

# NIDI scenario

## Strong population decline in China

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**United Nations projections assume that by the end of this century one third of the world population will live in India, China or Nigeria. While population growth in India will slow down and the population size of China will decline, population growth in Nigeria will accelerate. A new NIDI scenario projects less population growth in Nigeria and sharp population decline in China.**

Today China is the most populated country in the world with 1.4 billion people. India ranks second with almost 1.3 billion people. Since the population of India grows faster than that of China, the United Nations (UN) medium-variant population projections expect that within ten years, India will have the largest population in the world. By the end of the century the population size of India would be 1.7 billion people compared to 1.0 billion people for China (Figure 1). Today Nigeria ranks 7<sup>th</sup> in population size with 182 million people, but in 2100 it will be in 3<sup>rd</sup> place with 752 million inhabitants.

### UN: population decline in China and population growth in Nigeria

The UN projections depend heavily on the assumptions about the future development of fertility. In the 1960s the total fertility rate (TFR) in China and India was about 6 children per woman. In both countries fertility has declined strongly since then, but more strongly in China than in India (see Figure 2). The role of the one-child policy in the decline of Chinese fertility is unclear and being debated. As the Chinese fertility decline started well before the introduction of the one-child policy, factors such as economic and cultural change may have had a great impact as well. Though fertility did not decline to one child per woman due to many exceptions to the rule that were granted to families, the policy may have contributed to the sharp decline in the total fertility rate from 3 children per woman around 1975 to 1.5 children around 2000. As for the future, the UN projection assumes that the end of the one-child policy in China will lead to an increase of the total fertility rate.

In India the total fertility rate has declined as well, but at a slower pace than in China: from 5 children per woman in the 1970s to 2.5 children today. The UN projection expects that the decline will continue to 1.8 children around the middle of the century. In contrast with the decline of fertility in China and India, in Nigeria the fertility level is still very high: almost 6 children per woman. The UN projects a decline, but at a slow pace. Not before 2060 will fertility have declined to 3 children per woman, and by the end of the century fertility will still be higher than 2.

The UN projection is based on the assumption that in the long run the total fertility rate in all countries will move to around two children per woman. Other experts are convinced that a lower fertility rate is plausible, mainly due to an increase in the level of education of women. The



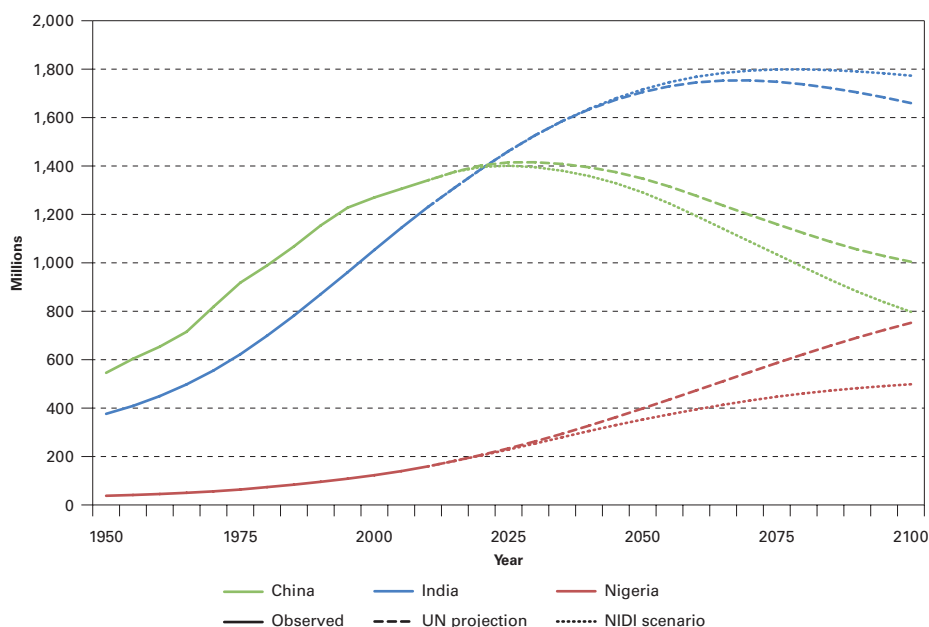
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Wittgenstein Centre in Vienna expects that family size in China will remain at the current level of 1.5 children per woman, while in India it will decline from the current 2.5 to 1.6 in the long run, and in Nigeria from 6 to 1.9. These expectations are based on expert judgment (Lutz et al., 2014).

