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Author(s): David Newton

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Three MSc Student Projects for Population Matters

DAVID NEWTON

Dr Newton is Visiting Senior Fellow at the department of Management, London School of Economics

Introduction

This article is about a number of studies conducted by students for Population Matters in 2015. The MSc in Management Science offered by LSE is a one-year programme which covers various analytic, statistical and problem structuring techniques. By its nature it is an applied science, and the climax of the programme is a summer project, in which students tackle real-world problems for a variety of sponsor organisations.

For the students, this is an opportunity to take the skills and techniques they have learnt and act as a genuine consultant, working with and within organisations to provide valuable insight and influence key decisions. For the organisations, they get access to bright minds backed up by the LSE's world-class academic staff. Sponsor organisations come from many sectors including health, finance, logistics, housing, education, tourism, publishing, media research, and the third sector.

LSE Management Science students have conducted projects for Population Matters for several years, analysing the impact of population growth on matters as diverse as health, housing, energy, jobs, education, and biodiversity. Initially these projects focused mainly on the UK but in recent years they have taken a more global perspective. This article summarises three reports from projects in 2015. The full reports will be made available on the Population Matters website.

Project 1: Mothers' Index by Guangjie Shi

Save the Children, a major international charity, devised the Mothers' Index (MI) as a way to compare the quality of life for women in countries around the world, based on certain core criteria. While the MI does not include any specific reference to population, there is good reason to expect that population growth may influence many factors which are included. The aim of this project is to assess whether demographic indicators, particularly population growth rate and total fertility rate (TFR, the average number of children a woman has in her lifetime), correlate with ranking on MI.

Over the period from 2000–2014, MI has been constructed in 3 different ways. For the first two of these, the index was applied to all countries while for the third, countries were divided into 3 tiers – developed, developing and least developed. This study correlates population factors with both MI as a whole, and key individual components of the index, over the spectrum of countries for which full information is available. Some global data analysis was presented, but much of the analysis focused on small groups of countries, closely related to each other geographically.

There was a broad general correlation in which countries with a high population growth rate were associated with a poor – and deteriorating – MI. However, it was clear that in developed, industrialised countries, the correlation between population growth and MI ranking was relatively weak, whereas for developing and least developed countries, population growth was a much clearer indicator of the likely MI. To take two extreme examples, the MI of South Korea rose to the top of its tier as its population stabilised (due to firm government policies), whereas the MI for Niger (with the highest TFR in the world) remained at the bottom.

In some parts of the world, such as the Arab oil producing countries, rapid population growth was not associated with a falling of MI ranking, probably due to the affluence of these countries and perhaps because much of the population increase is due to immigration. Population growth is fastest in sub-Saharan Africa and this is strongly reflected in the poor Mothers' index for many countries in this region. The sparkling exceptions are Rwanda and Ethiopia, where governments have focused more on family planning and have made considerable progress

in stabilising their populations. Rwanda has also made giant leaps forward in education since the genocide in 1994. This suggests governments should focus on both education and reproductive health to promote development.

The study proposes that while Mothers' Index stresses education, it would be of more value if it included an explicit consideration of population growth in each country. Another important aspect that is not explicitly addressed by the Mothers' Index is income inequality. This is of note in Central American countries where the Gini index (a measure of inequality) is highest. Amongst large countries, inequality is most evident in India where the elite have high quality health and other services, but the poor majority have much less.

In summary, it is concluded that there is an overall correlation between population growth and Mothers' index, particularly in developing and least developed countries. The Mothers' Index would be improved if it included explicit factors related to population growth and income inequality.

Project 2: Correlating population growth with real GDP growth by Ciyang Chen

National GDP growth statistics are prominently reported and avidly followed, because it is usually assumed that real national GDP growth corresponds to a rise in income per person, and ultimately higher living standards. However, it can be argued that it is real GDP *per capita* that is more likely to reflect the outcome experienced at an individual level, which means that population growth needs to be taken into account. An earlier student project had investigated the UK economy, and found that despite forecast GDP growth, GDP per capita would be static until 2030 after taking into account population growth in this period.

In 2015, the methodology used in the UK analysis was extended and applied to other EU member countries, taking population, GDP and inflation data from 1992 to 2014. The countries selected were UK, France, Germany and Italy, the four largest countries, plus Cyprus and Latvia, which had the highest and lowest population growth rates respectively.

The analysis found different correlations between population growth and GDP Growth. In the UK, GDP growth was positively correlated with population growth. This could be because as population grew, more investments were being

made in infrastructure. In Greece, France and Italy, however, population growth was negatively correlated with GDP growth. These countries had a shrinking ageing population. Consequently fewer working-aged people were creating GDP, shared among a higher percentage of aged people. This might explain the negative correlation.

In Cyprus and Latvia, GDP growth was primarily (and negatively) correlated with inflation. Both countries experienced high levels of inflation during the period under analysis.

Overall, the results suggested that it was not just population growth that had a bearing on real GDP per capita, but the change in demographic structure, which could be the explored further in future projects

Project 3: Comparative study of the impact of population momentum across four countries by Yushu Zou

An important factor in projecting future population growth is the phenomenon known as 'population momentum'. This is the name given to the factor that, for countries which have a fertility rate above the replacement rate, even if this were to fall to the replacement rate immediately, the population would continue to increase for a considerable time.

The main objective of the study was to explore the effects of several demographic indicators, namely the total fertility rate, mean age of childbearing (MAC) and life expectancy on population growth. The project also studied the momentum effect and its associated population ageing during the demographic transition process towards a stationary population.

Four countries were studied in this project, including China, India, Nigeria and Germany. A cohort model was built to forecast future population, assuming different demographic indicators. Second, following Preston (1997), the momentum factor was calculated, which is an indicator that measures the extent of momentum effect, for each country. Third, applying the method in Andreev et al (2013), the contribution of each demographic indicator to population growth was calculated.

The study found that TFR is positively correlated with population growth, most notably in Germany, where if TFR increased by one child, the population in 2050 would increase by 77% compared to its population size in 2010. Surprisingly, MAC is positively correlated with population growth for China and Germany, but negatively for India and Nigeria. This is because delaying childbearing would raise fertility among the more populous cohort of older women in China and Germany, thereby increasing the population.

Comparing the momentum factor across the four countries, Nigeria has a highest at 1.45, implying that its population would increase by 45 per cent even if the fertility rate in Nigeria were suddenly to drop to the replacement level today. The momentum factors for China, India and Germany are 1.07, 1.42 and 0.71 respectively. The negative momentum effect in Germany implies that population in Germany will continue to decline even if the TFR were raised to the replacement level.

Turning to the contribution of demographic factors to population growth, in Nigeria the biggest single contributory factor is fertility, while in India it is the increase in life expectancy, plus the momentum effect, which contribute most to population growth.

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