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Population decline will likely become a global trend and benefit long-term human wellbeing

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Abstract

Summarising earlier publications, I draw a rather optimistic picture of the human future on this planet, if priority is given to universal education, and, in particular, to female education. The benefits of a greater focus on education range from a lower desired family size and empowerment to reach this goal, to better family health, to poverty reduction, to greater resilience, to expanded capacities to mitigate and adapt to climate change, and, ultimately, to the emergence of better institutions and social values that are less obsessed with material consumption and violent nationalism and more concerned with cooperation, care and wellbeing. I also show that extended periods of below replacement level fertility are beneficial for long-term human wellbeing, and that the human population is on the path to peaking during the second half of this century and then declining to 2–4 billion people by 2200. As this smaller population will be well-educated, they should be healthy and wealthy enough to be able to cope fairly successfully with the already unavoidable (moderate) effects of climate change.

Keywords: population; climate change; long-term; human capital; female education

1 Introduction

"Towards a world of 2–6 billion well-educated and therefore healthy and wealthy people" was the title of an editorial I published in 2009 in the Journal of the Royal Statistical Society (Lutz, 2009), and I further expanded this title in 2017 by adding the words "... that would be able to cope well with the consequences of already unavoidable climate change" (Lutz, 2017). In both papers, I am speaking about the longer-term future of the 22nd century and beyond. The challenge at

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hand, however, is how to manage the necessary transitions over the coming decades, including the transformation of our energy system, the relocation of people, and the possible conflicts arising from nationalism, vested interests of certain groups, and, at a deeper level, backward-oriented patriarchal attitudes resisting the enlightenment and empowerment of women.

In the opening plenary speech of the Pontifical Academy of Sciences meeting in the Vatican in 2017, I introduced the notion of "the rise of *homo sapiens literata*" (intentionally using the female adjective with the generic male noun *homo*) to highlight the key role of female education in accelerating not only the demographic transition, but also the urgently needed transformation of countries into societies that are less obsessed with conventional economic growth, material consumption and violent expansive nationalism, and are more concerned with cooperation, care and quality of life.

In this short commentary, I will try to argue that this focus on more education, and, in particular, female empowerment through education, can help to resolve the current apparent controversies around the issue of population. While there is a very rich body of literature showing that education has positive effects on health, poverty reduction and economic growth, and that it lowers the desired family size and enhances access to contraception (Galor, 2010; Lutz, 2014; Prettner and Strulik, 2017), strangely, these insights have not yet entered the so-called population debate. In this commentary, I will explicitly refer to the Debate contribution by Rees (2022, this volume) as well as to a recent set of comments in the "Population Debate Revisited" of the "Great Transition Initiative", and, in particular, its opening essay by Lowe (2022). Both of these contributions focus on the role of population trends in global environmental change, and state that despite its overriding importance, population is hardly discussed in the climate change literature because it is considered a taboo topic. They also call it the elephant in the room.

Here I argue that the role of demographic trends and longer-term population forecasts that draw on different possible scenarios must indeed be a prominent and explicit topic in our discussions of the future of humanity. But this discussion should also be based on the most recent state of the art in demography, particularly on the multi-dimensional approach to modelling changing population size and structures–which is the very definition of demography. I should clarify at this point that I also consider changes in the educational structure of populations by age and sex as demographic changes under a multi-dimensional definition of demography (Lutz, 2021). Strangely, of the over 25 commentators in the abovementioned "Population Debate Revisited", I could recognise not a single one as being a demographer. In the following, I would like to show how this debate can become more enlightened and less controversial once it is based on the proper state-of-the-art demography, rather than on often poorly informed and ideologically predefined views. The same applies to statements by people panicking about depopulation for mostly nationalistic reasons.

