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Fertility transitions in sub-Saharan Africa
A general review and a case study on desired fertility in the DRC

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Fertility transitions in sub-Saharan Africa

A general review and a case study on desired fertility in the DRC

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Abstract

As fertility rates have decreased to a low and constant level almost everywhere on Earth, it is not the case for many countries in SSA. In particular, the fertility transition is observed to be much slower in SSA. In order to study why this transition is slower in SSA compared to the rest of the world, a literature review is provided first. Then, the situation in one specific country, i.e. the Democratic Republic of the Congo (DRC), is investigated in more detail. Using data from the Demographic and Health Surveys (DHS) Program 2013-14, a descriptive analysis about fertility in the DRC is carried out. In particular, it focuses on the ideal family size (IFS).

The case study about the DRC shows that fertility preferences are lower for women compared to men. The heterogeneity in those preferences is also larger among men. In general, women having lower fertility preferences are coupled with men having lower fertility preferences. The same is true for women and men having higher fertility preferences. Other results show that fertility preferences decrease for higher levels of education and wealth. The opposite effect is found for age. Religion and the type of residence also have a significant effect on fertility preferences. After controlling for other determinants, the regression analysis shows that the effect of wealth on fertility preferences is rather weak. On the other hand, education and age appear to be important determinants of the ideal number of children.

As fertility preferences are an important determinant of actual fertility rates, policy makers should focus on reducing the IFS. Next, contraceptive methods could help achieving the desired fertility through avoiding unwanted pregnancies. Increasing women's empowerment also plays a key role in reducing fertility. Because of the higher costs of having children, women tend to prefer having less children compared to men. When a woman has more bargaining power within the household, the final decision of the household will correspond more to her preferences.

List of abbreviations

DESA	Department of Economic and Social Affairs
DHS	Demographic and Health Surveys
DRC	Democratic Republic of the Congo
FP	Family planning
IFS	Ideal family size
MPSMRM	Ministère du Plan et Suivi de la Mise en œuvre de la Révolution de la Modernité
MSP	Ministère de la Santé Publique
SD	Standard deviation
SSA	Sub-Saharan Africa
TFR	Total fertility rate
UN	United Nations
US	United States
WHO	World Health Organization

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1. Introduction

In 1798, Thomas Malthus published an “Essay on the Principle of Population”, in which he described the link between food supply and population growth (Dunn, 1998). He pointed out that population growth is limited, because an increase in food consumption per capita, due to technical progress, leads to a faster population growth until food consumption falls below the level of subsistence, and hence, population levels stabilize again (Steinmann et al., 1998). Up to 1800, when around 1700 million people were living on planet Earth, this Malthusian trap appeared to be important in explaining the mechanisms of population growth, especially in preindustrial Europe (Lee, 2003). However, after this long period of stagnation, characterized by both high fertility and mortality rates, population trends started to change. A decline in mortality rates in Western Europe marked the start of the demographic transition (Lee, 2003). The drop in mortality rates led to a fast increase in population. After some time, fertility rates also started to decline, decreasing the rate of population growth. When both mortality and fertility rates reached a low and constant level, population growth became zero (Lee, 2003). After its take-off in Western Europe, this demographic transition was observed in many parts of the world and predicted to be completed by 2100 (Lee, 2003). However, different population trends are observed in sub-Saharan Africa (SSA). Although fertility rates in this region started to drop in the 1980s, the decline is much slower compared to the rest of the world (Shapiro & Hinde, 2017). This research will focus on the question why the fertility transition is much slower in SSA compared to the rest of the world.

The remainder of the paper contains a literature review, followed by a case study about the Democratic Republic of the Congo (DRC). The first part of the literature review covers the concept of demographic transition. Different regions across the world are compared and several causes of the transition are investigated. The second part focuses on changes in fertility and considers parents’ decision to have children through the lens of economic theory. To study the demand for children, it is important to take into account the trade-off of having children and the role of women in the decision to have children. Furthermore, policy induced changes are also investigated. In the third and last part, the focus will be on SSA and why the fertility rates in this region do not follow the global trends. First, the current population trends in SSA are described, followed by a description of the ideal family size in SSA and some other key facts linked

to why this region is considered as an exception in terms of fertility. Then, family planning programs and the impact of urbanisation in SSA are studied in more detail. At the end of the section, future fertility trends and challenges, as well as some policy implications are mentioned. The case study at the end of the paper includes a descriptive analysis about fertility in the DRC, using data from the Demographic and Health Surveys (DHS) Program 2013-14. First, it focuses in particular on the ideal family size. Then, some more general findings linked to fertility in the DRC are discussed. The research ends with a conclusion.

2. Literature review

2.1 Demographic transition

2.1.1 The demographic transition model

In 1929, Thompson, an American demographer, developed the Demographic Transition Model (Thompson, 1929). In this model, the process of demographic transition can be divided into four different stages. The first stage is characterized by high levels of both fertility and mortality. Population growth is minimal or even absent. This high stationary stage is followed by a drop in mortality rates, while fertility rates remain high and constant. During this early expansion stage, the population starts to grow rapidly. After some time, a drop in fertility rates is observed. Population still increases, but at a slower rate in this late expansion stage. In the fourth and last stage, also called the low stationary stage, both fertility and mortality rates are low, and the population remains constant (Blacker, 1947; Bongaarts, 2009; Lee, 2003).

Regarding demographic dynamics, it is not yet clear what will happen after this transition. Both fertility and mortality rates might stay at their low level. However, some authors argue that fertility rates might start increasing again (e.g. Feyrer et al., 2008), while others argue that it might decrease even further (e.g. Lutz et al., 2006). Hence, the population will slowly start increasing again or it will start to decrease, respectively. Therefore, future global population trends are highly speculative. For instance, Lee (2003) predicts a global decrease in total fertility rate (TFR) from 2.7 births per woman in 2000 to 2.0 in 2050, whereafter it remains constant until 2100. Whereas global population size is predicted to increase from 6.07 billion in 2000 to 8.92 billion in 2050

and eventually to 9.46 billion in 2100, growth rates will decrease significantly. In 2000, the global population grew at a rate of 1.22% per year. As predicted by Lee (2003), this growth rate will only be 0.33% in 2050 and 0.04% in 2100.

2.1.2 A global view

Globally, there is a large heterogeneity in the take-off of the demographic transition as well as in the length of the different stages across countries (Kirk, 1996). With a decline in mortality rates, starting in 1800, the demographic transition was first observed in Western Europe, whereafter the process took off in many other regions (Lee, 2003; Lee & Reher, 2011). The drop in fertility rates was first observed between 1890 and 1920 in some places in Europe and the United States (US). For less developed countries, such as India and China, the fertility transition started around the mid-1960s. Although it began later, the fertility transition was observed to be faster compared to the transition in Western Europe and the US (Lee, 2003). While most Western countries, including almost all European countries and the US, are currently in the last stage of the demographic transition, or even further (e.g. Germany and Japan), this is not the case for SSA. Whereas a decrease in mortality rates is observed in many SSA countries, their fertility transition is far from complete (Groth & May, 2017). This can be seen in Figure 1, which shows the evolution of the TFR for different regions across the world. For all regions, except for SSA, the TFR started to decrease in the first half of the 1960s or even before. For SSA, the decline started only at the beginning of the 1980s. Note that this does not imply that all SSA countries are an exception regarding the fertility transition. Even within SSA, there is a large heterogeneity in the process of the demographic transition. Fertility trends observed in some of the SSA countries correspond more to global trends, while this is much less the case for other SSA countries. Nowadays, for instance, Niger, the country with the world highest fertility rates as well as highest dependency ratio, and Uganda are in the second stage of the demographic transition (Maga & Guengant, 2017). Some other SSA countries, such as Ethiopia and Rwanda, are currently in the third stage of the demographic transition (Hailemariam, 2017; Schoumaker, 2017).

