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An economic demographic approach

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Abstract

The world is rapidly converging towards lower fertility: in 2020, countries with a total fertility rate of less than 2.25 will encompass more than three-quarters of the world population. This implies that the determinants of childbearing will be increasingly similar in high-income and middle-income regions of the world. In this article, I discuss economic demography in relation to levels of childbearing. How do different societies distribute resources across the life course and between generations, and to what extent is this done through governmental transfers? The extent of such transfers varies considerably between low-income, middle-income, and high-income countries, which I explored through data from the National Transfers Account project. I argue that in low-fertility societies, the extent to which the costs of childrearing are socialized is important for fertility. The extent to which childrearing is socialized will be an important determinant of future fertility levels and, if used as a population policy, offers a straightforward pathway to achieve a desirable population size. As the global fertility decline continues, such policies will be relevant to most societies and a tool for governments to affect fertility levels across many contexts.

Keywords: Population growth, government transfers, environment, economic demography, sustainability, fertility

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Introduction

Most developed countries spend considerable government resources on support for parents and childrearing. All high-income and many middle-income societies provide some combination of child allowances, housing support, parental leave, tax breaks for parents, and government-supported daycare. In richer societies such support involves considerable sums but even in many middle-income countries, government transfers often specifically target parents and large families. All countries around the world provide primary education and healthcare for children to some extent, unlike in pre-industrial societies where such costs were borne by parents. The resources for such government support are generated from general taxation of individuals, independent of their number of children, and are transferred to parents based on the number of children they have chosen to have. As such, it represents a transfer of economic resources from non-parents (and parents with a below-average number of children) to parents (with an above-average number of children). Such policies coexist with a situation in which, as many researchers argue, the current and future global population size is higher than what will ultimately be sustainable (Daily & Ehrlich, 1992; Dasgupta & Dasgupta, 2017).

All over the globe, societies with relatively low fertility constitute a substantial and growing share of the world population. This changing demographic reality is not reflected in scientific, governmental, and public discourses on population policy. On the contrary, a great deal of attention is paid to the small and shrinking part of the world population with high fertility (e.g., a Total Fertility Rate (TFR) above 3)[1], and less attention is paid to the much larger share of the world population with lower fertility. In 2014, only 21% of the world population lived in societies with a TFR above 3 and this is projected to continue decreasing rapidly. In this paper, I argue that effective policies for influencing global population size will therefore have to be directed at societies with relatively low fertility, as they contribute the vast majority of current and future births. The extent to which population policy can help in mitigating potential negative externalities linked to population size, such as environmental degradation (Ehrlich & Holdren, 1971), global land use (Meyer & Turner, 1992), and greenhouse gas emissions (Bongaarts & O'Neill, 2018; Jorgenson &

[1] Throughout the manuscript, an approximate TFR of 3 will be used as a threshold for defining low-fertility societies, where a typical individual chooses his/her family size deliberately and where preferences and deliberate planning play a large role. The exact point of such a threshold is of course a subject of debate, and most societies with TFR between 2.5 and 4.5 will typically consist of both large groups that plan their family size deliberately and large groups that do not.

Clark, 2010; O'Neill et al., 2012) – will be greater in low-fertility societies than in high-fertility societies, and this will be increasingly true in the near future.

In the present study, I show how perspectives from economic demography can provide insights into how governmental transfers change the incentives for childbearing in societies with low fertility. In such societies, fertility is by and large determined by the agency of parents, and parents make deliberate choices situated in an institutional setting shaped by the government. In all societies where TFR is below 3, parental preferences are the primary determinant of childbearing, where the majority of the population are capable of targeting a particular family size. In the future, the determinants of fertility in middle-income societies will likely look increasingly like those in contemporary richer societies.

Life-cycle analysis of how much individuals consume and produce at different ages across the life course are useful for understanding how much society, as an aggregate, invests in children, through both private and public expenditures. Recent developments in economic demography help us to conceptualize and empirically calculate the extent of such transfers across generations and ages. I apply data from the National Transfers Account (NTA) project on the extent of public and private transfers over the life cycle in four countries, at different stages of development, and with varying degrees of public transfers over the life course.

I argue that the extent and configuration of government support for parents and childrearing form an important discourse in which issues of over- and under-population should be debated within low-fertility societies. Different welfare systems in low-fertility societies, varying in the extent to which they socialize childrearing, exemplify how governments can influence childbearing. This is in contrast to previous discourse on global population policy, which has been more concentrated on family planning (e.g. Bongaarts, 2016; Bongaarts, Mauldin, & Phillips, 1990; Gerland et al., 2014). Unlike this earlier discourse, looking at the incentives of government transfers puts greater focus on high-income and middle-income societies, whose populations are responsible for most negative externalities associated with population growth.

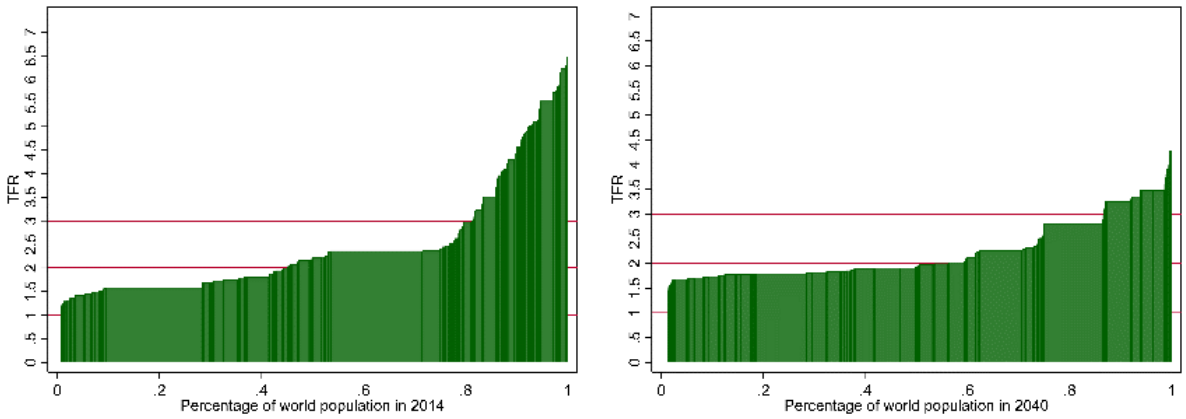
A global perspective on population and fertility rates

The international discourse on population policy is still greatly affected by the high fertility levels observed across the world in the 1960s and 1970s. In the 1960s, the global fertility rate was around 5 children per woman (Lam, 2011). Such fertility levels arise in societies where large proportions of women are not using any method of contraception (Bongaarts, 1978). With such high fertility rates among the majority of the world's population, it was understandable that most of the attention related to population policy focused on such societies and the need for family planning (Bongaarts et al., 1990; Demeny, 1975).

However, as figure 1 shows, the world has changed during recent decades, with quickly falling fertility levels across the globe. In 2014 only 19% of the world population lived in societies with a TFR above 3, and only 13% in a society with a TFR above 4 (Figure 1A). Today, a very large share of women in a sexual union worldwide act deliberately to avoid unwanted pregnancies.[2] As an illustration, at present the global proportion of women in a sexual union using contraception is only 6% higher in Europe than in the world as a whole, and most women in the world control their fertility (United Nations Population Division, 2015). It is forecasted that, by 2040, only 14% of the world population will live in societies with a TFR above 3, and less than 1% in societies with a TFR above 4 (Figure 1B). This implies that the proportion of the world population that, to some extent, deliberately plan their fertility will be close to 100% in a few decades.

[2] In 2008, the proportion of unintended births as a percentage of all pregnancies was the same in the more developed of the world as in the less developed part (Singh et al., 2010).

Figure 1: A) Cumulative world population by total fertility rate in 2014 (left panel), B) Cumulative forecasted world population by total fertility rate in 2040 (right panel).



Source: World Bank Development Indicators Database (UN population division medium forecasts), data processed by the author.

Therefore, any policy aiming to affect the total size of the global population will increasingly have to target societies that already have low (or soon will have low) fertility rates. This means that the traditional focus on family planning will be decreasingly important. In part, this outcome can be seen as a result of the success of programmes during the past half-century. In most parts of the world, the determinants of childbearing in the 21st century will likely be more similar to what has been experienced in high-income societies across the 20th century. In low fertility societies, fertility is determined by the choices of parents, which are based on an institutional framework that is to varying degrees created by the state.

To focus on fertility in societies with low and moderate fertility may seem paradoxical, but this is not necessarily the case when it is global population size that creates negative externalities. UN population forecasts also highlight how significant decreases in fertility could combine with strong growth of the global population due to population momentum effects (Gerland et al., 2014; United Nations Population Division, 2017). A large share of the global population has not yet reached the age at which fertility is completed, and will live for a long time. Therefore, the growing share of the world with low fertility is forecasted to coincide with a large and growing population for the next century, eventually reaching over 11 billion people in 2100, over 3 billion people more than in 2020 (equivalent to the population growth between 1959 and 2011). If a global population size

closer to or below the current global population is desirable, a long period of moderate negative population growth is necessary.