2 The role of demographic change in our "dangerous ecological overshoot"

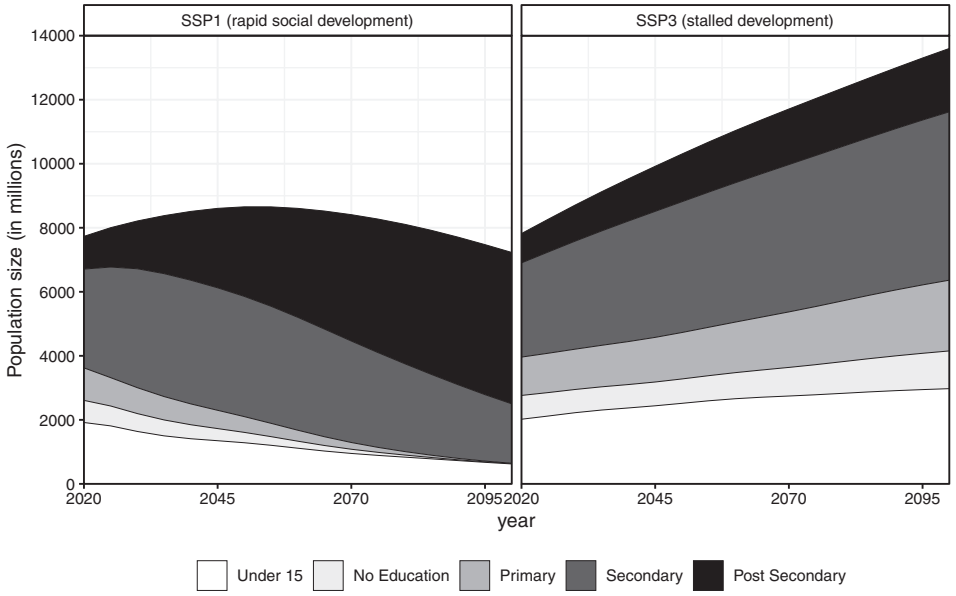
In his Debate article in this issue of the Vienna Yearbook of Population Research, William E. Rees, the father of the highly influential concept of the ecological footprint, makes a convincing case that our modern techno-industrial society is in a state of dangerous ecological overshoot. In a nutshell, his point is that too many people consume and pollute too much on a finite planet. While acknowledging the important role of prevalent material production systems and consumer lifestyles in causing this overshoot, he also stresses that continued population growth is the major contributor to this dangerous degradation of the ecosphere, and argues that resistance to family and national population planning is one of the "largest potholes on the road to sustainability" (Rees, 2022, p. 2).

In a similar vein, Lowe (2022), in his opening essay to the abovementioned "Population Debate Revisited", highlights the important role population growth plays in current and future climate change trends. He also claims–unfortunately without providing the numerical information on which this claim is based–that the synthesis of results from several climate models shows that if world population follows the UN medium population forecast, it is not feasible to limit global warming to below 2 degrees Celsius above pre-industrial levels, which the Paris Agreement has set as an overriding goal. I will call this claim into question later in this commentary. At this stage, I would simply like to point out that his entire argument focuses only on the so-called mitigation side (how factors contribute to greenhouse gas emissions), and disregards the potentially even more relevant effects of demography on the adaptation side. In particular, he fails to recognise how future demographic trends might affect the adaptive capacity of societies to cope with the level of climate change that is already unavoidable, even if the Paris goal should be reached. While it is clearly important to secure the functioning of life support systems–including climate-related factors–to protect human existence and well-being on this planet, a focus on adaptation to the ongoing and unavoidable consequences of climate change is equally essential.

The Shared Socioeconomic Pathways (SSPs, Riahi et al., 2017), which are now widely used in the climate change modelling community and are extensively cited in the recent Report of the Intergovernmental Panel on Climate Change (IPCC, 2022), are based on a multi-dimensional population model by age, sex and six levels of educational attainment, and are explicitly designed to cover both the mitigation and the adaptation effects of alternative future demographic trends. In this context, it has also been shown that education, in particular the universal education of women, is not only the most powerful driver of fertility decline, but is also a key contributor to the empowerment, abstract thinking, forward-looking planning and access to information that societies will need to enhance their adaptative capacity and reduce future climate change-related fatalities (Lutz and Muttarak, 2017; Lutz et al., 2014).

A look at the SSP scenarios also makes clear that alternative future demographic trends matter more for climate change adaptation than for mitigation, mostly because

Figure 1:
World population by level of educational attainment 2020–2100, SSP1 (rapid social development scenario) and SSP3 (stalled development scenario)



Source: Wittgenstein Centre Human Capital Data Explorer http://dataexplorer.wittgensteincentre.org/wcde-v2/.

of the timing involved. The left side of Figure 1 shows the SSP1 scenario, which is the most optimistic in terms of rapid social development and the associated expansion of mitigative and adaptive capacities. Under this low population growth scenario, the world population increases from 8.0 billion people currently to a peak of 8.7 billion in 2050, after which it starts a slow decline, reaching 7.2 billion by the end of the century. This compares to projections that the world population will increase to 9.4 billion in 2050 under the middle-of-the-road (most likely) SSP2 scenario and to 10.3 billion under the worst-case SSP3 scenario, which assumes stalled development associated with high fertility. This implies that the difference between mid-century world population projections of the SSP2 and of the almost unrealistically optimistic SSP1 is only around 0.7 billion people. Moreover, virtually all of this difference comes from the populations of Africa (0.43 billion) and Asia (0.21 billion). For the industrialised countries that have by far the highest GHG emissions, the gap between these two scenarios by 2050 is negligible (0.017 billion for Europe and 0.023 billion for North America).