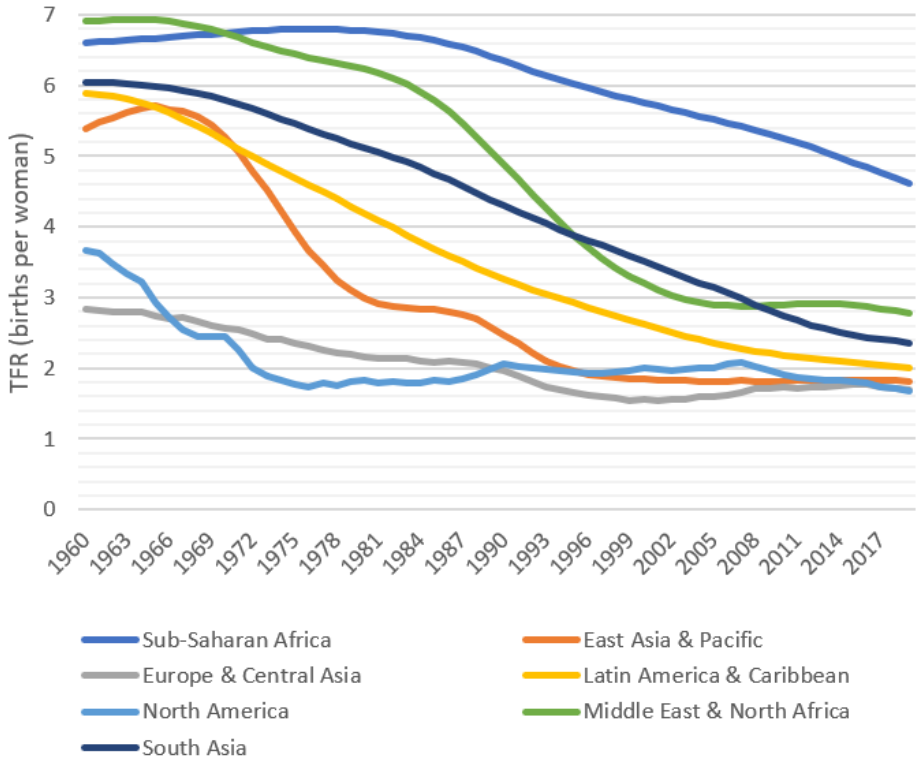

Figure 1: Evolution of total fertility rates per region from 1960 until 2019

Source: derived from The World Bank Group (2022)

The fact that different countries are nowadays at different stages in the transition, is not only a consequence of differences in take-off, but another reason is the large variability in the length of the different stages, as mentioned above. For instance, stage two, characterized by a decrease in mortality rates, took place over 75 to 100 years in Northern Europe, while it only took 20 to 25 years in Eastern Europe. For less developed countries, for which the demographic transition started much later, this stage was achieved in an even shorter period (Kirk, 1996). While the process of demographic transition was spread over two centuries for the United Kingdom, it lasted less than a century for Japan (Roser et al., 2013).

Based on population trends observed today, experts can make projections for the future. Since the start of the transition, in 1800, the population on Earth has increased by a factor of six, and life expectancy has more than doubled. By 2100, Lee (2003) predicts a tenfold increase in global population size compared to 1800 levels, with a ten times higher ratio of elders to children. Moreover, life expectancy will have tripled and the TFR is expected to decrease from six to two births per woman (Lee, 2003). The Population Division of DESA (the Department of Economic and Social Affairs of the United Nations) made projections about the total population for different regions

across the world. The projections for 2020 to 2100 based on the “medium variant” are shown in Figure 2. While the total population is projected to remain constant or even might start to decrease in some regions, this is clearly not the case for SSA. The population in this region is expected to grow tremendously. The future population trends for SSA are discussed in more detail in section 2.3.7.

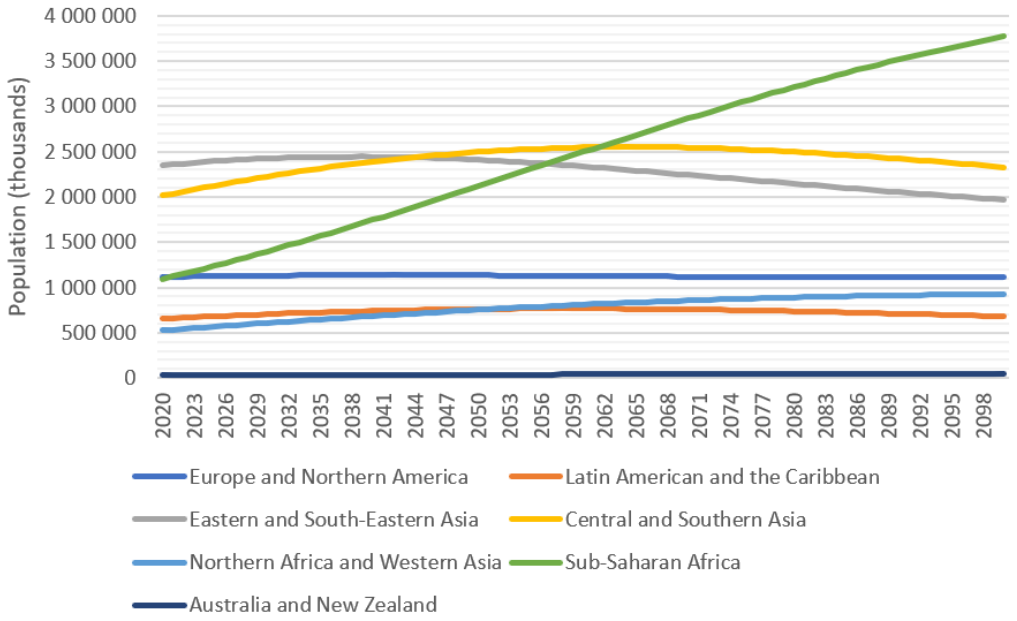

Figure 2: Population projections (medium variant) per region from 2020 until 2100

Source: derived from UN (2019)

2.1.3 Causes for the transition

The mortality decline can be explained by many factors. For the modern world, Kirk (1996) distinguishes three stages of decreasing historical mortality rates. In the first stage, the arrival of public order, linked to increasing incomes in the late eighteenth and early nineteenth century, directly led to less violence and wars. Indirectly, with transport infrastructure, the incidence of famines was reduced considerably. The revolution in medicine, starting at the end of the nineteenth century, introduced the second stage. Until World War I, decreasing incidence of diarrhoea and tuberculosis led to lower child mortality, and eventually also lower infant mortality. The period between World War 1 and World War ll was characterized by improvements in medicine as well as in health education. Thereafter, in the third stage, the use of antibiotics became the main driver of the declining mortality rates (Kirk, 1996). Lee (2003) also mentions the role of the smallpox vaccine and improved personal hygiene.

Additionally, he argues that better nutrition played a major role in increasing longevity. For low-income countries, on the other hand, the decline in mortality rates only began in the twentieth century and those improvements happened almost all at once. As a result, they experienced a much faster increase in longevity compared to countries that experienced an earlier drop in mortality rates (Lee, 2003).

In contrast, explaining the fertility transition is more complicated. Some authors argue that a drop in mortality rates might have a direct effect on fertility. Parents care about the total number of surviving children, not about the number of children born. Hence, declining mortality rates might lead to lower fertility rates (Kirk, 1996; Lee, 2003). Furthermore, children can be regarded as "desirable goods" by their parents. As a result, changes in fertility can also be explained by other, more economic, determinants. The next section focuses more deeply on the fertility transition and its determinants from an economic point of view.

2.2 Fertility transition: Demand for children

2.2.1 Trade-off of having children

In 1994, Pritchett concluded that "fertility is principally determined by the desires for children, contraceptive access or family planning effort more generally is not a dominant, or typically even a major, factor in determining fertility differences" (Pritchett, 1994, p. 39). Parents' desire for children can be studied by analysing the costs and benefits related to having children. On the one hand, children can be considered as an investment in terms of child labour and old age security. On the other hand, parents also take into account the costs of having children. In addition, having children may also directly increase parents' utility for non-economic reasons.

Rosenzweig and Evenson (1977) conclude that there is a positive relationship between child labour and fertility choices. Whereas child labour directly provides physical capital, human capital could be accumulated trough education. Both options (i.e. child labour and education) are regarded as substitutes by Jensen and Nielsen (1994). Parsons and Goldin (1989) made the assumption that each parent wants to maximize their family wealth. As the economic benefits of child labour decrease and the returns from education increase, parents prefer school attendance over child labour. Because

there is a direct cost related to education, it is more profitable for parents to have fewer children. Thus, the decreasing importance of child labour tend to be related to the drop in fertility. The link between education and fertility can also be regarded as the quantity-quality trade-off. Fertility and the number of resources invested into each child are inversely related under a fixed budget constraint. Becker (1960) argues that with an increase in income fertility decreases, but more resources are invested into each child. In other words, parents prefer quality over quantity. This can be explained by the fact that with the process of development, investment in human capital of children becomes increasingly important (Bao, 2019). In other words, the return to the quality of children is higher than the quantity.

