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SIMULATING SUDDEN REFUGEE INFLUX AND ITS IMPACT ON DEMOGRAPHIC STRUCTURE: THE KOREAN CASE

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ABSTRACT

The problem of low fertility rate in a country gives rise to numerous other social and economic problems. Many solutions have been proposed for overcoming this issue, and immigration is one of the proposed solutions which may also entail opening up country for refuge, due to some unfortunate incidents in other countries. Working on these lines, we simulate the impact of rapid immigration influx on fertility rates in Korea, using real data and agent based modeling.

1 INTRODUCTION

Many developed countries of the world such as Japan, Korea, Singapore, Germany etc., are facing the issue of decreasing birth rates and increasing aged populations. Better healthcare services result in increased life expectancies, and change in preferences of younger generation lead to delayed marriages and childbirths. This problem could lead to building up of tremendous pressure on ever decreasing work force to support the ever increasing aged population. One of the potential solutions for this problem is liberal immigration and refugee laws. Korea has stringent immigration laws and most of the immigration into the country is temporary in nature. However, in the recent years, there has been noteworthy increase in international immigration into Korea and there has been an increasing demand to relax the immigration laws. Due to wars and political circumstances in the middle-east, we have witnessed exodus from these countries to many European countries. Such a phenomenon could have lasting impacts on the host country. Following this cue, we simulated the rapid influx of people seeking refuge in Korea. In this particular simulation test case, we observed the change in demographic distribution of Korea.

2 MODEL

We built a general purpose agent based model for Korean demography, using AnyLogic v. 7.1.2. This simulation test case is one of the modules of the bigger model. We made use of real census data from Korean Statistical Information Service (KOSIS, http://kosis.kr/) and Statistics Korea (KOSTAT, http://kostat.go.kr/). Using this model, we simulated a steady influx of a total of one million immigrants into Korea over a course of two years. All the agents in the simulation have characteristics like education, age, gender, marital status, desired and current number of children, income, etc. For the immigrant agents, the data for these agent characteristics was taken, for the year 2017, from AIDA (http://www.asylumineurope.org/) and UNHCR (http://www.unhcr.org/). It must be noted that the proposed model is fully dynamic in nature with all the agent characteristics evolving with every simulation tick. A simulation tick corresponds to one year and simulation is run for 70 years (from 2005). Fertility and immigration events add agents, whereas agents are removed by mortality event. All the demographic activities are governed by real data and are not as-

sumed randomly. The agents in the simulation also interact with each other and influence behavior (particularly desired education, desired children). These interactions thus also influence immigrants' behavior and that of the native population too. This whole functioning of model delivers us interesting insights and results.

3 RESULTS

The results presented here are average of ten simulation runs. We first present the validation graphs for our model. We compared the original calibrated simulation run against the actual data for the population numbers, independently for young, working and aged population. The real data for validation is obtained from KOSIS and KOSTAT. Government provides lower, middle and upper limits of this data. It is evident from Figure 1 that our simulation results lie within the government provided data range.

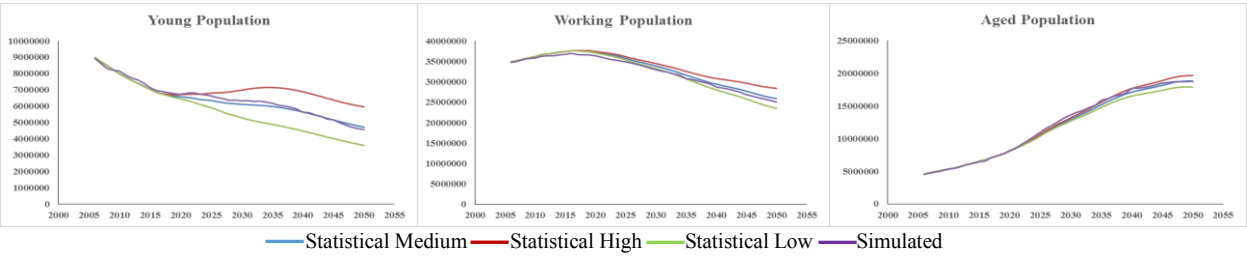

Figure 1. Model Validation. Young, Working and Aged Population (from L to R). *x*-axis represents simulation years and *y*-axis represents population numbers.

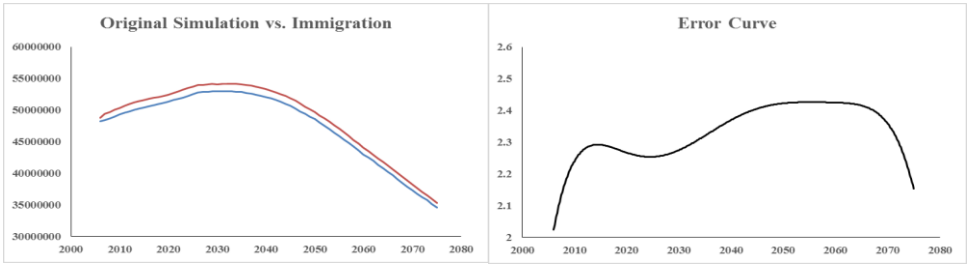

Figure 2. a) Total population, original simulated (blue line) vs. immigration case (red line). b) approximated error curve (original simulated and test case population)(*x*-axis represents years, *y*-axis represents % error).

We can see from the simulation results that there is an obvious initial increase in the population numbers. But as time goes by, the effect of immigration starts decreasing, which is evident from the error curve plotted in Figure 2b. This implies that only a sustainable immigration over many years would lead to a lasting positive effect in the demographic change, and the effect of sudden influx of migrants would eventually diminish. Studies and observations like these can be used for designing and contemplating immigrations polices for the future. This test case excludes other social and economic effects of immigration. We exhibited one of the potential uses of our proposed model. Our model could be put into use for evaluating other similar policies (such as change in education policy, salaries, social interactions, etc.) concerning demographics. We are working towards generalizing our model using machine learning tools.

ACKNOWLEDGMENTS

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