This time horizon of 2050 is decisive for mitigation, because the most recent IPCC report shows that to limit global warming to 1.5 degrees, CO2 emissions must fall to zero by 2050; and that to reach the less ambitious target of limiting

global warming to 2.0 degrees, emissions must fall to net zero by 2080 (IPCC, 2022, WGIII). Reaching these goals will require a massive change in our energy systems, particularly in the rich countries where population growth is projected to be minimal over the coming three decades. Meanwhile, in Africa, where alternative population trajectories do make some difference over this time horizon, per capita emissions are so low that they contribute very little to the global totals. In other words, to reach the Paris climate targets, massive changes in energy and production systems and our consumption patterns are necessary, but demographic trends over the coming decades will matter very little. If, however, the global community fails to reach these targets and the transition to green technologies is stalled, even as today's poor countries become richer over time and join the club of great polluters, continued population growth in those countries would make an already very bad situation even worse. In this case, lower near-term population growth followed by a shrinking of the world population with increasing levels of education (as assumed under SSP1) would clearly be the preferred scenario.

When the focus is on the adaptation that will be necessary to cope with the already unavoidable consequences of climate change, the vulnerability of different demographic groups starts to matter in the immediate future. The current series of droughts, floods, heat waves and other extreme weather events show that we are already having to cope with serious effects of climate change at levels of warming that are still well below the Paris climate goals. And even if global warming can be limited to 1.5 or 2.0 degrees, the likely impacts over the coming decades and far into the 22nd century will be much more serious than those we are experiencing today. In this context, demographic trends do indeed play a major role in the future vulnerability and adaptive capacity of different parts of the world. What matters is both the size of the population exposed to those risks as well as its composition by age, sex and, in particular, level of education. The empowering effect of education in reducing disaster vulnerability at both the individual and the societal level has been well established in a large number of studies, including in a special issue on the "Ecology and Society" (Muttarak and Lutz, 2014), as well as in summary articles in "Science" (Lutz et al., 2014) and "Nature Climate Change" (Lutz and Muttarak, 2017). A specific quantification with respect to the SSPs shows that the estimated death toll due to climate change varies by a factor of more than five when comparing an SSP1 (rapid development) to an SSP3 (stalled development) scenario under otherwise identical patterns of future climate change and the associated increasing disaster risks (Lutz et al., 2014). This much higher number of climate change-related deaths under SSP3 results from both a larger number of people being exposed to the risks and their greater vulnerability due to their lower education (see the SSP3 scenario on the right-hand side of Figure 1).

A final note on the population component of the SSPs is in order to correct a misunderstanding. Lowe et al. (2022) criticised the SSPs for neglecting possible initiatives directed at reducing fertility, and depending "solely on improvements in education and poverty reduction to drive fertility decline" (p. 27). While it is true that improving female education is considered in the SSPs as a powerful force for reducing

high fertility in countries over the course of the demographic transition because it is linked to both lower desired family size and better access to contraceptive methods (poverty is actually not linked to fertility in the SSPs), there are still differences between the education-specific fertility rates assumed under different SSPs resulting from factors other than education. Hence, the lower fertility assumed under SSP1 also reflects other cultural, economic or policy factors that operate independently of education. Some of these other factors influencing demographic trends are discussed in more detail in a related effort to quantify the potential effects of meeting the Sustainable Development Goals (SDGs) on future world population trends (Abel et al., 2016). Several of the specific targets established under the SDGs directly affect demographic trends, including the targets not only for child and maternal mortality, but also for reproductive health and eliminating the unmet need for contraception, as well as different goals for female education. Unpacking the different effects that different demographically relevant policies may have seems to be more productive than the reference of Lowe et al. (2022) to the rather unspecific notion of "family planning", which they claim would be the only solution to the population problem. The observation that this rather unspecific notion comes with historical baggage and seems to elicit strong emotions in different directions could help to explain the perceived avoidance of open and direct discussions about the undeniable impacts of demographic trends on future human wellbeing.