Additionally, parents may take into account the support they might get from their children when they get old, called “old age security”, in their decision to have children (Nugent, 1985). This phenomenon is more observed when there are no capital markets, and saving money in the bank is not possible. In this regard, children are considered as assets, transferring income to their parents when they are old (Caldwell, 1976). Galor (2012, p. 25) argues that “the establishment of capital markets in the process of development reduced this motivation for rearing children, contributing to the demographic transition”. Furthermore, by pooling individual risks, for instance with retirement insurances, the decision to have children can be made more efficiently. Besides having surviving children, another important condition for old age security is having loyal children. The importance of this second condition is also lowered with the existence of retirement insurances (Nugent, 1985).

The drop in fertility rates is not only related to decreasing economic benefits of having children, but also to the rise in costs. Schultz (1994) writes that the cost of having children increases with women’s wage. Thus, with a higher income, more children could be afforded, but they also become more expensive in relative terms. With growing labour productivity linked to technological progress, parents increasingly value their time. Therefore, the opportunity cost of childrearing plays a significant role in fertility decisions. Because the cost increases proportionally more than the increase in the total income of both parents, fertility decreases (Galor & Weil, 1996). Lee (2003, p. 174) states that “since women have had primary responsibility for childbearing and rearing, variations in the productivity of women have been particularly important”. He also argues that the demand for non-agricultural products, using mainly educated

labour as input, increases with higher wages, leading to an increase in the return to education. As a result, parents' investments in education may also rise (Lee, 2003).

2.2.2 Women's role in the decision to have children

Since the cost of having children is higher for women than for men, women often prefer to have fewer children (Banerjee & Duflo, 2011; Lutz, 2006). The higher opportunity cost for women is already mentioned in section 2.2.1. These higher costs are not only in terms of time and wages, but maternity may also have a cost. Figures of the World Health Organization (WHO, 2019) show that on average 810 women die each day as a result of being pregnant or giving birth in 2017. 94% of those deaths occurred in low and lower middle-income countries, whereas about two-thirds of all maternal deaths occurred in SSA. Furthermore, women surviving pregnancy and giving birth might suffer from permanent health damage. Maternal deaths and health damage are found to be highest among teenage girls (WHO, 2019).

The final decision on the number of children within a household strongly depends on women's bargaining power. If women have more bargaining power, the final decision of the household is more likely to reflect the woman's preference. Typically, more empowered women are those that are educated and have a job (Banerjee & Duflo, 2011). Thus, when more empowered women prefer to have less children, lower actual fertility rates are found. The results are opposite for less empowered women, for instance living in more patriarchal societies (Komura, 2013). Similar results are found by Feyrer et al. (2008). They found a strong negative correlation between fertility and female labour force participation. A negative correlation between actual fertility rates and female education levels is found in the chapter of Shapiro et al. (2017), suggesting again that female empowerment matters.

2.2.3 Policy induced changes

In addition to the strong effect of the desired number of children on actual fertility rates (Pritchett, 1994), family planning (FP) programs and other types of policies might also have an effect. In particular, there are three main ways in which policies that aim to reduce fertility could operate. The first one is avoiding unwanted pregnancies. For

instance, this can be done through sexual education and FP programs. Evidence from de Silva and Tenreyro (2017) shows that larger fertility declines are found in countries with a higher budget for FP. These efforts also have a strong positive effect on fertility reductions. Typically, those FP programs include the supply of contraception as well as guidance on how they can be used. Bao (2019) writes that thanks to education people might not only gain knowledge about the use of contraceptive methods, but education might also affect their perception about contraception. Moreover, it might have a positive impact on the desire for having smaller families (Bao, 2019). Indirectly, women's education reduces fertility through a positive effect on their bargaining power, as described in section 2.2.2.

Changing the desired fertility is a second way in which those policies could operate. This can be done, for instance, through small-family norms. Small-family norms can be achieved through mass communication, for instance with posters and slogans. The media might also affect those norms (de Silva & Tenreyro, 2017).

Lastly, affecting the cost of having children can also have an effect on fertility. For instance, this could be done through changing female labour force participation, family subsidies, education costs, etc. Moreover, some studies investigated the effect of changing the price of little things. For instance, an article in the Economist (2020) talks about "car seats as contraception". The conclusion is as follows: "Most such cars, though, can comfortably accommodate only two safety seats. So, the older a child must be before no safety seat is required, the longer a family must wait before a third child will fit in the car. Sometimes, that wait will mean no third child is ever conceived and born." Some other programs that are used to reduce fertility are sterilization campaigns, raising the legal age for marriage, limiting the number of children per household, etc.

Also interesting to mention in this regard are FP programs for men. Recently, some of these programs moved their focus towards the male population, instead of focusing only on women. Most common forms of contraception for men are the condom, withdrawal, and vasectomy. Globally, each of these accounts for respectively 5.7%, 4.5%, and 6.8% of total contraceptive use (Glasier, 2010). Another type of FP programs might focus on changing the mindset of men through, for instance, small-family norms.

2.3 Fertility trends in SSA

2.3.1 Population in SSA

During the last sixty years, the population has increased by a factor of five in SSA. Currently, about 1.136 billion people are living in SSA, compared to only 227 million in 1960 (The World Bank Group, 2022). In 1987, population growth peaked in this region and reached 2.91% per year. Today, population growth in SSA is still 2.63% per year, which is much higher compared to the global average population growth of 1.02% per year.

The global average TFR is 2.4 births per woman; it was highest in 1964, reaching 5.1 births per woman. For SSA, the peak was reached in 1975 with a TFR of 6.8 births per woman. The current average TFR for this region is still surprisingly high, i.e. 4.6 births per woman (The World Bank Group, 2022). Those numbers indicate that the fertility transition is still incomplete in this region, which is especially true for three sub-regions, namely Eastern Africa, Central Africa and Western Africa (Groth & May, 2017). In general, the largest declines are found in former British colonies (Kirk, 1996).

Based on data from The World Bank Group (2022), the evolution of TFR for some specific countries in SSA as well as for the average of the whole region is shown in Figure 3. Indeed, as discussed in section 2.1.2, there is a large heterogeneity in fertility trends among different countries in SSA. On the one hand, the drop in fertility rates was already observed before the 1980s for South Africa, Ghana, and Kenya. Today, the fertility rates in these three countries are among the lowest in the region. On the other hand, the decline is observed to be very slow in the DRC, Niger, and Nigeria. In the case of Burundi and Ethiopia, the decline started only around the 1990s.

Currently, the world highest TFR, i.e. 6.8 births per woman, is found in Niger (The World Bank Group, 2022). Maga and Guengant (2017) argue that Niger is the only country in the world in which no drop in fertility rates has been observed. However, the graph shows a little decline during the most recent years. The highest fertility rates are observed in Rwanda, with a peak of on average 8.5 births per woman around 1980. This peak is followed by a strong decrease in fertility. Today, the average is 4.0 births per woman in Rwanda. Kenya, where, after Rwanda, the second highest TFR has been found throughout history has now experienced a huge drop in fertility rates (Kirk, 1996).

In the 1960s, the TFR in Kenya exceeded eight births per woman, whereas today, it is only 3.4 birth per women (The World Bank Group, 2022).

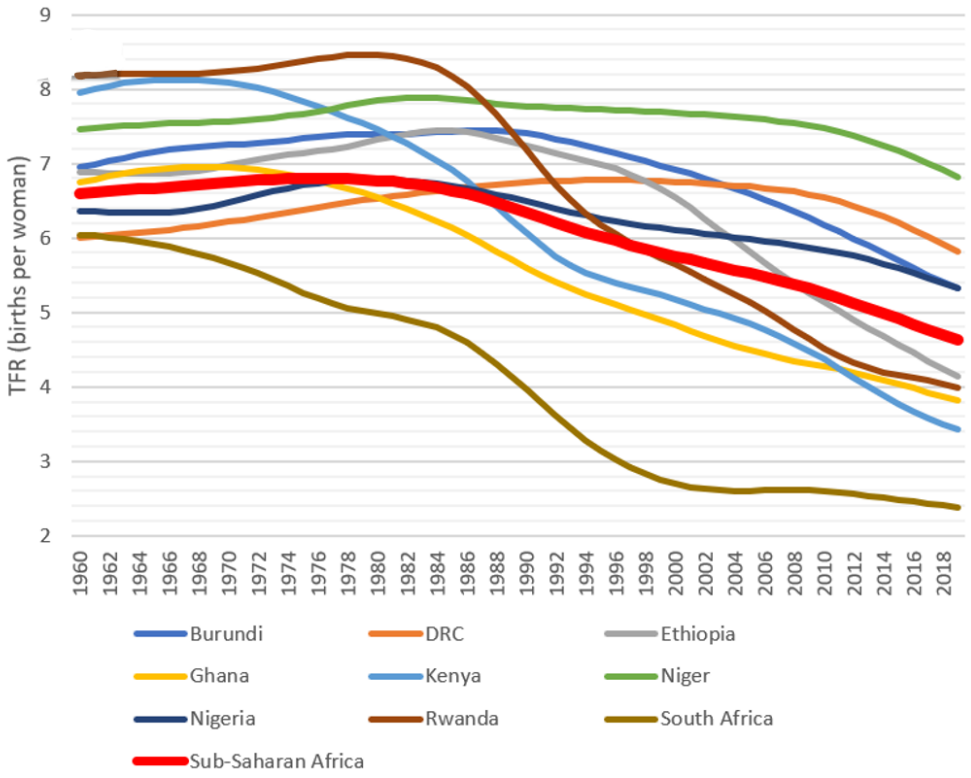

Figure 3: Evolution of total fertility rates for SSA and some specific countries from 1960 until 2019

Source: derived from The World Bank Group (2022)

Also interesting to mention is the positive evolution in life expectancy. Although the average for SSA (61.6 years) is far below the global average (72.7 years), it is a considerable improvement compared to the average for this region in 2000 (50.5 years) (The World Bank Group, 2022).

