Chapter 6
Does Fertility Decline Stimulate Development?

6.1 Introduction

Economists have debated the potential impact of demographic change on economic growth since Malthus. The consensus on this relationship has shifted repeatedly since the late 1950s when Coale and Hoover (1958) published their influential study. They argued that rapid population growth inhibits growth in per capita income because the savings needed to raise human and physical capital per capita are higher in rapidly than in slowly growing populations. Population growth absorbs savings that could be used to increase capital intensity and raise per capita output. Coale and Hoover also concluded that rapid population growth and high fertility lead to a high proportion of children in the population, which limits savings needed for growing economies. Ministers of finance and development planning experts throughout the developing world realized that rapid population growth would require large investments in education, health services, housing, agriculture, and infrastructure just to keep up with population growth, thus leaving few resources to increase standards of living. From the 1950s to the mid-1970s, concerns about the adverse economic and environmental effects of rapid population growth dominated academic, political, and popular thinking (NAS, 1971)

This consensus came to an end when empirical studies from the late 1960 and 1970s failed to confirm an inverse correlation between the population growth rate and the growth rate of per capita output of countries (Headey & Hodge, 2009, 2001; Kuznets, 1967). This finding contradicted expectations arising from Coale and Hoover' analysis and led to a revisionist view that population growth is largely a neutral or even a positive factor in development (Simon, 1981).

This revisionist view itself was overturned during the 1990s as more sophisticated models were developed and data from the 1980 and 1990s became available. The previously insignificant correlation between population growth and growth of per capita output turned negative (Headey & Hodge, 2009; Kelley & Schmidt, 1995, 2001). A plausible explanation for these initially puzzling findings was provided in a

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thorough review of the evidence by Kelley and Schmidt (1995, 2001). They concluded that declines in mortality, fertility, and population growth all have positive effects on economic growth per capita. These findings helped explain the change over time in the correlation between population and economic growth. For example, the studies using pre-1980 data often included many developing countries that were experiencing rapid mortality decline as well as accelerating population growth. According to Kelley and Schmidt's findings, the former's positive effect on economic growth was offset by the latter's negative effect, thus producing an unexpected absence of a correlation. In subsequent decades, mortality decline slowed, fertility declined rapidly, and population growth slowed. The negative correlation between growth and development observed from the 1980s onward could be explained by the combined effects of declines in fertility and declining growth rates, both of which enhance economic growth.

A further important development occurred in the 1990s when seminal research by Barro (1991, 1997) identified fertility decline as an important factor in economic growth. The finding was of great interest to policymakers and led to a set of new studies by economists of what is now called the "demographic dividend." This dividend offers a potential boost to GDP per capita when fertility decline leads to a rise in the ratio of workers to dependents. The period during which the dividend is available is bounded but can range up to decades.

This chapter reviews the evidence for the demographic dividend in the developing world. We first summarize the magnitude and timing of the age-structure changes caused by fertility decline. This is followed by a discussion of the first and second demographic dividends provided by these changes in the age-structure. We conclude with a summary of a range of multi-sectoral non-economic benefits of fertility decline.

6.2 Age Structure Effects of Declining Fertility

Before the onset of the fertility transition, populations typically have an age pyramid that is wide at the bottom (many young people) and narrow at the top (few old people). Figure 6.1 plots the age structures of the population of the developing world in 1970 and 2020. The 1970 population had the young age structure typical of pre-transitional populations with half of the population under age 18. The fertility decline after 1970 has shrunk the under 18 population to just 32% of the total population in 2020. As expected, this decline is accompanied by an equivalent increase in the population above age 18. The population of working age (18–64) rose from 48 to 60% between 1970 and 2020, and the 65+ population rose from 4 to 7%. These changes in the population age structure, which are largely the result of declining fertility, are the first of the demographic dividends.

Figures 6.2 and 6.3 examine trends in measures of the age structure by region (estimates to 2020, projections to 2100). About half of the population was under age 18 before 1970 in Asia, Latin America, and SSA (see Fig. 6.2). During the 1950