Negative or positive impacts of a larger population?

A key issue in economic demography is whether the population size of current and future generations will have an impact on the quality of life of future individuals. I will briefly discuss two aspects of the effect of additional future individuals on well-being. The first is the material and socioeconomic impacts of a larger population, a traditional area of economic demography. The second concerns the environmental impacts of large populations, which have not traditionally been incorporated into standard models of economic demography. Such ecological impacts concern both dimensions of life that are difficult to incorporate into models of material welfare (such as irreversible loss of biodiversity) and environmental degradation that negatively impacts non-material aspects of welfare alongside economic growth and affluence.

How an additional person affects the average affluence in a population is the most prominent question in economic demography (Hutchinson, 1967; Malthus, 1798). For Western pre-industrial populations, the evidence is clear that population growth reduced wages (Galloway, 1988; Lee, 1987). The evidence for low- and middle-income countries in the 20th century is more complex, though most evidence suggests that population growth reduces average affluence, even if the effects were not as substantial as occasionally feared (Bloom, Canning, & Sevilla, 2003; Coale & Hoover, 1958; Lee, 1987; Mason, 1986; Preston & Donaldson, 1986).

The situation in high-income societies is even more complex. Fertility levels well below replacement, e.g. TFRs of 1.3 or lower, are likely ultimately unsustainable as a population will decrease at a very rapid pace and this will put considerable strain on young generations to pay for older generations and decrease affluence (Lee & Mason, 2014). There is also substantial fear about the negative effects of low fertility in high-income societies among governments and researchers (e.g. Morgan, 2003); however, theoretical and empirical calculations often do not support the notion that fertility closer to replacement (e.g. a TFR of 1.5) will make people less affluent (Lee & Mason, 2010, 2014; Samuelson, 1975; Striessnig & Lutz, 2013). Lee and Mason (2014) suggest that a TFR of around 1.5 for the US seems to be consistent with maximizing the affluence of future

generations. Consequently, there is little evidence to suggest that moderate negative population growth will reduce affluence or be unsustainable during a moderate time range.[3]

The economic perspectives discussed above largely fail to consider the environmental costs of larger populations. Unlike economic arguments, most environmental arguments are related to the size of the *global* population (and not the effect of age structure), as human impact is largely proportional to the number of people (Bohn & Stuart, 2015; Ehrlich & Holdren, 1971). There is a clear consensus that a future larger population will be associated with negative environmental externalities, which may affect both economic affluence and non-material resources and environmental quality (Bongaarts & O'Neill, 2018; Cohen, 1996; Holdren & Ehrlich, 1974; Keyfitz, 1991; Lee, 1987; Livi-Bacci, 2007). The so-called "IPAT" relationship, used to describe the impact of humans on the environment, shows the linear impact of increasing population size on the environmental impact of humans (Ehrlich & Holdren, 1971).

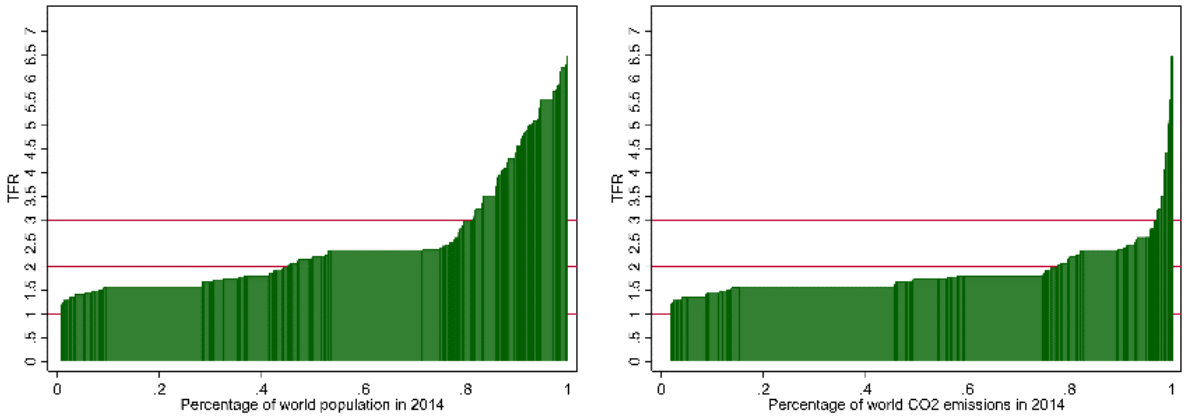
A good illustration of such a challenge is climate change. Since negative impacts are related to the global concentration of CO_2 (and other greenhouse gasses) in the atmosphere, which is independent of the number of people responsible for the emissions, fewer individuals could theoretically each emit more CO_2 and have the same overall effect as more people emitting less CO_2. In fact, most of the increases in emissions during the past half-century have closely followed population growth and this is forecasted to continue (IPCC, 2014). Climate change is thus illustrative of a case where (1) the marginal effect of an additional individual is a negative externality, (2) the problem has to be framed as an issue for all societies, and (3) the negative impact is driven mainly by individuals in low-fertility, high-income societies. Most environmental challenges share these characteristics. For example, richer countries have a much higher impact than poorer countries on global land use, biodiversity, and estimates of overall environmental footprints (Sanderson et al., 2002; Wackernagel & Rees, 1996; Weinzettel, Hertwich, Peters, Steen-Olsen, & Galli, 2013).

Figure 2 illustrates the relationship between global fertility and CO_2 emissions, and the extent to which emissions take place in low-fertility societies. Societies with a TFR above 3 were responsible for only 3% of global emissions (Figure 2B), while they represented 23% of the world population (Figure 2A). More than 76% of CO_2 emissions were produced in societies with a TFR below 2.

[3] It should be noted that such arguments are largely based on effects on growth *rates* and effects of age structure, and that contemporary approaches take little account of absolute population sizes.

Because affluent societies have the largest current and future environmental footprint as well as the largest historical debt towards current environmental concerns, the population size and future fertility of affluent societies will be particularly important in solving future environmental challenges.

Figure 2: A) Cumulative world population by total fertility rate in 2014 (left panel). B) Cumulative world CO_2 emission by total fertility rate in 2014 (right panel).



Source: World Bank Development Indicators Database, processed by author

Recently researchers have forecasted truly catastrophic impacts of environmental problems related to global warming (New, Liverman, Schroder, & Anderson, 2011), and general human impacts on the environment (Steffen et al., 2015). As environmental impacts are linearly related to population size, a powerful long-term mitigation strategy will always be to shrink the global population (Bohn & Stuart, 2015; Daily & Ehrlich, 1992; Ripple, Wolf, Newsome, Barnard, & Moomaw, 2019). Some environmental problems may be solved independently of global population size but for some challenges, such as land use, this is not plausible even in the far future. There have been many attempts to calculate what constitutes a sustainable human population size – one that does not entail substantial negative trade-offs with welfare (Cohen, 1996). Many such estimates are well below the current global population, and much lower than the forecasted global population for 2050/2100 (Cohen, 1996; Daily & Ehrlich, 1992; Dasgupta & Dasgupta, 2017; Wackernagel & Rees, 1996). This suggests that the negative externalities of current population growth are likely very high.

Even if projected human population growth does not have catastrophic consequences (Lam, 2011), any hypothetical carrying capacity of the earth will always be based on a trade-off between

population size and material welfare as well as non-material values such as biodiversity (Cohen, 1996). Higher population size trajectories will imply trade-offs between more people and material and non-material values, and on average additional population growth will likely be a negative externality for current and future individuals. The higher the total population, the greater such trade-offs will be. Giving a relatively larger value to welfare future in contrast to current generations, and the health of the biosphere, will imply a lower optimal population size.

On balance, it seems likely that slower than forecasted (or negative) population growth will be beneficial to future generations concerning both future affluence and equity (Gardiner, 2004). As we have seen, moderately low fertility (TFR around 1.5) seems to have mostly positive economic impacts, so even models that treat the Earth's resources as endless human welfare may increases faster in populations with below-replacement fertility rates. If environmental externalities are also included in such calculations (Bohn & Stuart, 2015), it seems likely that even lower fertility would maximize the well-being of future generations.

Intergenerational demography and the cost of having children in a life-course perspective

The human life cycle, and the provision of resources to children

A universal aspect of human societies – past, present and future – is that people in the age range 20 to 60 years support those that are both younger and older (Chayanov, 1925[1966]; Lee & Mason, 2011b). In less affluent societies, the burden posed by the older population is smaller both absolutely (due to low survival) and relatively (due to the high contribution of the elderly) than in richer societies, but in all societies, working-age people support the youngest individuals (Lee & Mason, 2011a). A lifecourse transfer approach is useful if we wish to understand why, and how, societies distribute the costs of childrearing; it is also useful, I argue, if we wish to understand how governmental policy affects levels of childbearing across societies.