2.3.2 Ideal family size

An important factor in determining a family's actual fertility rate is the ideal family size (IFS). Bongaarts and Casterline (2018) argue that the decline in IFS is one of the major determinants for the fertility transition. Those fertility preferences could be affected by the costs and benefits of having children (as described in section 2.2.1), increased importance of education, rural-urban migration, drop in mortality rates, or other economic developments (Bongaarts & Casterline, 2018).

Whereas this number is below four births per woman in half of the Asian and Latin American countries, it is above six for most of the SSA countries (Bongaarts & Casterline, 2013). An even larger gap is found when comparing with developed countries. Hence, IFS tend to be lower for a higher level of development. Within SSA, the largest fertility preferences are found in Middle and West Africa (Casterline & Agyei-Mensag, 2017). Except for some countries in the Sahel, Casterline and Agyei-Mesag (2017) argue that those preferences are changing, even in the regions with exceptionally high fertility preferences. In contrast, Walters (2021) argues that those preferences will continue to remain high in SSA. The desire for a large number of children is explained by the pronatalist values that are central in many African societies (Musinguzi, 2017; Walters, 2021). Religion plays a direct role in this respect. Results of the World Fertility Survey, published in 1984 by the National Population Bureau, show that "Up to God" was much answered in SSA compared to other regions to the question on IFS (Caldwell & Caldwell, 1987). In addition, high fertility is rewarded in society (Caldwell & Caldwell, 1987). Still, the "pronatalist" argument should be put in perspective, as others argue in Walters (2021, p. 187) that "colonial demand for taxes heightened African need for the labour of children to work on family-farmed cash crops".

2.3.3 SSA as an exception

Next to the exceptionally high IFS, there are some other key facts that are different in SSA compared to the rest of the world, which could also be linked to the fertility rates. Some authors (e.g. Bongaarts & Casterline, 2013) argue that the lower social and economic development in SSA, together with weak FP programs might be the reason why this region is still at the beginning of the decline in fertility rates.

Both contraception and abortion play a predominant role in reducing actual fertility rates, following a decline in IFS. These contraceptive methods as well as abortion are used to stop women from having unplanned pregnancies (Bongaarts & Casterline, 2013). First and foremost, to have an impact, those methods must be made widely available. In SSA, the share of women for whom contraception was available has doubled in the last 30 years. However, in 2018, this number was still only half of the global average (i.e. of all married women between 15 and 49 years old: 31.5% in SSA

and almost 60% globally) (The World Bank Group, 2022). Limited supply as well as high costs are the main barriers to their availability. Other important elements related to the use of contraception are the knowledge on how to use it, people's perception towards those methods (not only by women, but also by other family members), social acceptance, etc. (Bongaarts & Casterline, 2013).

Furthermore, different birth intervals are observed in SSA. Bongaarts and Casterline (2013) found higher fertility rates for younger and older women in SSA compared to the rest of the world, while those rates were found to be lower for women at intermediate ages. Therefore, they conclude that birth intervals are longer in SSA, indicating that they have longer periods of abstinence and breastfeeding. Casterline and Odden (2016) conclude that the length of birth intervals are increasing globally, but more rapidly in SSA.

Additionally, the benefits of having children, as described in section 2.2.1, might still play a significant role in SSA. Capital markets might not be fully developed or even absent in economically less developed parts of SSA. If this is the case, children might still be considered as a form of insurance at old age. Furthermore, figures of UNICEF (2021) show that about one-fourth of all children in SSA are involved in child labour. This proportion strongly exceeds all other regions in the world.

2.3.4 Family planning programs

In 1976, only one-fifth of all African countries had FP programs in place. Twenty years later, these programs were found in more than two-thirds of the SSA countries (de Silva & Tenreyro, 2017). Compared to the rest of the world, there was a remarkable delay in the implementation of FP programs in SSA. The extremely high population growth rates were much earlier recognized as a serious problem by governments in other developing countries compared to the governments in SSA. De Silva and Tenreyro (2017) argue that this delay in implementation has contributed to the delay in fertility reductions. Their theory is supported by their results, showing a positive relationship between fertility decline and exposure to the programs.

The main goal of FP programs is to "assist women in achieving their reproductive goals" (Bongaarts, 2020, p. 2). Therefore, a high IFS makes it more difficult for those programs to succeed. However, IFS could be affected through messages in the media.

Those programs could have an effect by increasing parents' preferences for smaller families. Moreover, by being exposed to information about contraception, those programs could raise its use directly (Freedman, 1997).

In what follows, some examples of successful FP programs implemented in three SSA countries are described. For each country, a description of the implemented programs is provided first, whereafter some relevant outcomes are discussed.

In 1975, Kenya adopted a five-year family program planning, aiming to lower population growth rates and to improve the health of both children and mothers (Kobiané & Bougma, 2017). The goals of the national population policy, created in 1957, were revised in 1984 and 2000. These include lowering the TFR, increasing the availability of contraception, minimizing reductions in life expectancy at birth, etc. (Kobiané & Bougma, 2017). In 2012, Kenya FP2020 was developed, mainly aiming to increase the use of modern contraceptive methods. Today, up to 58% of all married women are using modern contraceptive methods in Kenya (Family Planning 2020, 2020b). This is a considerable improvement compared to pre-program levels. In 2009, any modern form of contraception was prevalent for only 39% of all married women (The World Bank Group, 2022). Injectable(s) (47.9%) is the number 1 used modern contraceptive method in the country, followed by implant (18.2%), the pill (14.1%), and the male condom (7.9%) (Family Planning 2020, 2020b).

During the early 1990s, there was only one NGO (i.e. the Family Guidance Association of Ethiopia) focusing on FP programs in Ethiopia. In the same decade, the number of NGOs with similar objectives increased rapidly in the country (Hailemariam, 2017). All health service facilities of the government started to provide those programs. Hence, the availability of contraceptive methods increased immediately (Hailemariam, 2017). The FP2020 Ethiopia, developed in 2012, focusses on youth and its health. Availability to safe contraceptive methods as well as other reproductive and sexual health services are key in this program (Family Planning 2020, 2020a). Results show an improvement in different health indices in Ethiopia. Currently, about 41.1% of all married women are using modern contraceptives, compared to only 27% in 2011 (Family Planning 2020, 2020a; The World Bank Group, 2022). Injectables (67.3%) and implants (21%) are the most used modern contraceptive methods in Ethiopia (Family Planning 2020, 2020a).

After Mauritius, Rwanda has the second highest population density in SSA (The World Bank Group, 2022). By having children, you will be respected by other people in society (Family Planning 2020, 2020c). However, at the beginning of this century, Rwanda experienced a rapid demographic transition (Westoff, 2012). In the early 1980s, the government acknowledged the rapid growing population as a concern. The country's first FP program was implemented in 1982, whereafter a population policy was adopted in 1990. This policy encouraged FP programs to reduce fertility rates and to level off population growth. A second policy was implemented in 2003, focusing more broadly on the quality of people's life (Kobiané & Bougma, 2017). The FP program implemented during that period had a significant impact on current fertility rates in the country. Between 2005 and 2010, the use of contraceptive methods more than doubled (Bongaarts & Casterline, 2013). A possible explanation for the successful results is the way how it was implemented. Media campaigns aimed to explain the advantages of both small families and the use of contraception were provided in the whole country. They did not only affect the demand for contraception, but they also had an influence on family size preferences (Bongaarts & Casterline, 2013).