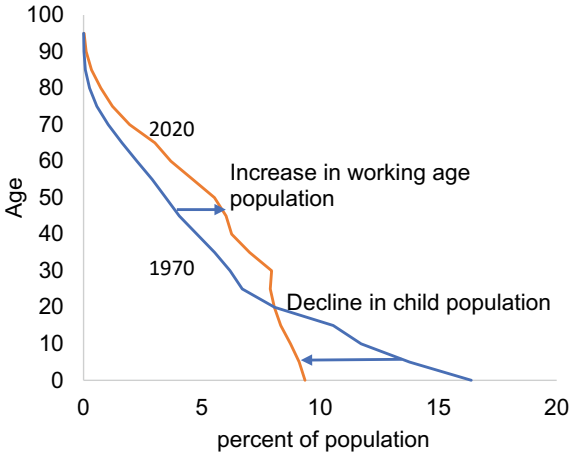

Fig. 6.1 Population distribution by age of the developing world, 1970 and 2020 (UN Population Division, 2019)

and 1960s the proportion under age 18 actually rose slightly as a result of a decline in child mortality. However, as fertility declines proceeded in Latin America and Asia/N.Africa in the 1970 and 1980s, the proportion of children declined rapidly to around 30% by 2020 (United Nations Population Division, 2019). In contrast, the decline in the child population in SSA started later—around 2000—and was slower as a result of later and slower fertility declines. As expected, there is a close correspondence between trends in fertility and trends in the proportion under 18, although the latter follows the former with a delay of one to two decades (compare Figs. 2.1 and 6.2). Projections to 2100 indicate further declines in the proportion under 18 dropping below 20% in Asia/N. Africa and L. America. This downward trend is largely due to a continuing rise in the population over 65.

Another important indicator of the changing age structure is the proportion of the population of working age (usually taken to be between 18 and 64 years), which is often referred to as the "support ratio". Figure 6.3 plots estimates and projections of regional averages of this proportion from 1950 to 2100. In Asia/N.Africa and Latin America, the substantial declines in the proportion under age 18 after 1970 led to a sharp rise in the proportion aged 18–64 between 1970 and about 2020. In future

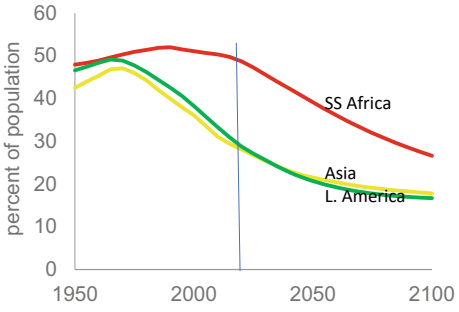

Fig. 6.2 Percent of population under age 18, 1950–2100 (UN Population Division, 2019)

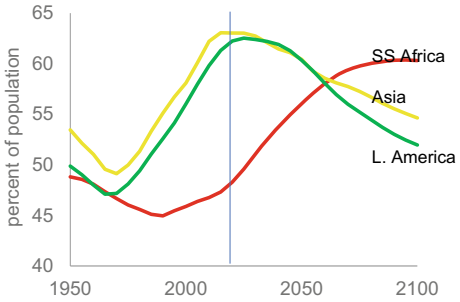

Fig. 6.3 Percent of population aged 18–64, 1950–2100 (UN Population Division, 2019)

decades this proportion declines again as earlier fertility reductions eventually lead to a smaller working age proportion and a larger 65+ proportion. A quite different pattern is evident in SSA, where the later and slower onset of the fertility decline leads to a delayed rise in the proportion of working age relative to other regions.

6.3 The Components of Growth in GDP Per Capita

A brief discussion of basic economic arithmetic is useful to understand how changes in the population age-structure affect economic growth. Analyses of the growth of national economies often rely on a decomposition of GDP per capita and its growth rate into three largely independent factors (World Bank, 2016):

(1) *Support ratio*, defined as the proportion of the total population that is of working-age.
(2) *Labor force participation rate*, defined as the proportion of the working-age population (18–64) that is employed.
(3) *Productivity*, defined as the GDP per worker.

In any given year the *level* of the GDP per capita of a population equals the *product* of these three factors. In addition, the *growth rate* in the GDP per capita in that year equals the *sum* of (1) rate of change in the support ratio; (2) the rate of change in labor force participation rate; and (3) the rate of change in productivity. These equations indicate that, everything else constant, a 1% increase per year of the support ratio (or any one of the other two factors) results in an equivalent 1% increase in GDP per capita. If all three factors increase by 1% per year, GDP per capita rises at 3% per year.

6.4 The First Demographic Dividend

The first demographic dividend (also called the arithmetic dividend or the labor-force accelerating effect) refers to the rise in GDP per capita that results, other things being equal, from an increase in the support ratio as the population age-structure changes over time. (Ahmed & Cruz, 2016; Bloom & Williamson, 1998; Bloom & Canning, 2004; Bloom et al., 2009; Canning et al., 2015; Cruz & Ahmed, 2016; Eastwood & Lipton, 2011; Higgins & Williamson, 1997; Kelley & Schmidt, 1995, 2005, 2007; Karra, Canning, & Wilde, 2017; Lee & Mason, 2006; Mason & Kinugasa, 2008; World Bank, 2015). This dividend is independent of any changes or improvements in productivity or the labor force participation rate.