Researchers are increasingly collecting data on consumption and production over the life course, with much of this work coming under the National Transfers Account (NTA) project. Researchers have collected data on consumption in both developed and developing societies and, crucially, broken down by state and private spending and income as a function of the age of recipient and contributor. The data is based on budgets, and household surveys from a single year, and reflects

how resources flow between age groups in that year (including consumption derived from savings). This represents how each society re-distributes resources from working-aged people to support younger and older individuals. Unlike much previous NTA research, my purpose in using NTA data is not to calculate how different demographic trajectories (like low or high fertility) affect future challenges of financing ageing; my purpose is to illustrate cases of how transfers to children differ between public and private sources in different societies, for which a cross-sectional approach is suitable. A detailed description of the data, how they were calculated, and why they are suitable for this purpose is provided in a supplementary appendix. An important advantage of focusing on all government transfers using NTA methodology, as opposed to the more common demographic focus on family policy and transfers (e.g. Neyer & Andersson, 2008; Thévenon, 2011), is that it captures private and public educational expenditure. The subsequent comparison between Taiwan and Sweden illustrates why this matters.

Below I show overall life cycle patterns of consumption and labour income for a typical low-income country (Nigeria in 2004), a middle-income country (Indonesia in 2004), and two high-income countries (Taiwan in 1998 and Sweden in 2003) using data from the NTA project. The four countries were chosen from a larger set of NTA countries, because they were indicative of how societies at their approximate income level socialize childrearing through public transfers. While Indonesia and Nigeria both have many unique, country-specific, traits; in the extent and shape of public and private transfers they are broadly representative of their income class. For the factors analysed below, other countries in the NTA data-set are largely comparable. Sweden and Taiwan on the other hand were chosen as they differ substantially in how they redistribute resources through public transfers, while both having high affluence and robust state institutions, illustrating how societies can implement different priorities.

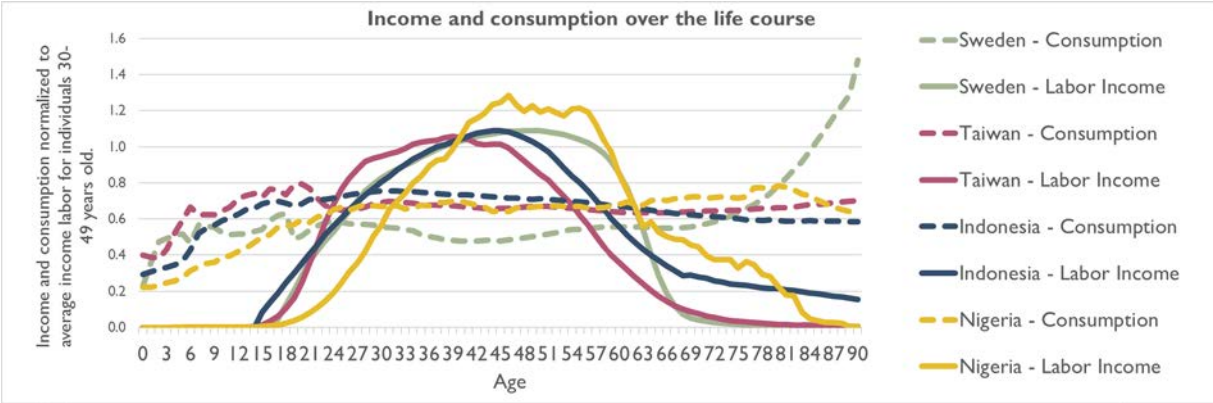
Some of the costs of people's consumption, such as food, housing, and consumer goods, are paid for by the household, while others are paid for by the government (importantly education and health). Private consumption during childhood will be financed by the parents, as the child does not provide income for the household. However, public consumption is funded through general taxation. As such, to the extent that the cost of young and old people is paid for by the state, these costs are socialized, instead of being paid for by the individual. In countries where children mainly consume private resources, most costs for childrearing are borne by parents, while socialized costs

are borne by the entire population, including both non-parents and parents of other children. All the results shown are normalized to labour income in the country (though in nominal terms the sums vary enormously across the countries).

In Figure 3, I display the parts of the life course in which individuals consume and produce resources. The pattern of consumption is also remarkably similar in all 4 countries (even though their absolute income differs enormously), where only the richest country, Sweden, stands out. The main difference in production is that people in Nigeria and Indonesia earn labour income into later life. While the age patterns for consumption are similar across the countries, the content of consumption differs dramatically as shown in Figure 4. Of main concern for this paper is how consumption in childhood is financed. Figure 4 shows the pattern over a hypothetical life course, where the aggregate cost in a society can vary greatly depending on its age structure. In particular, in Indonesia and Nigeria investment in children constitutes a larger share of total societal expenditure due to the younger age structure.

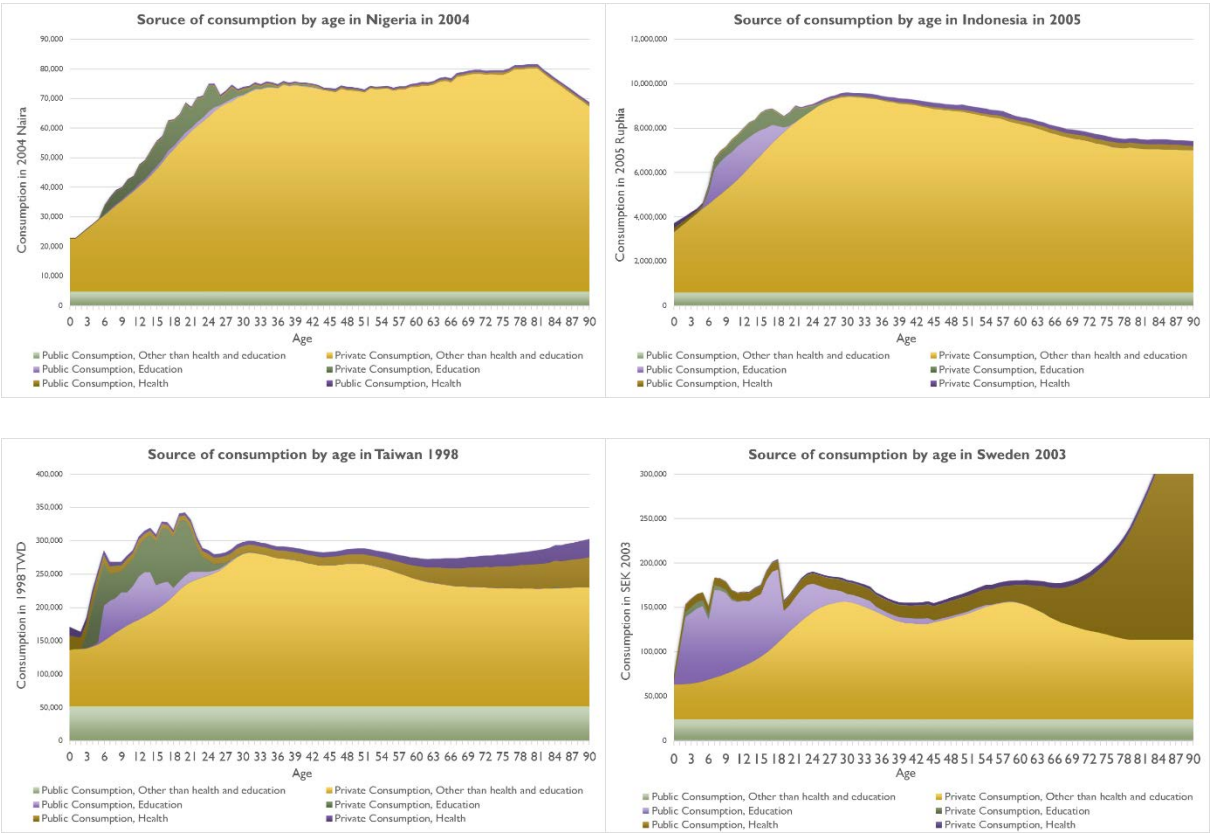
In Nigeria, almost all consumption is private, while public expenditure is related to the cost of maintaining the state, with few transfers to the individual. Young individuals consume some education, but this cost is almost entirely borne by the household – the parents. The Indonesian pattern resembles the Nigerian pattern, but in Indonesia much, but not all, of the cost of schooling is covered by the state. The private share increases with more years of education. In the two richest countries, the share of consumption in childhood that is education is much higher. However, the two societies finance education very differently. In Taiwan, parents bear most of the cost of their children's education, in particular for tertiary and later education. Indeed, personal consumption is highest in early adulthood due to the cost of education. In the country with the largest public transfer scheme, Sweden, almost all education costs are socialized, including daycare for young children which the Swedish NTA classifies as education. The Swedish pattern also differs from the other three countries later in the life course due to the high cost of healthcare at older ages. The difference between how much of the total cost of educating a child is paid by parents in Sweden and Taiwan is dramatic.