2.3.5 Impact of urbanization

The process of urbanization tends to have an effect on fertility rates (Groth & May, 2017). The rural-urban migration is increasingly experienced by many countries in SSA (Shapiro et al., 2017). Flückiger and Ludwig (2017) found significantly lower fertility rates in urban areas compared to rural area. The higher cost of rearing children for families living in cities goes together with a shift from an emphasis on quantity of children towards quality in urban areas. Flückiger and Ludwig (2017) mention two important reasons why the fertility transition was first observed in urban areas. First, women living in cities typically have higher levels of human capital. Second, they are also more likely to have higher incomes. Both lead to higher opportunity costs of having children. Hence, women living in urban areas tend to have fewer children and they tend to invest more in the education of their children. This theory is confirmed by the literature (Flückiger & Ludwig, 2017). They found that more educated women tend to have less children. The same is found for wealthy women. This schooling effect, in which fertility drops for higher levels of education, is also described by Shapiro and Tambashe (2017). They argue that the effect is moderate in rural areas, whereas it is

largest in the biggest cities. Groth and May (2017) also argue that urbanization boosts the demographic transition due to higher female human capital. In contrast, Shapiro et al. (2017) argue that urbanization often leads to high levels of poverty instead of wealth. As a result, they claim that the process of urbanization does not necessarily decrease fertility rates.

2.3.6 Future trends and challenges

Future trends

Because SSA is not following similar fertility trends as observed elsewhere in the world, future projections for this region are highly speculative. Compared to other regions, the decline in TFR is projected to be moderate, namely around 0.65 children less each decade (Guengant, 2017). Vollset et al. (2020) predict that, among all regions, SSA will keep having the highest fertility rates. Their projections show that the population will not peak before the end of this century. This corresponds to the projections shown in Figure 2. Moreover, only after 2063, TFR is projected to be below replacement level, i.e. 2.1 births per woman. DESA (2020) forecasted a TFR of 3.1 births per woman in 2050, while in 2100 TFR would equal replacement level. For SSA, projections of the United Nations (UN) show an increase in population size from 1.14 billion today to 3.78 billion by the end of the century (The World Bank Group, 2022; UN, 2019).

For the three countries with the largest population in SSA, i.e. Nigeria, Ethiopia, and the Democratic Republic of the Congo (DRC), population size is projected to increase very rapidly. Currently, Nigeria has with 206 million people the seventh highest population size worldwide (The World Bank Group, 2022). Based on projections, this number will increase to almost 400 million by 2050, becoming the fourth in the global ranking (Jimenez & Ali Pate, 2017). For Ethiopia, population size is projected to increase from 115 million now to almost 190 million in 2050 (Hailemariam, 2017; The World Bank Group, 2022). Today, almost 90 million people are living in the DRC. By 2050, this is projected to be more than 195 million, indicating a two and a half-fold rise compared to 2015 levels (Shapiro et al., 2017).

Challenges

The plausible quadrupling of the population in Africa during the twenty first century brings a whole range of challenges, not only in economic terms, but also socially and environmentally (Bongaarts & Casterline, 2013; Groth & May, 2017). Climate change will make it even more challenging. In the future, droughts and food shortages will become more prevalent and natural resources will become depleted. As a result, an immense share of the population will suffer from thirst, hunger, conflicts, etc. (Fox, 2011). With the growing population, global water demand will increase by 30% by 2030. By 2050, an additional three billion people will need shelter worldwide, most of them living in SSA (Fox, 2011). The increasing population in SSA already exceeded gains in agricultural productivity. Hence, there is less food available per person, and malnutrition and hunger have become more severe (UN, 2005). With the peak in population projected far ahead, and without any intervention, these problems are expected to worsen in the next decades.

The pace of urbanization rises very fast with rapid population growth. Moreover, the number of people living in slums, having very poor living conditions, also increases dramatically (UN, 2005). Two other important consequences linked to rapid urbanization rates are a higher exposure to harmful health conditions and limited access to social services (Mberu et al., 2017). With the doubling of population within a few decades, investment in infrastructure needs to be more sustained. Currently, there is an unmet demand for education and employment in SSA. This gap will become even larger with population growth.

Groth and May (2017) also mention its effect on Europe. Migration flows coming from SSA will largely affect European demography. These different challenges are making it only harder to improve living standards, which is the main goal of development (Bongaarts & Casterline, 2013; UN, 2005).

Age distribution

Another challenge is related to the age distribution of the population. Using dependency ratios, Lee (2003) investigated the changes in age distribution in more detail. The total dependency ratio is calculated as the ratio of the dependents (below 15 years and above 64 years) to the working age population (between 15 and 64

years). Moreover, two other types of dependency ratios are also used, with both a different effect on economic growth. First, the child dependency ratio is calculated as the ratio of the younger dependents (below 15 years) to the working age population. Second, the old-age dependency ratio is defined as the ratio of older dependents (above 64 years) to the working age population (Lee, 2003).

The drop in mortality rates in the second stage of the demographic transition is strongest among younger people. Hence, the child dependency ratio increases due to the higher proportion of children in society (Lee, 2003). This group consumes a lot of food, clothes, medical care, education, shelter, etc., while they do not generate income (Bloom et al., 2001). In addition, the right infrastructure for a society with many children needs to be provided by the government. For instance, enough schools need to be in place to be able to achieve educational goals (Lee, 2003).

A large drop in the child dependency ratio is observed during the third stage, when fertility rates start to decline. The largest population growth happens at the working-age population, decreasing the total dependency ratio. For this stage, both positive and negative effects on the economy are described in the literature. On the one hand, the group of working age people saves more than it generates. National savings increase when this group becomes larger, which might lead to higher investment and economic growth (Bloom et al., 2001). On the other hand, a lot of people at working age may increase unemployment rates (Lee, 2003).

The low levels of mortality, and thus higher life expectancy, lead to an increase in the number of old people in the last stage. Moreover, together with the low fertility levels, and thus decreasing growth of people at working-age, both the old-age and total dependency ratios increase rapidly (Lee, 2003). On the one hand, in countries with a well-developed pension system, a large amount of elderly in the population increases the pressure on people actively involved in the labour market (Lee, 2003). An increasing amount of elderly decreases labour force and might have a negative impact on economic growth (Bloom et al., 2001). On the other hand, when the elderly are more responsible for themselves, there might be a decrease in aggregate saving rates in the society (Deaton & Paxson, 2000; Lee, 2003). In this case, their own savings are used as support.

2.3.7 Policy implications

To (partly) overcome the challenges mentioned in the previous section, it is important for policy makers to focus on reducing fertility rates in SSA. Lower fertility rates will contribute to better health for both women and children. It also provides economic advantages by raising living standards (Bongaarts & Casterline, 2013).

A first type of policy that could have positive results is increasing the use of FP programs. This can be done by raising government funding, which could directly reduce the unmet need for contraceptive methods (Bongaarts & Casterline, 2013; de Siva & Tenreyro, 2017). However, even when everyone would have access to contraception, fertility rates may still remain very high. An explanation for this is the typically high IFS in SSA. To overcome this problem, policies should include investments in both social and economic development. Although the effect would only be observed after many years, those investments will eventually lead to lower fertility rates (Bongaarts & Casterline, 2013). Bongaarts and Casterline (2013) argue that preferences about family sizes might also be influenced by the type of FP program, such as providing information and explaining the socio-economic advantages of having a smaller family.

Next, an important aspect to reduce fertility is raising women empowerment. By increasing education for girls, the economic theory says that they will prefer quantity over quality. This is in line with findings of Keats (2018), showing that higher education for girls decreases fertility during their schooling years as well as in their adulthood. He also found evidence for higher investments per child. In addition, more educated girls increasingly use contraception at younger ages (Keats, 2018). An effective way to increase education for girls is through free primary school fees. Results of Keats (2018) show increases in school completion as well as in secondary school registrations when primary school fees are removed.

Furthermore, DESA (2020) highlights the importance of gender equality in order to reduce fertility. Therefore, policies should focus on fighting female discrimination, early child marriages, unequal labour market opportunities, etc. Additionally, it could be helpful to raise the husbands' participation in FP programs (DESA, 2020). However, Bongaarts and Casterline (2013) claim that raising awareness of policy makers about the importance of lower fertility rates to achieve higher levels of development is the most important step.