3 Is population really a "taboo topic"?

Both Rees and Lowe as well as many of the other commentators in the population debate seem to agree that in discussions of global environmental change, the population topic does not get the attention it deserves. Indeed, population is often called a "taboo topic". Lowe (2022) identifies three reasons for this reluctance to directly address population growth and family planning: (1) the first has to do with past apocalyptic projections of the presumed consequences of a population explosion that have not come to pass; (2) the second is related to the "dark legacy of population control policies in the last century", which in some cases violated human rights; and (3) the third is that proponents of pro-poor development believe that a focus on population growth shifts the blame from the rich to the poor. While I agree that this a fair characterisation of the discussion around population, I do not share the view that this has made population a taboo topic or an elephant in the room. The SDGs that now dominate the international development agenda explicitly address all the key determinants of population trends under SDG 4 (such as universal high-quality primary and secondary female education) and SDG 3 (reproductive and maternal health). As was mentioned above, it has been shown that implementing these goals would lead to significantly lower world population growth (Abel et al., 2016).

In the more specific context of climate change, a widely cited Policy Forum paper in *Science* by John Bongaarts and Brian O'Neill entitled "Global warming policy: Is population left out in the cold?" identifies four so-called misconceptions

about population and climate change (Bongaarts and O'Neill, 2018). One of these alleged misconceptions concerns the effectiveness of family planning programs, and, in particular, efforts to help women to avoid unintended pregnancies. Here, again, it matters what precisely is meant by "family planning". A focus on meeting the "unmet need for contraception" has been the dominant population policy paradigm following the 1994 ICDP (International Conference on Population and Development) in Cairo. The unmet need has been defined as concerning women who say (in surveys) that they do not want to become pregnant but are exposed to the risk of pregnancy and do not use contraception. This definition and the resulting policy focus are largely uncontroversial, and have been endorsed by women's rights groups, the World Health Organization as well as governments from around the world. Only some fundamentalist religious groups opposed to any kind of contraception have expressed opposition to this form of family planning. Hence, a focus on meeting the unmet need for contraception can hardly be called a "taboo topic". It is openly discussed in many policy forums, and is also explicitly included in the SDGs. Target 3.7 under SDG3 on Health specifically says: "By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programs" (United Nations, 2015). Again, I see no evidence of a taboo here.

What can be considered more problematic are efforts to directly influence women's desired family size. For people who are concerned about population growth and high fertility in general, one problem with an exclusive focus on the unmet need is that it only addresses women who already want to have smaller families. In other words, it does not aim to lower the desired family size, but rather takes the ideal family size as stated by women as a given that should not be influenced (Prettner and Strulik, 2017; Pritchett, 1994). This, at least theoretically, significantly limits the scope for policies aimed at lowering fertility, since in many African countries ideal family sizes are still very high, especially among the low-educated segments of the population. The most recent results from the DHS in Nigeria (Nigeria Population Commission and ICF International, 2019), for instance, show that the mean ideal family size of women with at least secondary education is 4.4 children, whereas it is 7.9 children among women with no education. This survey also shows that the proportion of births that were wanted at the time of conception remained constant at 90 percent over the past five years, while just 8 percent were considered mistimed and only 3 percent were unwanted. This indeed leaves very little room for fertility decline if only unwanted births are being addressed.

Another cautionary piece of information about the effectiveness of focusing only on the unmet need comes from a series of DHS surveys that ask explicitly about the obstacles that women face in meeting this unmet need. Of all the possible obstacles listed, only 3 percent (for women with higher education) and 8.5 percent (for women with no education) of all women classified as having an unmet need cited either cost or a lack of access to contraception (Lutz, 2014). The main reasons mentioned were health concerns, general opposition to family planning (including opposition from the woman's husband) and a lack of exposure (e.g., the woman is married but her

husband is away for work). These data imply that better access alone could only help to meet these 3–8 percent of unmet needs. Female education, on the other hand, not only helps to overcome many of the other obstacles, it also makes a lower desired family size a voluntary choice that does not require any nudging, manipulation or even coercion from family planning programs (Lutz and Skirbekk, 2014). It can thus be assumed that female education is the key to lower fertility in high-fertility settings. Because female education empowers women to plan their families more effectively, it could even be seen as part of family planning, very broadly defined.