Figure 3: Income and consumption over the life course



Source: NTA Data, see supplemental material

Figure 4: Source of consumption over the life course



Source: NTA Data, see supplemental material

Figure 4 reveals 4 different patterns for how the cost of education is paid for at different levels of development; indicating both increased spending on education with development and divergence

in whether this cost is borne mainly by parents or taxpayers. Additional data with more information on various kinds of transfers are shown in the supplementals[4] All OECD countries also socialize private expenditures on childcare to some extent, through child allowances, tax breaks, and parental leave benefits (Thévenon, 2011). When state budgets are funded by general taxation, resources are effectively transferred from non-parents to parents (and, by extension, from parents with fewer children to those with more).

The care and health of the elderly are also funded through transfers from middle-age and older people, but unlike expenditures for children, where resources are transferred from non-parents to parents, in most OECD societies funding for the elderly is either socialized through public transfers (public pensions, public healthcare), through private pensions, or through private assets-based reallocations of savings meaning the older people consume the resources they privately saved during mid-adulthood. However, in societies where intrahousehold transfers are important, older individuals do partly rely on the production of their adult children. Evidently, low fertility societies can maintain high levels of transfers from middle-age to elderly individuals (Lee & Mason, 2014). These results related to the measured costs of childcare and elderly care do not include unpaid labour (shadow costs); however, there are published calculations incorporating time use (Vargha, Gál, and Crosby-Nagy 2017), and predictably show strong differences by sex.

As stated above, these four countries illustrate different pathways for how countries socialize the costs of childrearing. For the poorest society, Nigeria, the pattern largely reflects the weak state, which has neither the resources nor capability to effect substantial transfers. As such, it is representative of most of the world's low-income societies. In the foreseeable future, the kind of government transfers discussed in this article will probably only have a marginal influence on fertility decision making. Sweden and Taiwan illustrate how very different transfer regimes are possible in high-income countries with well-developed institutions. Sweden is a typical example

[4] In the supplemental figure S1, I show additional graphs on how different kinds of public transfer schemes redistribute resources across ages. In Indonesia, the total amounts of public transfers are small and mostly go from middle-aged adults to fund education and other costs for children, though some minor cash transfer benefits are given to parents. In Taiwan, middle-aged adults fund public transfer schemes for all other life-course stages, including both education and other childcare-related costs. In Sweden, middle-aged adults pay for the generous transfer schemes benefitting other parts of the life course, but they are also net receivers of cash transfers linked to parental benefits, such as parental leave and child allowances. Cash transfers that only go to middle-age parents are then used for much of the private costs of childrearing, as shown in Figure 4. This represents additional socialization of the cost of childrearing in Sweden. No data are available for Nigeria, though public transfers are negligible there.

of a welfare state, with extensive subsidies for childrearing. Taiwan is a society that, despite a well-run government and high affluence, has not chosen to do this, and where private educational expenditure is very high. Most other high-income societies fall somewhere in between these two societies, wherein most East Asian societies, despite occasional vocally pronatalist cash transfer systems such as Singapore's, private educational expenditure is high, public childcare limited or absent, and the overall degree of socialization of childrearing low (Tung, 2011). Other European countries often socialize education to a high extent but rely less heavily on generous parental leave and subsidized childcare than in Scandinavia (Thévenon, 2011).

Indonesia is representative of a rapidly growing middle-income society, in which the state is able and willing to bear some but not all costs for education. As a middle-income society with a functioning, but currently limited state, it shares many features with the societies in which around 75% of the world currently live. In the next section, I argue that the policy choices societies like Indonesia (but also high-income countries) will make in the near future have important implications for future global fertility trends.

The relationship between public transfers and fertility

The large variation seen in how the cost of childrearing is socialized across different levels of development raises the issue of how the degree of public socialization of childrearing affects fertility levels.

In poorer societies, the modest scope of public transfers is likely to mean that their impact on fertility is small (see the data for Nigeria above). As such, it is not surprising that, in such societies, family planning programmes have focused on ideational change (Casterline, 2001) and access to, use, and availability of methods for fertility control (Bongaarts et al., 1990; United Nations Population Division, 2015). In richer societies, the evidence that government transfers influence parents' eventual choice of family size is growing (e.g. Björklund, 2006; Luci-Greulich & Thévenon, 2013; Toledano, Frish, Zussman, & Gottlieb, 2011).

In Sweden, on the other hand, the amount of child allowances and parental leave benefits amount to approximately €65,000 for the first 16 years of a child's life, in 2018, and childcare (pre-school from age 1-6, and after-school care for older children) amounts to a similar amount of around

€75,000. By comparison, the average disposable income in Sweden per person was around €28,000, and the total costs of two children during the first 16 years of life, was €260,000 (see supplemental material for calculations).

The causal relationship between family benefits and fertility is complex (Gauthier, 2007; Luci-Greulich & Thévenon, 2013). The best evidence plausibly comes from studying policy changes in the generosity of child allowances and tax breaks for families. Such studies typically find positive effects of policy changes on fertility (Gauthier, 2007; Milligan, 2005; Mörk, Sjögren, & Svaleryd, 2013; Rindfuss, Guilkey, Morgan, & Kravdal, 2010). Effects are often interpreted as small (e.g. Gauthier, 2007), but that is a matter of discussion. Results show that transfers of between €1,000 – €10,000 typically increase different dimensions of fertility by 5-20%. Given the large differences in the socialization of childrearing across countries (Figure 4, S1), and relating the changes in subsidies to the total amount of subsidies for childbearing in welfare states such as Sweden (as well as the total costs for parents of rearing a child), these results could easily be interpreted as showing that fertility is quite responsive to increases in direct public transfers to parents.

The low fertility in high-income societies in East Asia, where childrearing is less socialized than in other OECD countries and parents have to pay for a large share of their children's education (Tung, 2011) is consistent with economic costs being a major determinant of childbearing. Similar patterns are found across Southern Europe and increasingly in other parts of Asia and across in middle-income countries like Iran and Thailand. East Asian societies have responded to very low fertility with increasingly explicit pro-natalist policies, such as in Singapore, Taiwan and South Korea (e.g. Jones, 2012). The current approach considering the overall socialization of childbearing can provide an answer to why they have been largely ineffectual, as they also include the very substantive cost of education as illustrated by NTA data from Taiwan. Evidence from historical and developing countries typically show very strong positive elasticities between economic resources and fertility (Lee, 1987). Unlike in low-income societies, in middle-income societies the state, in some cases, takes considerable responsibility for the cost of schooling. Some middle-income societies also have non-trivial transfer schemes to parents, such as the means-tested child allowance in Brazil and South Africa (Mourão & Jesus, 2012; Triegaardt, 2005). In middle-income societies with low fertility, such as China and Iran, the economic cost of childbearing is mentioned by parents as a reason why they don't have more children and is part of the public discourse (e.g.

Gholipour & Farzanegan, 2015; Zhenzhen, Cai, Feng, & Baochang, 2009). It seems likely that public transfers are also important for childbearing in middle-income countries, though this is an under-researched area relative to the large amount of research on fertility and family policy in high-income countries. Many European programmes to socialize the cost of childrearing were introduced at lower levels of development. France introduced child allowances in 1932/39 and Sweden in 1937, when GDP was similar to contemporary lower-/middle-income countries. This was based on specifically pronatalist concerns (King, 1998; Myrdal & Myrdal, 1934).

A natural question is then whether transfers from non-parents to parents influence fertility, and if so how overall life-cycle distribution patterns in a society may play a role in developing a sustainable population policy. Broadly, public transfers tied to costs of childrearing can be grouped into three categories, all of which represent the state socializing parts of the cost of childrearing. Most of the public transfers of overall consumption in NTA (Figure 4) belong to the third category, while the first and second categories are only visible on a more detailed accounting level (Figure S1).

(1) Many countries provide direct transfers of money to parents (not children). Such allowances can come through child allowances paid at birth, continuously during the upbringing of a child, as tax deductions for parents, and parental leave benefits. Benefits like these are common both in middle-income and high-income countries (Thévenon, 2011), though they vary considerably in scope and extent. From an economic life-cycle perspective, such transfers to parents coincide with the age when individuals make the greatest contribution in taxes to government budgets (see supplemental material for transfers in Sweden). As such, they are a form of transfer from non-parents to parents in a population.

(2) In some countries there are substantial government subsidies for childcare outside the household. Such benefits are only common in some of the developed OECD countries. They can be seen as a way of socializing the cost of caring for children and of encouraging female labour force participation. Where such schemes are most developed, in Scandinavia, parents pay only a small fraction of the total cost of daycare. Unlike transfers of money to parents that are mostly a cost for governments, childcare increases labour force participation and tax revenues. As such, they do not necessarily imply transfers of resources from non-parents to parents, though this is likely

the effect at high subsidy levels. Regardless, they are a clear example of a society socializing the cost of having children.

(3) Nearly all governments fund some of the costs of education and healthcare for children, though in some low-income societies parents still bear most of these costs. This differs substantially from the other expenditures, as it is undoubtedly an investment in the children themselves, rather than transfers to their parents. Such schemes represent socialization of the cost of childrearing in society, but can also be viewed as social investments in human capital.