3. Case study: the Democratic Republic of the Congo

3.1 Introduction

Today, almost 90 million people are living in the DRC, with an annual population growth of about 3.1%. This is almost a doubling of the population compared to 2000, when about 47 million people were living in the DRC. Life expectancy increased from about 50 years in 2000 to 60.7 years today. On average, women in the DRC have 5.8 children. Between 1991 and 2000, fertility rates were at their highest level, i.e. about 6.8 children per women (The World Bank Group, 2022). Although overall fertility rates are decreasing, experts do not call this a fertility transition. Shapiro and Tambashe (2017) claim that fertility rates are still pretransitional, except for the capital city, Kinshasa. Schoumaker (2019) writes that the DRC, together with three other African countries, is not experiencing a fertility transition since the 1990s. He argues that a fertility transition is only happening “if the published TFR (for the last three years) is at least 10% lower than the maximum average number of children ever born among women aged 45-49 in any preceding DHS survey, and if contraceptive prevalence among married women is at least 10%” (Schoumaker, 2019, p. 264). Shapiro et al. (2017, p. 75) also argue that apart from Kinshasa the DRC experiences a “very slow or incipient fertility transition”.

This section contains a descriptive analysis of the situation in the Democratic Republic of the Congo (DRC) based on data from the Demographic and Health Surveys (DHS) Program 2013-14, supplemented with data from other sources and findings from the literature. More specifically, fertility preferences and its determinants are investigated in the following part. Focussing on the desired number of children instead of actual fertility rates, provides important insights. For instance, policies focussing on the supply of contraception will not lead to any changes if people do not prefer to have fewer children. While this dimension is less often analysed, it could explain the slower fertility changes in some SSA countries. Next, some other relevant findings from the DHS related to fertility in the DRC are discussed.

3.2 Ideal family size

To ask parents about their ideal number of children, two types of questions were asked. The first question, asked to women and men without living children, is “Si vous pouviez choisir exactement le nombre d’enfants à avoir dans votre vie, combien en voudriez-vous?” (“If you could choose exactly how many children to have in your life, how many would you want?”). The second question, i.e. “Si vous pouviez revenir à l’époque où vous n’aviez pas d’enfant et que vous pouviez choisir exactement le nombre d’enfants à avoir dans votre vie, combien auriez-vous voulu en avoir?” (“If you could go back to the days when you were childless and could choose exactly how many children to have in your life, how many would you have wanted to have?”) was asked to women and men with living children.

Based on two separate datasets for women and men, women in the DRC are observed to prefer on average 6.33 children, whereas this is 7.58 for men. So, the ideal number of children is on average 1.25 lower for women compared to men. As described above, this can be explained by the higher costs of having children in terms of time, wages, and maternity for women compared to men. Furthermore, the heterogeneity among men is much larger.

The analysis shows that fertility preferences vary across a wide range of factors. The mean and standard deviation of the ideal number of children for both women and men for some of these factors are included in Table 1.

The ideal number of children is significantly different across different levels of education (p-value = 0.000). Specifically, fertility preferences are found to be lower for higher levels of education. For men, the difference between no education and primary education is found to be not significant (p-value = 0.742). Except for higher education, the heterogeneity among men is observed to be large. Typically, with higher levels of education, offspring’s’ quality is preferred over quantity.

The relationship between wealth and fertility preferences can also be investigated. A significant difference in the ideal number of children is found across different wealth categories (p-value = 0.000). These results show a negative relationship between wealth and fertility preferences. For women, fertility preferences are not found to be significantly different between the poorest and poorer wealth group (p-value = 0.435). The largest decrease in ideal number of children is found between the richer and

richest wealth group for both women and men. This negative relationship can be explained by the fact that children are relatively more expensive when parents' income is higher, as mentioned earlier.

Furthermore, fertility preferences differ significantly with respect to the type of residence (p-value = 0.000). For both women and men, the ideal number of children is significantly lower in urban areas compared to rural areas. A large heterogeneity in fertility preferences is found for men living in rural areas. These differences in desired fertility can be explained by the fact that both income and human capital are often higher in urban areas, leading to higher opportunity costs of childbearing. An additional analysis was done to investigate the difference among people living in those urban areas. In particular, people living in Kinshasa and other large cities were excluded from the "urban" subsample. However, the results show no significant difference in the desired number of children between people living in these large cities and those living in other urban areas.

Different fertility preferences are also found across different religions (p-value = 0.000). In general, the results show that animists prefer to have the largest number of children. Westoff and Bietsch (2015) write that fertility rates are typically high for traditional religions, such as this one. Note, however, that the share of animist women and men in the sample is very small compared to the share of other religions. Also interesting to note is the large heterogeneity among animist men. The lowest fertility preferences were found among catholic women and men.

It could also be interesting to analyse fertility preferences at different ages. The ideal number of children is observed to be significantly different across different five-year age groups (p-value = 0.000). The last age group that is included in the analysis is 45 to 49 years old (born between 1964 and 1968). For this group, fertility preferences are found to be highest for both genders, while it decreases for lower age groups. The lowest average ideal number of children is found for the youngest age group, i.e. from 15 to 19 years old (born between 1993 and 1998). The heterogeneity among men also increases with age.

Another interesting result, found by analysing the couple's dataset, is the fact that women having lower fertility preferences are in general coupled with men having lower fertility preferences. The same is true for women and men having higher fertility

preferences. This seems to be no coincidence. Typically, couples tend to have similar beliefs, values, and even personalities (BBC, 2022). In addition, results of a study in Kenya, carried out by Dodoo (1998), show that women's fertility preferences might be affected by the preferences of their husband.

Note that one needs to be cautious using this data. When people report their ideal number of children, there might be an issue related to experiences. The likelihood of a mother that reports that she prefers to have fewer children than she already has is found to be low. This is in line with the theory of cognitive dissonance, stating that "if a person knows various things that are not psychologically consistent with one another, he will, in a variety of ways, try to make them more consistent" (Festinger, 1962, p. 93).

Table 1: Mean and standard deviation (SD) of the ideal number of children for women and men in the DRC (N = number of observations)

	Women			Men		
	Mean	**SD**	**N**	**Mean**	**SD**	**N**
Level of education						
No education	7.386	3.188	3,062	8.209	5.191	321
Primary education	6.826	2.989	6,743	8.519	5.745	2,020
Secondary education	5.580	2.461	7,187	7.452	5.031	5,252
Higher education	4.265	1.364	550	5.213	2.715	616
Wealth group						
Poorest	6.983	3.062	4,066	8.817	5.897	1,726
Poorer	6.873	3.062	3,401	8.434	5.671	1,660
Middle	6.654	2.931	3,386	7.954	4.972	1,728
Richer	6.153	2.638	3,146	7.156	4.684	1,559
Richest	4.921	2.137	3,543	5.256	3.154	1,536
Type of residence						
Urban	5.353	2.404	6,429	6.035	3.931	2,895
Rural	6.899	3.007	11,113	8.416	5.536	5,314
Religion						
Animist	7.292	2.892	65	10.571	7.850	54
Catholic	5.975	2.761	5,099	6.927	4.506	2,648
Kimbanguiste	6.461	2.902	516	7.813	5.000	269
Muslim	6.739	2.758	280	7.932	4.603	166
Protestant	6.603	2.948	4,904	7.645	4.717	2,353
Other Christians	6.328	2.917	6,259	8.041	6.012	2,856
No religion	6.760	3.189	154	7.408	3.954	210
Five-year age group						
15-19	5.460	2.683	3,760	6.159	3.618	1,618
20-24	5.885	2.671	3,491	6.203	3.866	1,338
25-29	6.377	2.734	3,250	7.164	4.718	1,203
30-34	6.655	2.833	2,373	7.936	5.595	1,001
35-39	6.966	2.992	2,016	8.519	5.503	802
40-44	7.187	3.196	1,467	8.862	5.798	746
45-49	7.522	3.146	1,185	9.481	6.369	630

Regressions

Another remark is the fact that those different determinants might be correlated. For instance, as described in section 2.3.5, women's education is typically higher in urban areas. The analysis above reveals that the ideal number of children is lower for both higher educated women and women living in urban areas. However, with this analysis, it is not possible to disentangle their effect on IFS. Therefore, some simple OLS regressions are used to investigate this. The dependent variable in the model is the ideal number of children of women. The explanatory variables are education, type of residence, wealth, age group, and religion of women as well as the ideal number of children of the husband. To be able to include the husband's ideal number of children, the couple's dataset of the DHS is used for this analysis. Table A1 in the Appendix provides the same information as Table 1, but using the couple's dataset. Although the values are not exactly the same in Table 1 and Table A1, the same trends can be observed. The results of the regression analysis for women are shown in Table 2.

Model A, B, and C include the individual effect of respectively education, type of residence, and wealth on the ideal number of children. The same trends are observed as in Table 1.

A significant decrease is found for higher levels of education (Model A). From no education to primary education, the decrease is observed to be quite small compared to the difference between primary and secondary education as well as between secondary and higher education.

The results for Model B indicate a significant negative effect of living in urban areas compared to rural areas on the ideal number of children.