### NIDI scenario: more decline in China and less growth in Nigeria

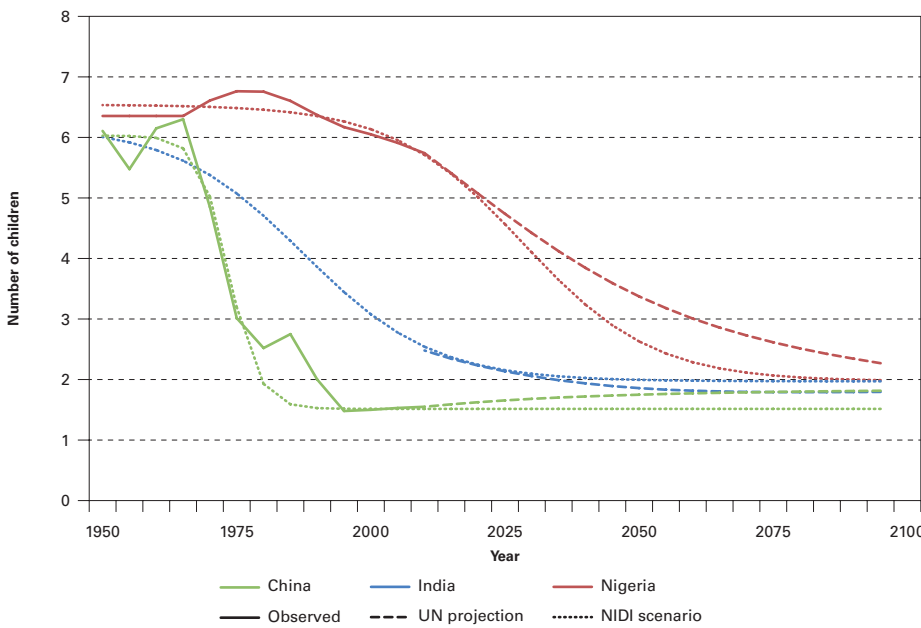
Instead of assuming that fertility will move to

**Figure 1.** Population size in China, India and Nigeria, 1950-2100, UN medium-variant projection and NIDI scenario



Source: UN (2015) and author's calculations.

**Figure 2.** Total fertility rate in China, India and Nigeria, 1950-2100, UN medium-variant projection and NIDI scenario



Source: UN (2015) and author's calculations.

two children per woman (the UN approach) and instead of asking experts which level of fertility they regard as plausible (the Vienna approach), NIDI proposes an alternative approach. The NIDI scenario is based on the assumption that the development of fertility shows a similar pattern of decline in all countries as their economies develop and the educational level of young generations improves. This development can be described by a logistic curve. Starting at a high level, fertility first declines slowly, then declines at a fast rate and finally the rate of decline slows down until a stable low level

is reached. The logistic model includes four parameters representing (1) the starting level, (2) the rate of decline, (3) the period during which the decline occurs and (4) the low level at the end of this trajectory. By estimating these four parameters for each country in such a way that the model describes the observed development as closely as possible, the model can be used to project the future development (Figure 2).

The logistic model projects that the total fertility rate of China will be 1.5 children per woman in 2100 while the UN assumes that the fertility level will increase to 1.8. Figure 1 shows that the NIDI scenario, which is based on the logistic model, will result in a sharper decline of population size in China than according to the UN prospects (200 million people less in 2100). For India the UN assumes that fertility will continue to decline to 1.8. Since the rate of decrease has slowed down in recent years, the logistic model projects a smaller decrease of the total fertility rate in India than the UN: to 2 children in the long run (see Figure 2). As a result, the NIDI scenario projects that the Indian population size will be stable in the long run, whereas the UN projects, a slight decline.

Since in Nigeria fertility has only started to decline in recent years, the logistic model cannot be used to project the eventual low level of fertility unless additional assumptions are made. If we assume that in Nigeria fertility will show a similar development as in India (i.e. the same pace of decline and the same ultimate level), we can estimate by how many years the transition from high to low fertility in Nigeria lags behind that in India. This turns out to be 40 years. Figure 2 shows that this projection implies that in the short run, fertility will decline at the same pace as the UN projection, but in the long run, fertility will decline faster. By the end of the century the level of fertility will not differ much between both projections, but the trajectories do differ and this has a strong impact on population growth, as Figure 1 shows.

### Summing up

The UN projections assume that the population size of China will decline by one quarter by the end of the century. This projection is based on the assumption that the end of the one-child policy in China will lead to an increase in fertility. The NIDI scenario assumes no increase in fertility and this results in an even stronger decline of population size by 40 percent. For Nigeria, the UN projects that population will grow by almost 600 million people due to a very slow decrease in fertility. NIDI assumes that fertility will decline at a faster pace and this will result in a population growth of 'only' 300 million people.

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### REFERENCES:


- Lutz, W, W.P. Butz & S. KC, eds. (2014), *World Population and Human Capital in the Twenty-First Century*, Oxford University Press.
- United Nations (2015), *World Population Prospects: The 2015 Revision. Key Findings and Advance Tables*.

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## DEMOGRAPHIC FEARS

Why are demographic developments often surrounded by anxiety? In the sixties the end of the world seemed to be near as a result of the "population bomb". That fear has not faded, especially when looking at the developments in Africa. Today many western societies fear the consequences of aging for pensions, health care and the economy in general. Many people are also fearful of migration, not to mention the perceived devastating effects of persistent low fertility levels on the vitality of our societies. Related to this is the fear for population decline, which brings us full circle: from fear of explosion to fear of implosion. This anxiety takes on many forms, from well-written reports, articles and essays of scientists and policy analysts in journals and newspapers to massive support for anti-immigration movements and populist parties.

Why is this the case? We love the past and fear the future. Demographic forecasts depict a future



society different from today, but we do not like change. We like the world to be in equilibrium and to be stable, and we associate that with the past, whereas we think of the future as chaotic and unstable, and a threat to our wealth and comfort. Of course the world has never been in equilibrium, or stable – we just think it should be. Blame the economists with their equilibrium models, or blame the demographers with their stable population theories, or blame the inert and conservative human nature in general.

Maybe we demographers should rethink the way we present our predictions of the future. The future is an extrapolation of the past, and after all, we survived the past and have come out wealthy and happy so far, haven't we? So maybe in our future work we should mix some optimism into the presentation of our projections. Aging is not the end of the world, nor immigration, nor population growth nor low fertility, nor population decline.

Or is that too scary a thought?

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