These three differ in the extent to which they provide indispensable services for society. Education is a major part of the total consumption of children but also has a large number of positive effects for children themselves and society at large. The returns on education at an individual level are typically large (Psacharopoulos & Patrinos, 2004). Societies also seem to underinvest in education (Psacharopoulos & Patrinos, 2004) and, to the extent that parents privately fund education, this will almost certainly lead to huge inequalities in opportunity. Similarly, the costs of healthcare early in life are limited and have very positive outcomes. Therefore, it seems unlikely that any societies would want to reduce the total amount of investment in education and child health or decrease the public share of such costs. This is particularly the case in less affluent societies. Socialization of the costs of education can easily be justified based on how educational success can make the entire society wealthier, even when parents are unwilling to privately invest in their children (Becker & Murphy, 1988).

Subsidies to parents, on the other hand, reflect a direct transfer of resources from non-parents to parents. Cash benefits will, of course, often be used for the consumption needs of children, but they will invariably improve the finances of parents at the expense of non-parents. Such transfers are ethically complex if population growth reduces the welfare of future generations. Many childrearing subsidies are justified by social equity concerns (including gender equity if paid to mothers), alleviating child poverty, and giving children equal opportunities in life. These concerns may often be valid, and, if so, transfers should also target these groups with high accuracy. Universal, flat, or regressive subsidies are difficult to justify based on social equity concerns. In many countries, parental leave benefits are much higher for higher-income parents, which is hardly consistent with maximizing equality of opportunity. Similarly, child allowances – unlike other

sources of income – are typically exempt from progressive taxation, which benefits wealthier individuals.

Spending on subsidized childcare is more ambiguously associated with transfers from non-parents to parents, given that it encourages labour force participation among parents (normally women). The extent to which subsidized parental care arrangements are economically efficient differs from context to context. The very high uptake of and subsidies for parental leave in Scandinavia reflect substantial transfers from non-parents to parents. Much of the debate on family policy focuses on how policy measures are positioned towards either a male-breadwinner or dual-earner family constellation, where a comparable amount of family spending in different welfare regimes can both promote and depress female labour force participation (Esping-Andersen & Billari, 2015; McDonald, 2000; Thévenon, 2011). Promoting a society based on a dual-earner model promotes gender equality and has many advantages at times of high dissolution rates for unions. Given that subsidized childcare supports combining paid labour and childrearing (and consequently increases the female labour force participation of parents) and given the educational benefits of pre-schools, there are likely many positive societal benefits of preschool subsidies beyond altering the incentive structure for childbearing. Many other family policies – such as quotas for parental leave by gender and individual taxation – promote a dual-earner society without transfers from non-parents to parents. Whether female labour force participation, net of governmental transfers, has a positive or negative effect on fertility is currently an unsettled question.

Under the assumption that population growth has negative externalities given current fertility levels it would seem that many societies excessively transfer resources from non-parents to parents. The question arises of what aspects of childrearing should be socialized. Based on the reasoning above, to the degree that the socialization of childbearing should be related to population policy, it is primarily the extent of child allowances, tax breaks, and parental leave benefits that should be increased or reduced if governmental transfers are a tool to affect fertility levels. To the extent that transfers to families serve important goals of societal equity, then an alternative is to address equity issues directly, applying progressive taxation and benefits targeted to less well-off families.

Implications for future fertility in middle-income countries

I have argued in the present article that global population growth depends greatly on fertility across all countries, and that, in many of these, fertility cannot be understood outside the context of a policy framework in which resources are transferred from non-parents to parents. This is most important in high-income countries (Lee & Mason, 2011b) but also extends to upper-middle-income countries and plausibly also lower-middle-income countries. Recent family demography theories suggest that in OECD countries where such transfers are lower, such as in East Asia, fertility levels fall well below 2 children per woman (cf. Esping-Andersen & Billari, 2015; McDonald, 2000).

As discussed earlier, current forecasts project fertility levels close to or below 2 children per woman for most countries in the following decades, with few societies having a TFR above 2.5. The great majority of the world's population will thus live in societies in which fertility is based on deliberate choices made by women and men. This implication is largely not reflected in the discourses on population policies and possible negative externalities caused by increasing world population size – discourses that continue to focus on family planning and the unmet need for contraception. Research on population policy, negative externalities of population growth, and determinants of future population size have typically focused on family planning programmes (Bongaarts, 2016; Bongaarts et al., 1990; Bongaarts & O'Neill, 2018; Gerland et al., 2014). Such a discussion has been natural in relation to the fertility observed around the world in the second half of the 20th century (Lam, 2011) but is likely less relevant if we wish to understand future fertility developments.

Instead, population policy should pay more attention to institutional support for childbearing, and the degree to which countries socialize childrearing. A view of population policy through the lenses of only the poorest countries is insufficient, despite that this perspective has dominated discussions of possible overpopulation. In fact, given current population forecasts (United Nations Population Division, 2017), fertility will not be strongly correlated with GDP during the next decades, except for in the poorest quintile of countries in the world. A focus on fertility policy in high-income contexts seems particularly relevant given that most negative environmental impact originates in the richer half of the world.

In the near future, government transfers will probably still play only a marginal role in understanding fertility in low-income countries. In such societies, primarily in sub-Saharan Africa, family planning programmes will likely continue to be more important than government transfers for population developments due to the small scope of transfers both from individuals to the state and from the state to individuals. However, in many middle-income countries, which have the greatest share of the world population (around three quarters as of 2019), some socialization of childrearing already takes place and may or may not increase in scope as these societies grow wealthier. The policy choices of such societies – to what extent they will choose to socialize the costs of primary and secondary education and make direct transfers to parents – will have a great and direct impact on future population developments. Some societies may achieve increasing material welfare, with relatively weak central governments, or there might be strong opposition to the government taking an increasing financial role in people's lives. In such societies, given the absence of socialized childcare, fertility will likely drop. In middle-income societies with weak central governments, low fertility is therefore likely.

A related prediction is that, without an expansion of government transfer systems from non-parents to parents that socialize the cost of childrearing, it is likely that fertility will continue to be very low in middle-income countries. Current countries with weak socialization of the costs of childrearing (such as in East Asia and Southern Europe) have very low fertility. It seems plausible that fertility will decrease to very low levels in many current middle-income societies, and that TFRs well below 2 will be common across the world, even outside high-income countries. Given developments in Iran, China, Thailand, and some states in India, which already have a TFR below 1.7, this future may arive quite soon.

As a determinant of future population growth, family planning will be increasingly less important, as both unintended and unwanted pregnancies are increasingly uncommon with lower fertility. However, the current trajectories of population growth would likely be substantially higher if programmes were not adequately funded and maintained (Bongaarts, 2016). Family planning programmes will continue to be of immense importance to the quality of life of women and children. Such programmes ought to remain substantial, well-funded, and worthy of increasing attention and investment (e.g. Glasier, Gülmezoglu, Schmid, Moreno, & Van Look, 2006). However, if future population policy is going to have a significant impact for global fertility, it

must put more focus on fertility in low-fertility societies. A focus on family planning, as a pathway to a sustainable global population, cannot be the whole solution.

Conclusion

Determinants of childbearing decisions are increasingly similar across the world, and levels of fertility are converging and will continue to do so. At the same time, a wealthier and larger future world population will almost certainly bring significant externalities with respect to environmental challenges, such as climate change and global biodiversity loss, and the long term sustainability of human populations. Development has previously been associated with increasing socialization of the cost of childrearing. Some of this is related to government investments in the education and health of children – investments that increase as societies grow richer. At the same time, many (but not all) high-income countries have increasingly socialized other costs of childbearing although the extent of such transfers varies substantially across high- and middle-income states. Socializing some costs of childbearing is beneficial to societies and will continue to play an important role in the social structure of both richer and poorer societies. However, many subsidies that are likely to increase fertility are only weakly related or unrelated to investment in human capital and do not help promote equality by targeting only disadvantaged groups. Many of these subsidies primary effect is to transfer resources from non-parents to parents.

Evidence of the effects of fertility on the prosperity of societies suggests that low, but not very low, fertility has few negative trade-offs. This is good news, as many forecasts concerning what constitutes a sustainable total population size for the next century are well below the current projections of the world population in 2100 (Cohen, 1996; Daily & Ehrlich, 1992; Dasgupta & Dasgupta, 2017; Wackernagel & Rees, 1996). Regardless of whether population growth is seen as a severe existential risk due to environmental impacts or just as a negative externality that will lower the well-being of current and future generations, the extent of life-course transfers is a viable pathway to changing population trajectories. The importance of socialization of childrearing is most relevant in low-fertility societies due to both the high proportion of all future births in such societies (due to the large and increasing share of the world population) and the disproportionate impact of negative externalities from consumption in low-fertility societies (see Figure 2b).