Model C includes the individual effect of wealth on the ideal number of children. No significant difference is found between the poorest, poorer, and middle wealth group. However, the ideal number of children decreases significantly for the richer wealth group compared to the middle wealth group. Being in the richest wealth group has a very large effect on fertility preferences.

When both education and type of residence are included (Model D), similar effects are observed as in Model A and Model B. Education seems to have a larger impact on the ideal number of children than type of residence.

When both wealth and type of residence are included (Model E), the effect of type of residence is found to be highly significant. For wealth, the ideal number of children only changes significantly for women in the richest wealth group compared to the middle wealth group.

Education, type of residence, and wealth are included in Model F. The results show a significant effect of type of residence. The impact of education is found to be significant and even stronger. For wealth, only the difference between the middle wealth group and richest wealth group is significant. The ideal number of children does not significantly differ between the poorest, poorer, middle, and richer wealth groups.

Model G includes all determinants from Table A1. Religion has no significant effect. The effect of type of residence is again highly significant. Both education and age have a significant and large effect on the ideal number of children. However, the difference between no education and higher education is found to be larger than the difference between the youngest and oldest age group.

In addition to Model G, Model H includes the ideal number of children of the husband. The ideal number of children of the wife tends to be highly dependent on the ideal number of children of her husband. By including this variable, the impact of the other variables in the model has become smaller.

In sum, education remains an important determinant of the ideal number of children after controlling for several other factors. The largest decrease was found from secondary education to higher education, i.e. 1.05. The effect of type of residence is found to be less strong. The difference in ideal number of children between urban and rural residence is 0.54. Interestingly, wealth does not appear to have a strong effect after controlling for other determinants. Only for those in the richest wealth category, fertility preferences are found to be lower compared to the other wealth categories. The coefficient of the ideal number of children of the husband is 0.11. The husband's average ideal number of children is 8.69, which implies that the effect of this variable on the fertility preferences of women is quite strong.

Table 2: Coefficients (standard errors) of the ideal number of children for women (significance at *p < 0.05, **p < 0.01, ***p < 0.001)

	Model A	Model B	Model C	Model D	Model E	Model F	Model G	Model H
Intercept	4.315*** (0.391)	7.416*** (0.054)	7.287*** (0.097)	5.213*** (0.403)	7.340*** (0.098)	5.557*** (0.422)	4.905*** (0.795)	4.250*** (0.778)
No education dummy	3.513*** (0.403)			2.698*** (0.412)		2.362*** (0.425)	2.323*** (0.419)	1.973*** (0.410)
Primary education dummy	3.027*** (0.397)			2.299*** (0.404)		1.963*** (0.416)	1.981*** (0.411)	1.661*** (0.402)
Secondary education dummy	1.798*** (0.399)			1.376*** (0.340)		1.118** (0.407)	1.254** (0.402)	1.052** (0.393)
Urban dummy		-1.463*** (0.104)		-0.905*** (0.113)	-0.926*** (0.142)	-0.686*** (0.142)	-0.667*** (0.140)	-0.544*** (0.137)
Poorest dummy			0.157 (0.135)		0.150 (0.134)	-0.009 (0.134)	0.120 (0.132)	0.041 (0.129)
Poorer dummy			0.040 (0.137)		-0.024 (0.136)	-0.081 (0.135)	-0.002 (0.133)	-0.021 (0.130)
Richer dummy			-0.473** (0.149)		-0.136 (0.157)	-0.042 (0.156)	-0.092 (0.153)	-0.077 (0.149)
Richest dummy			-1.875*** (0.162)		-1.084*** (0.201)	-0.624** (0.206)	-0.910*** (0.204)	-0.731*** (0.200)
20-24 dummy							0.170 (0.185)	0.064 (0.181)
25-29 dummy							0.511** (0.180)	0.346* (0.176)
30-34 dummy							0.698*** (0.190)	0.460* (0.186)
35-39 dummy							1.313*** (0.195)	1.057*** (0.192)
40-44 dummy							1.653*** (0.208)	1.365*** (0.205)
45-49 dummy							1.717*** (0.229)	1.414*** (0.225)
Bundu dia kongo dummy							-0.813 (1.316)	-0.438 (1.286)
Catholic dummy							-0.475 (0.663)	-0.288 (0.648)
Kimbanguiste dummy							-0.337 (0.704)	-0.235 (0.688)
Muslim dummy							0.205 (0.730)	0.212 (0.713)
No religion dummy							-0.791 (0.831)	-0.557 (0.812)
Other Christians dummy							0.183 (0.662)	0.254 (0.647)
Protestant dummy							-0.258 (0.662)	-0.077 (0.647)
Ideal number of children husband								0.110*** (0.008)
R^2	0.063	0.049	0.048	0.078	0.058	0.081	0.126	0.166

Note: the excluded categories are respectively: higher education, rural residence, middle wealth group, 15-19 years old, and animist.

3.3 Other relevant findings from the DHS in the DRC

It might also be interesting to investigate some more general results related to fertility in the DRC. This section is based on the data of the DHS as aggregated in the report that summarizes the key findings, written by the Ministère du Plan et Suivi de la Mise

en œuvre de la Révolution de la Modernité (MPSMRM), Ministère de la Santé Publique (MSP) and ICF International in 2014.

Women's empowerment

One channel trough which female education affects actual fertility rates is through higher women's empowerment, and thus stronger bargaining power. Results of the DHS show that of all married women aged between 15 and 49, 81% were employed, while that number is 97% for married men. Moreover, the survey reveals that 72% of the married women that are paid in cash claim that they earn less compared to their husband. Furthermore, about one quarter of all married women do not participate in any important decision related to major purchases for the household, family's or friends' visits, and her own health care. Overall, this quite low female empowerment might explain their low bargaining power in the household, leading to higher actual fertility rates than they might desire.

Education and child labour

Related to the costs and benefits of having children, the DHS contains data on children's school attendance and child labour. Results show that of all children at school-age, 80% and 43% are attending respectively primary school and secondary school. In primary school, the gender gap is quite small. Compared to the number of boys, only a little less girls are attending primary school. On the contrary, this gap is much larger in secondary school. However, Shapiro et al. (2017) write that not only the average level of education has significantly increased during the past 30 years, but the gender gap also became much smaller.

For child labour, results of the DHS show that the share of children participating in child labour is 34% for children between 5 and 11 years old, 43% for children between 12 and 14 years old, and 49% for children between 15 and 17 years old. As described in section 2.2.1, child labour provides direct economic benefits for the household. On the other hand, education brings a direct cost for the family, while the benefits are only observed after some time. This might explain why one-fifth of the children are not attending primary school and more than half of the children are not attending secondary

school. Those results, together with the high rates of children participating in child labour indicate that parents still invest a significant share in physical capital compared to human capital. This might also partly explain the high fertility rates in the DRC.

Family planning

The DHS also contains important insights about FP in the DRC. In 1972, a first program was implemented in the country to provide information as well as services. In the following years, the program expanded throughout the country (Shapiro et al., 2017). Ten years after the first program, a second one was launched. The latter program was much more aggressive. However, with the start of civil unrest in the DRC in 1991, the program came to an end. Only after the conflict, in 2004, FP programs were implemented again. The government launched a national strategic plan in 2014, with the main goal to raise the demand for FP services (Shapiro et al., 2017).

Knowledge about reproduction is found to be very low among women in the DRC. Results of the DHS show that only 47% of the surveyed women knows at which moment of the cycle they are more fertile. However, knowledge about contraception is very widespread in the country. Almost 90% of women and 95% of men know one or more modern contraceptive methods. However, those positive results are not in line with its actual usage. Of all married women, 20% is using a contraceptive method. In terms of modern contraceptive methods, this is only 8%. The usage highly depends on female education. Only 4% of all uneducated women are using a modern method of contraception, while the share of women with a level higher than secondary education using modern contraception is 19%. Of all methods, the male condom is the most popular one, of which 70% is obtained through the private medical sector. On the other hand, other contraceptive methods, such as injectables, are mainly provided through the public sector. An unmet need for FP, which is described as “the percentage of married women who want to space their next birth or stop childbearing entirely but are not using contraception” in the report of the DHS (MPSMRM et al., 2014, p. 6), is found for 28% of married women. Data from the World Bank Group (2022) shows that in 2018 contraception was prevalent for 28.1% of all married women between 15 and 49 years old in the DRC. However, in 1991, this was only 7.7%. Even though the prevalence is considerably low and there is still a significant unmet need, the DRC has experienced

an improvement over the recent years. Based on previous trends, FP is expected to improve further in the coming years.