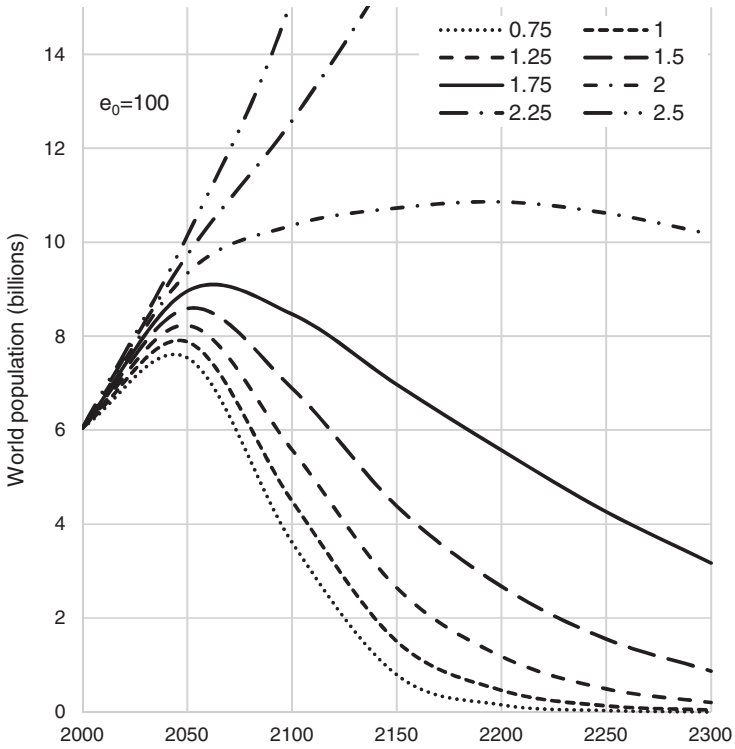
When trying to highlight evidence of the success of family planning programs in bringing down fertility rates, the case of Bangladesh is often taken as an example. Bongaarts and O'Neill (2018) pointed out the difference between trends in Bangladesh, which has a long history of family planning and currently has a low total fertility rate (TFR) of 1.95, and in Pakistan, which has similar economic indicators but little history of family planning, and currently has a TFR of 3.41 (United Nations, 2020). But a closer look at the two countries reveals that Bangladesh has also made much more progress on female education than Pakistan has. This issue motivated a recent comprehensive revisiting of the causes of fertility decline in Bangladesh that focused on the relative importance of female education and family planning by combining all available DHS data since the 1980s (Bora et al., 2023). This study found that, overall, the education of women was the driving factor behind the significant decline of fertility in Bangladesh from a TFR above 6.0 in the 1980s to the current replacement level, and that targeted government family planning programs played a significant role only in the early years of this period and in certain regions. Since higher levels of female education and improvements in reproductive health (partly due to targeted government efforts) go hand in hand and reinforce each other, it makes no sense to play one against the other. Strong efforts in both areas tend to result in the fastest fertility transition.

4 World population in the 22nd century

At the beginning of this commentary, I referred to the long-term population decline that seems to be a realistic outlook for humanity on our planet, if social development and, in particular, female education efforts continue at the same levels as those observed over the past decades. This implies that the laggards in the fertility transition in Africa and parts of South Asia will also follow the global trend over the coming decades, with their fertility reaching replacement level or even falling below that level. Such trends have been observed in virtually all populations around the world that entered the demographic transition process. This assumption of continued fertility decline to below replacement level is now shared by virtually all international population projections in their medium/most likely scenarios.

If global fertility levels remain below replacement level for extended periods and life expectancy does not continue to increase indefinitely, world population size is bound to decline in the longer run. Figure 2 shows the results of a rather

Figure 2:
World population scenarios over the coming three centuries with different stated long-term fertility levels (TFR), combined with the assumption that average life expectancy at birth will stop increasing after reaching 100 years



Source: Adapted from Basten et al. (2013) (CC BY-NC 2.0 DE).

straightforward exercise in numerical population dynamics that I published with Stuart Basten and Sergei Scherbov in 2013 (Basten et al., 2013). Based on 13 world regions, it starts with contemporary fertility and mortality levels and age structures (base year 2010), and assumes that the fertility levels will converge from the current level to the stated level of TFR by 2050 (this convergence was projected to occur in low-fertility regions as early as 2030, and a special scenario with convergence by 2070 was projected for Sub-Saharan Africa). The exercise further assumes that life expectancy will increase by two years per decade until the indicated maximum level is reached. Figure 2 only shows the case in which 100 years is assumed to be the maximum life expectancy. In the case in which 120 years is assumed to be the maximum life expectancy, all the long-term population trajectories are slightly higher.