The history of family planning and population policy for the entire 20th century has been highly controversial, and much of the discourse, as well as practical policy, has been seen as racist, violating the rights of women, and contrary to human rights (e.g. Feng, Cai, & Gu, 2013; Freedman & Isaacs, 1993; Hartmann, 1995). Traditional family planning policies have focused on some *other* group reducing the number of children they have. Population policy that focuses on institutional transfers from the government is in many ways less ethically problematic. In all democratic societies, such policies are constantly changing and are ultimately determined by elected politicians. It seems plausible that many moderately wealthy societies will socialize some aspects of the costs of childbearing, and democratic societies already display a wide range of such policies. Few strong ethical objections are related to reducing or increasing already existing transfers from non-parents to parents as a way of affecting fertility rates. Unlike family planning discourses and policies, a focus on public transfers puts an equal (or larger) focus on richer societies, which are responsible for most contemporary and historical negative environmental impacts, such as global land use and CO_2 emissions. As argued earlier, it is likely not desirable to stop socialization of investments in education or health, but policies aimed at economic transfers of resources to parents could be the focus of such considerations. Some socialization of childrearing will continue to play an important role in future welfare states, as will policy to increase female labour force participation, but policymakers may put more emphasis on the extent to which policies will incentivise childbearing

Societies need to come closer to a consensus concerning what constitutes a sustainable population size at a national and global level. In other words, we need to determine what population size is both consistent with an age structure that creates viable models for distributing resources across the life course and sustainable, with respect to the material and non-material welfare of future generations and the biosphere. With converging fertility levels across the world, fertility determinants and the role of government in socializing the cost of childcare will likely also converge across countries.

Given the common view among researchers that the primary global challenge during the next century is a too large, not a too small, global population, the present article has largely been framed under the assumption that a growing population has negative consequences for future generations. Another underlying assumption is that the world population should be viewed from a global

perspective, as the challenges of population growth are inescapably global and shared by current and future generations. Researchers with primarily nationalistic concerns may not share these assumptions. It should be noted that it is highly likely that some societies will have very low fertility in this century, and the lowest forecasts of a future population are quite low. The importance of socialization of childcare will be equally important in a world with a rapidly shrinking population and where negative global population growth has a negative impact on the well-being of the population. In a scenario where population growth is a positive externality, a society might wish to instead increase the extent of socialization of childbearing for the benefit of future generations (e.g. Gál, Vanhuysse, & Vargha, 2018).

References

Becker, G. S., & Murphy, K. M. (1988). The Family and the State. *The Journal of Law & Economics, 31*(1), 1-18.

Björklund, A. (2006). Does family policy affect fertility? *Journal of Population Economics, 19*(1), 3-24.

Bloom, D., Canning, D., & Sevilla, J. (2003). *The demographic dividend: A new perspective on the economic consequences of population change*: Rand Corporation.

Bohn, H., & Stuart, C. (2015). Calculation of a population externality. *American Economic Journal: Economic Policy, 7*(2), 61-87.

Bongaarts, J. (1978). A framework for analyzing the proximate determinants of fertility. *Population and Development Review, 4*(1), 105-132.

Bongaarts, J. (2016). Development: Slow down population growth. *Nature News, 530*(7591), 409.

Bongaarts, J., Mauldin, W. P., & Phillips, J. F. (1990). The demographic impact of family planning programs. *Studies in family planning, 21*(6), 299-310.

Bongaarts, J., & O'Neill, B. C. (2018). Global warming policy: Is population left out in the cold? *Science, 361*(6403), 650-652.

Casterline, J. (2001). Diffusion processes and fertility transition: Introduction. In J. Casterline (Ed.), *Diffusion processes and fertility transition: selected perspectives* (pp. 1-38). Washington, DC: National Academies Press.

Chayanov, A. (1925[1966]). *On the theory of peasant economy*. Homewood, Ill.: American Economic Association translation series.

Coale, A. J., & Hoover, E. M. (1958). *Population growth and economic development in low-income countries : a case study of India's prospects*. Princeton, N.J.: Princeton University Press.

Cohen, J. E. (1996). *How many people can the earth support?* New York: Norton.

Daily, G. C., & Ehrlich, P. R. (1992). Population, sustainability, and Earth's carrying capacity. *BioScience, 42*(10), 761-771.

Dasgupta, A., & Dasgupta, P. (2017). Socially embedded preferences, environmental externalities, and reproductive rights. *Population and Development Review, 43*(3), 405-441.

Demeny, P. (1975). Population policy: The role of national governments. *Population and Development Review*, 147-161.

Ehrlich, P. R., & Holdren, J. P. (1971). Impact of population growth. *Science, 171*(3977), 1212-1217.

Esping-Andersen, G., & Billari, F. C. (2015). Re-theorizing Family Demographics. *Population and Development Review, 41*(1), 1-31.

Feng, W., Cai, Y., & Gu, B. (2013). Population, policy, and politics: How will history judge China's one-child policy? *Population and Development Review, 38*, 115-129.
Freedman, L. P., & Isaacs, S. L. (1993). Human rights and reproductive choice. *Studies in family planning*, 18-30.
Gál, R. I., Vanhuysse, P., & Vargha, L. (2018). Pro-elderly welfare states within child-oriented societies. *Journal of European Public Policy, 25*(6), 944-958.
Galloway, P. R. (1988). Basic patterns in annual variations in fertility, nuptiality, mortality, and prices in pre-industrial Europe. *Population Studies, 42*(2), 275-303.
Gardiner, S. M. (2004). Ethics and global climate change. *Ethics, 114*(3), 555-600.
Gauthier, A. H. (2007). The impact of family policies on fertility in industrialized countries: a review of the literature. *Population Research and Policy Review, 26*(3), 323-346.
Gerland, P., Raftery, A. E., Ševčíková, H., Li, N., Gu, D., Spoorenberg, T., . . . Lalic, N. (2014). World population stabilization unlikely this century. *Science, 346*(6206), 234-237.
Gholipour, H. F., & Farzanegan, M. R. (2015). Marriage crisis and housing costs: Empirical evidence from provinces of Iran. *Journal of Policy Modeling, 37*(1), 107-123.
Glasier, A., Gülmezoglu, A. M., Schmid, G. P., Moreno, C. G., & Van Look, P. F. (2006). Sexual and reproductive health: a matter of life and death. *The Lancet, 368*(9547), 1595-1607.
Hartmann, B. (1995). *Reproductive rights and wrongs : the global politics of population control*. Boston, Mass.: South End Press.
Holdren, J. P., & Ehrlich, P. R. (1974). Human Population and the Global Environment: Population growth, rising per capita material consumption, and disruptive technologies have made civilization a global ecological force. *American Scientist, 62*(3), 282-292.
Hutchinson, E. P. (1967). *The population debate : The development of conflicting theories up to 1900*. Boston: Houghton Mifflin.
IPCC. (2014). *Climate Change 2014: Synthesis Report*. Geneva, Switzerland: IPCC.
Jones, G. W. (2012). Population policy in a prosperous city-state: Dilemmas for Singapore. *Population and Development Review, 38*(2), 311-336.
Jorgenson, A. K., & Clark, B. (2010). Assessing the temporal stability of the population/environment relationship in comparative perspective: a cross-national panel study of carbon dioxide emissions, 1960–2005. *Population and Environment, 32*(1), 27-41.
Keyfitz, N. (1991). Population and Development within the Ecosphere: One View of the Literature. *Population Index, 57*(1), 5-22. doi:10.2307/3643719
King, L. (1998). "France Needs Children": Pronatalism, Nationalism and Women's Equity. *The Sociological Quarterly, 39*(1), 33-52.
Lam, D. (2011). How the world survived the population bomb: Lessons from 50 years of extraordinary demographic history. *Demography, 48*(4), 1231-1262.
Lee, R. (1987). Population dynamics of humans and other animals. *Demography, 24*(4), 443-465.
Lee, R., & Mason, A. (2010). Fertility, human capital, and economic growth over the demographic transition. *European Journal of Population/Revue européenne de Démographie, 26*(2), 159-182.
Lee, R., & Mason, A. (2011a). Lifecycles, support systems, and generational flows: Patterns and change. In R. Lee & A. Mason (Eds.), *Population aging and the generational economy: A global perspective* (pp. 79-106). Cheltenham: Edward Elgar.
Lee, R., & Mason, A. (2011b). *Population aging and the generational economy : a global perspective*. Cheltenham: Edward Elgar.
Lee, R., & Mason, A. (2014). Is low fertility really a problem? Population aging, dependency, and consumption. *Science, 346*(6206), 229-234.
Livi-Bacci, M. (2007). *A concise history of world population*. Oxford: Blackwell.
Luci-Greulich, A., & Thévenon, O. (2013). The impact of family policies on fertility trends in developed countries. *European Journal of Population/Revue européenne de Démographie, 29*(4), 387-416.

Malthus, T. R. (1798). *An essay on the principle of population, as it affects the future improvement of society. With remarks on the speculations of Mr. Godwin, M. Condorcet, and other writers*. London: J. Johnson.