Mortality rates

Other relevant data include both maternal and childhood mortality rates, as well as age at first marriage and at first birth, and birth intervals. On the one hand, maternal mortality rates remain very high in the DRC. Per 100,000 births, 846 result in maternal death. Despite the large opportunity cost for women to give birth, fertility rates remain still very high. On the other hand, a decrease in childhood mortality rates is observed. Results show that per 1,000 births, 104 children die before the age of five. Despite this relatively high number, it is a major improvement compared to 2007. At that time, 148 children out of 1,000 births died before the age of five. As argued by Shapiro et al. (2017), this drop in mortality rates can be linked to two different factors. First, medical interventions were made publicly. Second, people's awareness about health risks increased, as well as their willingness to get help from a medical doctor. The DHS also reveals that childhood mortality rates are lower for higher levels of female education.

Furthermore, results of the DHS show that men marry at an older age compared to women. For women younger than 18 years, 37% is married, while this is only 6% in the case of men. The median age for women to give birth to their first child is 19.9 years. Birth intervals below two years have a significant risk of infant death (MPSMRM et al., 2014). In the DRC, those short birth intervals is the case for 27% of all children. 30.4 months is the median time between the birth of two siblings.

Place of residence

As argued by Shapiro and Tambashe (2017), previous numbers differ largely based on the place of residence. It is not only true for the results related to fertility preferences, but also for some other findings from the DHS. Actual fertility rates are found to be higher in rural areas (7.3 children per women), compared to urban areas (5.4 children per women). This is in line with section 2.3.4, indicating that both female income and human capital are higher in urban areas, leading to higher opportunity costs of childbearing. As a result, women tend to have less children. However, Shapiro et al.

(2017) argue that by excluding Kinshasa from the analysis, there is no large difference between rural and urban fertility rates.

In the case of FP, the DHS shows that, despite a similar unmet need, contraception is much more used in urban areas. The share of married women between 15 and 49 years using any method of contraception is 31% in urban areas, while only 15% in rural areas. For modern methods, this is 15% and 5% respectively, and it is found to be highest in Kinshasa, namely 19%. The share of children below the age of five who are stunted, wasted, or underweighted is found to be lower in urban areas. Moreover, this is also true for both infant mortality and under-five mortality. For educational attainment, Shapiro et al. (2017) write that people living in urban areas have significantly higher levels of education compared to rural areas. This is especially true for people living in Kinshasa.

As a lot of people are migrating from rural to urban regions, the proportion of people living in cities is increasing very rapidly. Shapiro et al. (2017) mention that, based on UN projections, by 2030, Kinshasa might become the twelfth largest city in the world, home to 20 million people.

Current fertility rates

By taking a closer look at the current fertility rates across the country, mixed results are found. Although the overall fertility rates are slightly decreasing in the country, an increase is found in three out of eight provinces. Sharply decreasing fertility rates are only found in Kinshasa. Many authors do not link these decreasing fertility rates to the third stage of the demographic transition (Schoumaker, 2019; Shapiro & Tambashe, 2017; Shapiro et al., 2017). Instead, some of them refer to it as a Malthusian transition, with the poorest people in society having less, or even no, children. Shapiro et al. (2017) argue that a lot of poverty is created with the process of urbanization, leading to Malthusian mechanisms.

4. Conclusion

The fertility transition in SSA is investigated in this paper. More specifically, it focusses on why SSA is not following the same trends as observed in the rest of the world. Starting in 1800, mortality rates began to drop in Western Europe, whereafter this happened in the rest of the world. Fertility rates also started to decrease. After some time, both fertility and mortality rates became low and constant, leading to a constant population. This process is known as the demographic transition. At the moment, different countries are at different stages in this process. For instance, many Western Europe countries as well as the US are in the last stage of the transition, in which the population remains quite constant. SSA is lagging behind. While mortality rates decreased in many SSA countries, the decrease in fertility rates is far from complete. Therefore, it is very uncertain to predict what will happen in the future. But one thing is for sure, the population in SSA will increase tremendously during the twenty-first century.

This rapid increase brings a whole range of challenges. The demand for food, water, shelter, etc. will increase considerably and climate change will make it even more challenging. The rapid urbanization and increase in the demand for schools requires a sustained investment in infrastructure. Hence, policies aiming to reduce fertility rates are needed. In order to develop the right policies, policy makers should be aware of the problem and understand the determinants at the basis of those high fertility rates.

One of those major determinants is the IFS. Typically, fertility preferences are very high in SSA. Those preferences are studied by investigating the costs and benefits of having children. On the one hand, children can be considered as an investment in terms of child labour and old age security. On the other hand, one needs to take into account the large costs of having children. As education becomes increasingly important, the economic benefits of child labour decrease. However, because capital markets are not everywhere well developed in SSA, the old age security hypothesis might still impact fertility preferences in some places. For a higher income, parents increasingly value their time, leading to high opportunity costs of having children. Those costs are even larger for women, as they typically spend more time raising the children. In addition, maternity has a substantial cost in SSA. All this together explains why women prefer to have less children compared to men. Only for sufficiently empowered women, the actual fertility rates will be in line with their own preferences. Furthermore, as women

living in cities tend to have both higher incomes and higher levels of education, fertility preferences are found to be lower in urban areas.

Fertility could also be affected by FP programs. Some of those programs focus on reducing the IFS through, for instance, small-family norms. Other programs are set up to avoid unwanted pregnancies. This could be done by providing contraception. Contraceptive methods play a dominant role in reducing actual fertility rates that follow on a decline in IFS. Although the prevalence of contraception in SSA increased considerably, it is still only half of the global average. The rather late implementation of those programs in SSA might have contributed to the delay in fertility reductions in this region.

Insights from the case study in the DRC show that the ideal number of children is higher for men compared to women. The heterogeneity in fertility preferences is also found to be much larger among men. In general, women having lower fertility preferences are matched with men having lower fertility preferences. The same is true for women and men having higher fertility preferences. Furthermore, education and wealth are negatively related to fertility preferences, whereas age is found to be positively related. People living in urban areas prefer to have less children compared to rural areas. In addition, the ideal number of children is found to be different across different religions. Results of the regression analysis show that wealth does not have a strong effect on fertility preferences after controlling for other determinants. On the other hand, education and age are more important determinants of the ideal number of children.

In order to reduce fertility rates in SSA, policy makers should first focus on reducing the IFS. This could be done through higher investments in social and economic development. Another, more precise way to reduce fertility preferences is using small-family norms. Next, when the fertility preferences are reduced, contraceptive methods should be available to avoid unwanted pregnancies and reach the desired number of children. As women tend to prefer having less children than men, by raising women's empowerment, through for instance providing cheap education for girls, the final decision of the household is more likely to reflect the preferences of the women.

Appendix

Table A1: Mean and standard deviation (SD) of the ideal number of children for women and men in the DRC using the couple's dataset (N = number of observations)

	Women			Men		
	Mean	**SD**	**N**	**Mean**	**SD**	**N**
Level of education						
No education	7.828	3.161	883	9.010	5.183	198
Primary education	7.342	2.953	1,718	9.734	6.269	1,041
Secondary education	6.113	2.580	1,261	8.566	5.533	2,391
Higher education	4.315	1.301	54	5.699	3.190	286
Wealth group						
Poorest	7.443	2.930	961	9.709	6.205	961
Poorer	7.327	3.022	909	9.231	5.819	909
Middle	7.287	3.036	883	8.952	5.641	883
Richer	6.814	2.841	660	8.214	5.059	660
Richest	5.411	2.373	503	5.926	4.002	503
Type of residence						
Urban	5.954	2.659	1,078	6.893	4.418	1,078
Rural	7.416	2.979	2,838	9.372	5.942	2,838
Religion						
Animist	7.500	2.479	18	13.034	9.081	29
Catholic	6.808	2.828	1,040	8.043	5.126	1,079
Kimbanguiste	6.852	2.711	122	9.103	6.008	116
Muslim	7.218	2.617	78	9.178	4.696	101
Protestant	7.095	3.009	1,194	8.465	5.156	1,095
Other Christians	7.080	3.066	1,368	9.229	6.431	1,343
No religion	6.733	3.005	30	5	4.124	102
Five-year age group						
15-19	6.354	2.733	328	6.652	2.248	23
20-24	6.379	2.643	759	6.848	3.349	315
25-29	6.798	2.798	931	7.854	5.222	705
30-34	6.976	2.864	659	8.405	5.686	729
35-39	7.542	3.120	553	9.039	5.886	620
40-44	7.904	3.333	409	9.189	5.920	614
45-49	7.978	3.248	278	9.809	6.284	461

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