The figure illustrates the strong sensitivity of long-term population trends to different convergence levels of fertility. As expected, all fertility assumptions slightly above replacement level will lead to continued substantial population growth, while those below replacement level will lead to a decline after the world population peaks during the second half of this century. Only an assumed TFR of 2.0 leads to a nearly stable population size of around 10 billion. But from today's perspective, a decline to the current average European level of around 1.5–which is not implausible, if current trends continue–would result in a significant population decline to below 3 billion in 2200 (about the same size as the world population in 1960; this is what I learned in school) and to below 1 billion in 2300. But even if fertility converged to the higher level of 1.75 (which is currently assumed in the medium scenarios of the UN and the Wittgenstein Centre alike), the world population would still decline to below 6 billion in 2200 and to almost 3 billion in 2300.

This projected long-term population decline to levels around 3 billion or below should be reassuring to ecologists who have estimated that the world's human carrying capacity is around this level (Dasgupta, 2004; Pimentel, 1991). But, as was highlighted in the description of the SSP3 scenario of stalled development, a continuation of current fertility trends should not to be taken for granted. A significant reversal of these trends is possible, particularly in large countries such as Nigeria, Pakistan and Afghanistan, which still have high proportions of women with low education, and which are vulnerable to religious fundamentalist movements that explicitly oppose female education. The name of the influential fundamentalist group Boko Haram in the Sahel means literally "education is sin". And since uneducated women tend to have many children who, in turn, have very few educational opportunities, there is a danger of a self-reinforcing spiral emerging; i.e., a vicious circle of low education, rapid population growth and extreme poverty (Prettner and Strulik, 2017). Such developments would not only pose serious problems for the countries concerned, they would also be sources of instability for the rest of the world.

5 From population stabilisation to balanced demographic trends

The overall goal of most population policies is "population stabilisation". This goal has been repeatedly stated in many of the United Nations policy documents produced since the 1960s, and is still cited as the overarching goal by Lowe (2022). This goal of population stabilisation was also numerically represented in the long series of UN population projections over the second half of the 20th century. The medium variant of these projections assumed that the fertility of all countries in the world would eventually converge to replacement level, and that improvements in life expectancy would come to an end once an assumed maximum level was reached. Together with the assumption of zero net migration, this resulted in a population outlook in which

the populations of all countries in the world stabilise in the long run and stay at that level forever. Such a vision of stabilisation has also been politically convenient. No member government of the United Nations has had to fear that in the long run its population would either explode in an unsustainable manner or shrink significantly or even disappear. In this view, sub-replacement fertility was considered a temporary phenomenon.

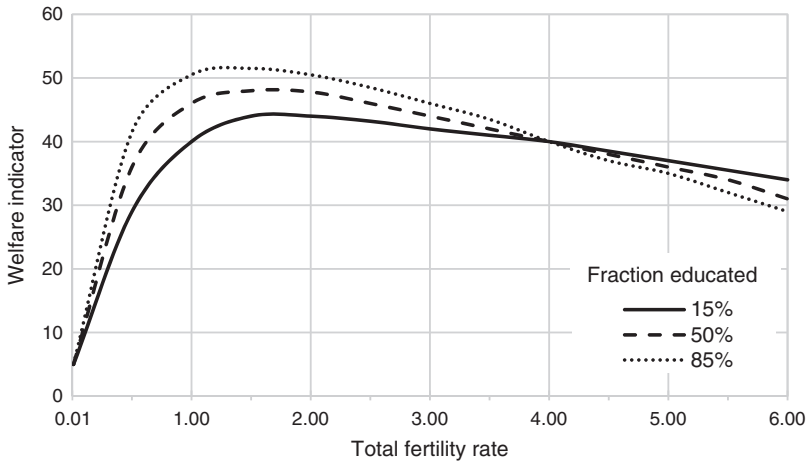
Real-world demographic trends have increasingly made this politically attractive vision of the long-term stabilisation of the populations of all countries untenable. It has become very clear that sub-replacement fertility levels are here to stay (Basten et al., 2014), and that in an increasing number of countries, fertility has fallen to levels that are even lower than those that were ever previously imagined. The TFR in South Korea is currently at 0.8, and might decline even further. Moreover, even the UN has now acknowledged that the TFR in China, which was previously assumed to have never fallen below 1.6, and to be on an increasing trajectory, has recently fallen to below 1.3, despite government efforts to increase it. In addition, the most recent data for India, which will soon to surpass China as the biggest country in the world, show that its TFR fell below replacement level much earlier than projected.