Mason, A. (1986). *Population growth economic development and family planning*. Paper presented at the Asian and Pacific population forum.

McDonald, P. (2000). Gender equity in theories of fertility transition. *Population and Development Review, 26*(3), 427-439.

Meyer, W. B., & Turner, B. L. (1992). Human population growth and global land-use/cover change. *Annual review of ecology and systematics, 23*(1), 39-61.

Milligan, K. (2005). Subsidizing the stork: New evidence on tax incentives and fertility. *The Review of Economics and Statistics, 87*(3), 539-555.

Morgan, S. P. (2003). Is low fertility a twenty-first-century demographic crisis? *Demography, 40*(4), 589-603.

Mourão, L., & Jesus, A. M. d. (2012). Bolsa Família (Family Grant) Programme: an analysis of Brazilian income transfer programme. *Field Actions Science Reports, 4*.

Myrdal, A., & Myrdal, G. (1934). *Kris i befolkningsfrågan [Crisis in the Population Question]*. Stockholm: Bonnier.

Mörk, E., Sjögren, A., & Svaleryd, H. (2013). Childcare costs and the demand for children—evidence from a nationwide reform. *Journal of Population Economics, 26*(1), 33-65. doi:10.1007/s00148-011-0399-z

New, M., Liverman, D., Schroder, H., & Anderson, K. (2011). Four degrees and beyond: the potential for a global temperature increase of four degrees and its implications: The Royal Society.

Neyer, G., & Andersson, G. (2008). Consequences of family policies on childbearing behavior: effects or artifacts? *Population and Development Review, 34*(4), 699-724.

O'Neill, B. C., Liddle, B., Jiang, L., Smith, K. R., Pachauri, S., Dalton, M., & Fuchs, R. (2012). Demographic change and carbon dioxide emissions. *The Lancet, 380*(9837), 157-164.

Preston, S., & Donaldson, P. (1986). Population growth and economic development. *Asia-Pacific population journal, 1*(2), 3-12.

Psacharopoulos, G., & Patrinos, H. A. (2004). Returns to investment in education: a further update. *Education economics, 12*(2), 111-134.

Rindfuss, R. R., Guilkey, D. K., Morgan, S. P., & Kravdal, Ø. (2010). Child-care availability and fertility in Norway. *Population and Development Review, 36*(4), 725-748.

Ripple, W. J., Wolf, C., Newsome, T. M., Barnard, P., & Moomaw, W. R. (2019). World Scientists' Warning of a Climate Emergency. *BioScience*. doi:10.1093/biosci/biz088

Samuelson, P. A. (1975). The optimum growth rate for population. *International Economic Review*, 531-538.

Sanderson, E. W., Jaiteh, M., Levy, M. A., Redford, K. H., Wannebo, A. V., & Woolmer, G. (2002). The human footprint and the last of the wild: the human footprint is a global map of human influence on the land surface, which suggests that human beings are stewards of nature, whether we like it or not. *AIBS Bulletin, 52*(10), 891-904.

Singh, S., Sedgh, G., & Hussain, R. (2010). Unintended pregnancy: worldwide levels, trends, and outcomes. *Studies in family planning, 41*(4), 241-250.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., . . . De Wit, C. A. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science, 347*(6223), 1259855.

Striessnig, E., & Lutz, W. (2013). Can below-replacement fertility be desirable? *Empirica, 40*(3), 409-425. doi:10.1007/s10663-013-9213-3

Thévenon, O. (2011). Family policies in OECD countries: A comparative analysis. *Population and Development Review, 37*(1), 57-87.

Toledano, E., Frish, R., Zussman, N., & Gottlieb, D. (2011). The effect of child allowances on fertility. *Israel Economic Review, 9*(1).

Triegaardt, J. D. (2005). The Child Support Grant in South Africa: a social policy for poverty alleviation? *International Journal of Social Welfare, 14*(4), 249-255.

Tung, A.-C. (2011). Consumption over the lifecycle: an international comparison. In R. Lee & A. Mason (Eds.), *Population aging and the generational economy: A global perspective* (pp. 136-160). Cheltenham: Edward Elgar.

United Nations Population Division. (2015). *Trends in Contraceptive Use Worldwide 2015 (ST/ESA/SER.A/349)*. New York: United Nations.

United Nations Population Division. (2017). World Population Prospects: The 2017 Revision, Key Findings and Advance Tables. *Working Paper No. ESA/P/WP/248*.

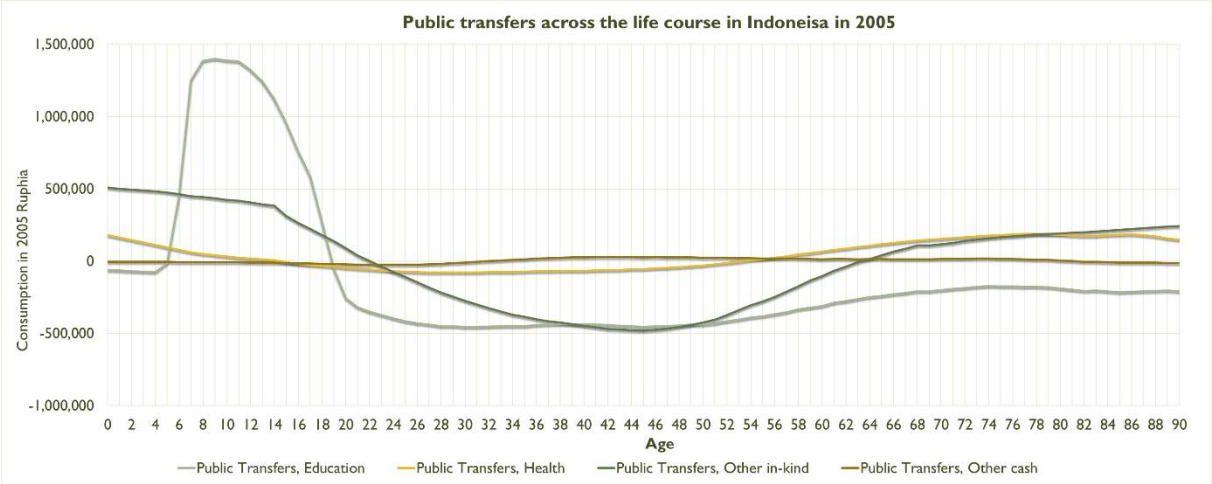
Wackernagel, M., & Rees, W. E. (1996). *Our ecological footprint : reducing human impact on the earth*. Philadelphia, Pa.: New Society Publishers.

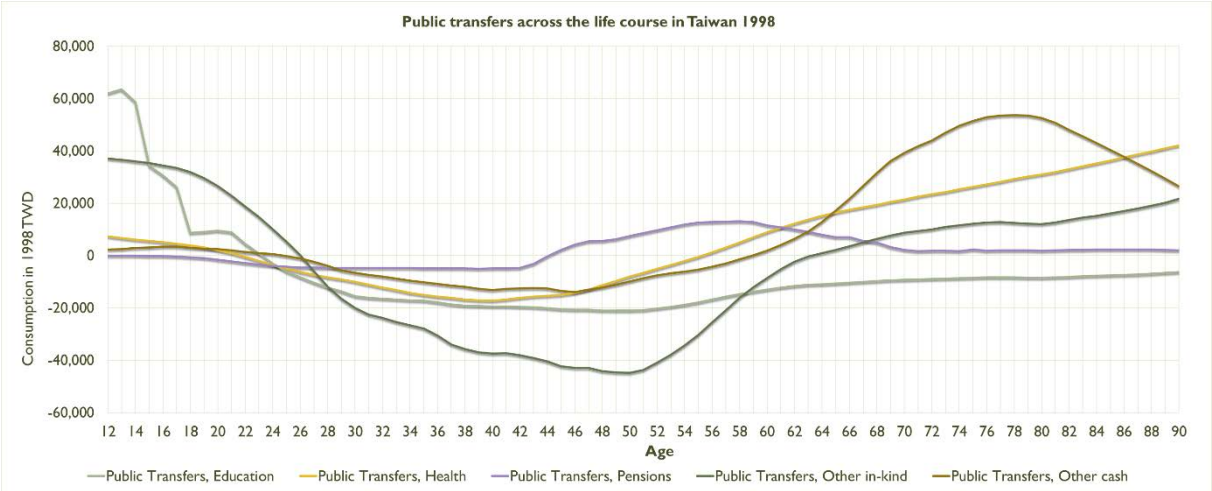
Weinzettel, J., Hertwich, E. G., Peters, G. P., Steen-Olsen, K., & Galli, A. (2013). Affluence drives the global displacement of land use. *Global Environmental Change, 23*(2), 433-438.

