from these projections is compared with the census counts for 2000, 2005, and 2010. The smallest difference emerged from the model using the standardized birth rate and census count. Among the other three models, the identified differences were similar to each other. The standardized birth rate model performed strongly because the regional variation in fertility measured by the standardized birth rate was the most stable from the base period to the projection period. On theoretical grounds, we cannot specify which measurement provides the most stable trends for future regional variation in fertility. Accordingly, if regional fertility patterns and trends were considerably different to those of the population that we used in this study, the performance of the model using the standardized birth rate could have been worse than it would have been had we used another fertility measurement. Instead, this study shows that the choice of fertility measurement did not directly affect the outcome of subnational population projections.