But are extended periods of below-replacement fertility a problem? Many governments, particularly in Eastern Europe, seem to think that a shrinking population is a serious issue, with some even calling it an existential problem. Aside from evident nationalistic reasons–national governments sometimes want there to be more people of their own nationality, irrespective of the wellbeing implications–are there economic reasons to assume that long-term below replacement fertility levels are a danger for future human wellbeing in individual countries or globally?

Instead of trying to provide a concise summary of this highly complex and controversial topic, I want to conclude this short commentary with a reference to a book that I co-edited almost 20 years ago entitled "The end of world population growth in the 21st century: New challenges for human capital formation and sustainable development" (Lutz et al., 2004b). After discussing the likely end of world population growth, this book also considers the possible policy implications. The concluding chapter is entitled "Conceptualizing population in sustainable development: From 'Population Stabilization' to 'Population Balance' " (Lutz et al., 2004a). It starts with the suggestion of abandoning the concept of population stabilisation and replacing it with a more meaningful concept that addresses the wellbeing of groups of people by generations (cohorts), instead of focusing on constant population sizes. It considers not only population size but also the changing proportions of people in groups differentiated by age and education. This focus on proportions also justifies the use of the notion of "balance", which, according to the *Oxford Concise Dictionary,* can be defined (particularly in the arts) as "the harmony of proportions". Hence, in our context, the challenge is to find the right mix (harmony) of demographic proportions (of age cohorts, education categories, etc.) that are most conducive to welfare and intergenerational equity over the long run.

Lutz et al. (2004c) also presented a very simple quantitative model of population balance that makes human welfare dependent on survival rates (life expectancy),

Figure 3:
Simple population balance model: Welfare indicator for stable populations by fraction educated and total fertility rates, baseline parameters



Source: Adapted with permission from Lutz et al. (2004b).

consumption and environmental quality, and that distinguishes between three stages of the human life cycle (youth, working age, retirement). It further subdivides the population into two education groups (high and low), with education having a cost, and the output produced depending on education. Pollution, which is a function of output, reduces environmental quality, and thus welfare. The highly stylised simple model of Population Balance as defined in this paper yields very interesting insights that highlight the interdependencies of and the trade-offs between the demographic proportions that matter for human welfare and intergenerational equity.

The graph presented in Figure 3 shows the long-term effects of different possible levels of fertility (TFRs ranging from 0.01 to 6.00) combined with different levels of education on the welfare indicator, assuming stable conditions (=rates stay the same over time). This simple graph highlights four important aspects of Population Balance: 1. the relationship between the TFR and welfare has an inverted U-shape, i.e., very high and very low fertility results in lower welfare than intermediate TFR levels; 2. the level of maximum welfare reached is higher for the more educated populations; 3. the optimal TFR depends on the level of education, with all optimal TFRs being below replacement level, and the optimal TFR being lower the higher the level of education is (which also results from education costs); and 4: all curves exhibit rather flat peaks, implying that the level of welfare is not very sensitive to the TFR being in intermediate ranges. For the low educated population, the optimum range stretches roughly from 1.5. to 3.5. For the highly educated population, the optimum range lies more narrowly between 1.0 and 2.0, and at a significantly higher

level. Note that this model also explicitly includes the environmental dimension (in admittedly very stylised form), and thus also captures the above-discussed interactions with climate change.

This 20-year-old model of Population Balance nicely summarises the main messages I wanted to offer in this comment: yes, very low and very high fertility are likely detrimental to long-term human wellbeing, but there is no reason to panic if fertility deviates somewhat from the stated optimum level. And yes, more investments in education pay off in terms of higher welfare, and even more so when combined with fertility levels that lead to long-term population decline in individual countries and, ultimately, around the world. Hence, this conclusion supports the title of the paper, which states that global population decline is not only likely, but will also benefit long-term human wellbeing.

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