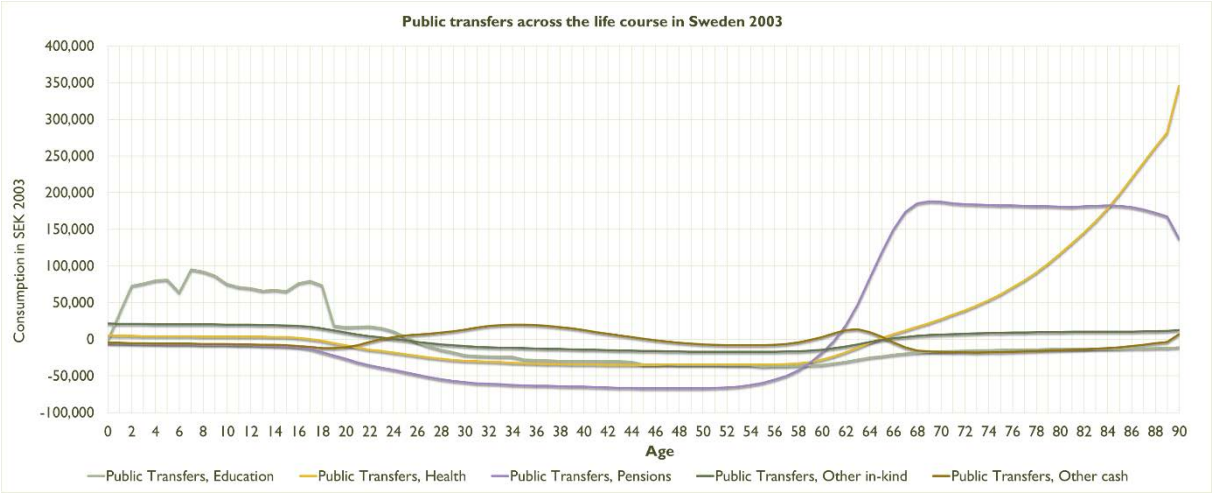
Zhenzhen, Z., Cai, Y., Feng, W., & Baochang, G. (2009). Below-replacement fertility and childbearing intention in Jiangsu Province, China. *Asian Population Studies, 5*(3), 329-347.

Supplementary materials

Supplemental figure S1: Public transfers across age groups and across the life course for Indonesia, Taiwan, and Sweden







Source: NTA Data, see supplemental material

Supplemental material – Description of NTA data material

The empirical analyses shown in the study are based on data from the National Transfers Account (NTA) project (Figures 3,4, S1). For a general description of the NTA project see Lee and Mason (2011).

The researchers in the NTA project have calculated inflows and outflows of income and expenditure for each age group in a society. This is done by attributing governmental expenditure from government accounts to the age classes that consume public services, as well as who pay taxes (both income-based and consumption-based such as VAT). For private expenditures, household surveys are used. Such calculations are both done aggregate for the total population of a country, and normalized over the life course (the data in the study is presented like this). For a detailed description of the methodology see Mason and Lee (2011).

All the NTA-data is based on cross-sectional information from a single year. As such, it gives a period measure of how transfers looked in that specific year, by means of a synthetic cohort. As such, the trends displayed are reflective of budget and household priorities in that specific year, and may represent transfers that are not either demographically or financially stable for future generations. Nevertheless, they give a clear picture of how resources are transferred between age groups at that specific time point, and what priorities the society made in a given year. In particular in societies that may see very rapid economic, institutional and demographic change (e.g. Indonesia

and Nigeria), the period estimates may therefore accurately capture how societies will bear the burden of for example future elderly care, though such concerns are less important for understating how societies socialize childbearing where a period view is quite accurate.

For access and documentation of data for the 4 specific countries see (Hallberg, Lindh, Öberg, & Thulstrup, 2011; Maliki, 2011; Soyibo, Olaniyan, & Lawanson, 2012; Tung & Lai, 2011). All calculations are shown in the local currency at the year of the data collection.

Explanation of data in Figure 3:

The data refers to all sources of income over the life course from paid labor including self-employment. It is therefore affected by both wages, labor force participation, and unemployment, and hours worked. It is calculated before any taxation. Consumption refers to all expenditures of individuals both those paid by individuals themselves (bought on the market), and received from the government or family (pensions, gifts etc). Figure 3 shows the pattern for a hypothetical person over his/her life course assuming that they produce/consume as a person of that age-class alive in the year of the survey, for a person that survives to old age. The total aggregated costs for society differs substantially if the proportion of young/old individuals in the population are high, see the country profiles in the underlying data for such results.

Explanation of data in Figure 4:

The data refers to the source of the consumption shown in Figure 3.

Public Consumption, Other than health and education

This category refers to public expenditures cost that does not go to individuals, and therefore cannot be assumed to be paid or received by individuals of a certain age. It is assumed to be distributed equally across the life course. Examples of such expenditures are costs for the military, infrastructure, and administration, police, and courts.

Private Consumption, Other than health and education

This category refers to most expenditures of individuals in a society that is not related to health and education. It includes costs for accommodation, transportation, food, leisure, and private costs of for example hiring a cleaner. It can either be paid for by other family members or from own income.

Public Consumption, Education

This category refers to the government total cost for primary, secondary and tertiary education. It differs across countries if public daycare is included in this category or not. In the Swedish NTA accounts the substantive costs of public daycare are included as an educational expenditure.

Private Consumption, Education

This category refers to the cost of education paid for by the parents, or in the case of tertiary education also by the university student. It also includes cost such as school uniforms and school books.

Public Consumption, Health

This refers to all government spending on health care, including medicine.

Private Consumption, Health

This refers to all private spending on health care and medicine, including user fees in highly subsided systems.

Other comments: The figure for Sweden is truncated at the top as otherwise the high public consumption at very old ages would make other patterns hard to see (see Figure 3)

Explanation of data for Figure S1:

The data in Figure S1 is not based on expenditures of a given age class but refers to if an age group is the net beneficiary or benefactor of a transfer. For Indonesia and in particular Nigeria it should be noted that the scale of public transfers is quite low compared to total consumption and income (Figure 4).

Public Transfers, Education

This refers to who receives and pay for the public expenditures of education.

Public Transfers, Health

This refers to who receives and pay for the public expenditures of health care.

Public Transfers, Pensions

This refers to who receives and pay for the public expenditures of pensions. In some countries there is a variety of different schemes supporting old people. These systems can variously be categories as general cash transfers (see Public Transfers, Other cash) or as pensions.

Public Transfers, Other in-kind

This refers to other expenditures of a government, which a citizen receives, that is not paid in cash and is none of the other categories. Examples are food vouchers, childcare (if not classified as education), or help with transportation or cleaning paid for by the government.

Public Transfers, Other cash

This refers to all transfers to an individual from the government that is paid in cash. In some countries this is mostly welfare schemes to low-income indivudals, but can also be for example parental leave schemes, child allowances.

Other comments: The figure for Indonesia does not include a separate account for pension payments.

Calculations for Swedish childcare and child allowance costs.

The cost of child allowances are calculated by summing up the yearly expenditures of the government of Sweden of child allowances and parental leave benefits in 2018 (Ekonomistyrningsverket, 2018), with the number of births in 2018. The amount was 650,488 SEK. In a steady state this will approximate how much is spent on a child, given that the age-structure, benefits, and fertility remains reasonably constant (as such it is a very approximate calculation).

The total expenditure on pre-school and after school activities in Sweden in 2016 (Skolverket, 2017), divided by the number of children which was 754,702. SEK Similar to above calculations this amounts to the approximate cost over the life course of a child for such expenditures.

The mean disposable income in Sweden 2016 was 281,600 SEK (Statistics Sweden, 2018). A conversion rate of 10 SEK to 1 EUR was used, a reasonable approximation of the exchange rate of 2016 and 2017.

References

Ekonomistyrningsverket. (2018). Utfallet för statens budget [Outcome of state budget - Sweden]. *ESV Rapport, 2018:32*.

Hallberg, D., Lindh, T., Öberg, G., & Thulstrup, C. (2011). NTA Country Report, Sweden 2003. *National Transfer Accounts. URL: http://www.ntaccounts.org*.

Lee, R., & Mason, A. (2011). *Population aging and the generational economy : a global perspective*. Cheltenham: Edward Elgar.

Maliki. (2011). NTA Country Report, Indonesia 2005. *National Transfer Accounts. URL: http://www.ntaccounts.org*.

Mason, A., & Lee, R. (2011). 3. Introducing age into national accounts. In R. Lee & A. Mason (Eds.), *Population aging and the generational economy: A global perspective* (pp. 55-78). Cheltenham: Edward Elgar.

Skolverket. (2017). Kostnader för skolväsendet och annan pedagogisk verksamhet 2016. *PM, 2017:1306*.

Soyibo, A., Olaniyan, O., & Lawanson, A. O. (2012). NTA Country Report, Nigeria 2004. *National Transfer Accounts. URL: http://www.ntaccounts.org*.

Statistics Sweden. (2018). Inkomstrapport 2016– individer och hushåll. *Ekonomisk välfärdsstatistik, 2018:1*.

Tung, A.-C., & Lai, N. M. S. (2011). NTA Country Report, Taiwan 1998. *National Transfer Accounts. URL: http://www.ntaccounts.org*.

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