The second demographic dividend refers to additional increases in per capita income that result from changes in productivity or the labor force participation rate as the age structure changes and savings rise; it will be discussed in the next section.

Figure 6.4 plots the first dividends for each region expressed in percent per year change. These plots are directly derived from the support ratios plotted in Fig. 6.3. The first dividend (i.e., the growth rate in the support ratio) is *positive* when the support ratio is *rising* and *negative* when the support ratio is *declining*. For example, in Latin America the support ratio rose from 47 to 62% between 1967 and 2024; these are the years during which the dividend is positive. In the years before 1967 and after 2024 the dividend is negative. Over the period from 1950 to 2100 the dividend starts negative (as declines in child mortality raise the youth population) and ends negative (as the share of the population over 65 increases quickly). In the intervening years the dividend is positive and the economic growth per capita receives a boost.

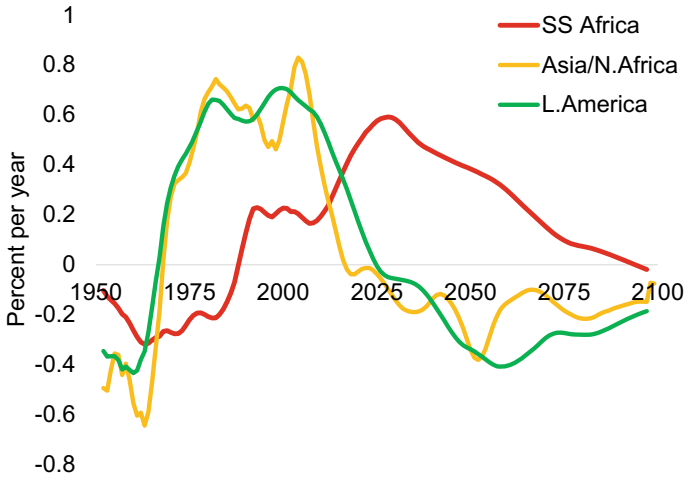

Fig. 6.4 First dividend by region 1950–2100 (Authors' calculations from UN Population Division, 2019)

Table 6.1 Selected statistics on the positive first dividend by region

	Timing of first dividend			Magnitude of first dividend (percent/year)		
	Start	End	Duration	Peak	Average	Cumulative
SS Africa	1989	2093	104	0.59	0.28	34.4
Asia/N.Africa	1968	2016	48	0.83	0.51	28.4
L.America	1967	2024	57	0.71	0.49	33.0

Source Mason et al. (2017)

The timing of the (positive) dividend years varies widely among countries and regions. As shown in Fig. 6.4 and Table 6.1 the dividend patterns are broadly similar for Asia/N.Africa and Latin America. In these regions the dividend onset was in the late 1960s and lasted about half a century. Peak dividends reach around 0.7–0.8% per year. In the future the economies of these regions face headwinds from the slightly negative first dividends. It should be emphasized that the estimates in Table 6.1 are regional averages and the peak values for individual countries can be substantially higher. For example, in several East Asian countries the first dividend peaked at over 2%. This means that the growth rate in GDP per capita in these countries were raised by 2% from the first dividend.

In sub-Saharan Africa the positive first dividend period starts later (in 1989) and ends much later—near the end of the twenty-first century. Its average value is about half that of the other region. The net result of the longer but less intense dividend is that SS Africa has a cumulative dividend of 34.4% which is slightly higher than in Asia/N.Africa (28%) and L.America (33%). The first dividend for SS Africa lies still mostly in the future while little dividend is left for the rest of the developing world.

6.5 The Second Demographic Dividend

The second dividend arises when faster growth of the working-age population leads to higher productivity per worker. As the number of dependents declines, workers are able to save more which leads to higher investment in human and physical capital thus raising productivity. Estimates of the second dividend are based on complex statistical models, see, for example, Ashraf et al. (2013), Karra et al. (2017), Mason et al. (2017). The findings of these studies are not easy to compare because the underlying assumptions of the models vary. One of the most comprehensive examinations of the two dividends is provided in a UN Technical Paper by Mason et al. Their main results are summarized in Figs. 6.5 and 6.6.

Figure 6.5 presents estimates of the first, second and total dividend between 1955 and 2015. The dividend is expressed as the cumulative impact on the GDP per capita by the end of the period.

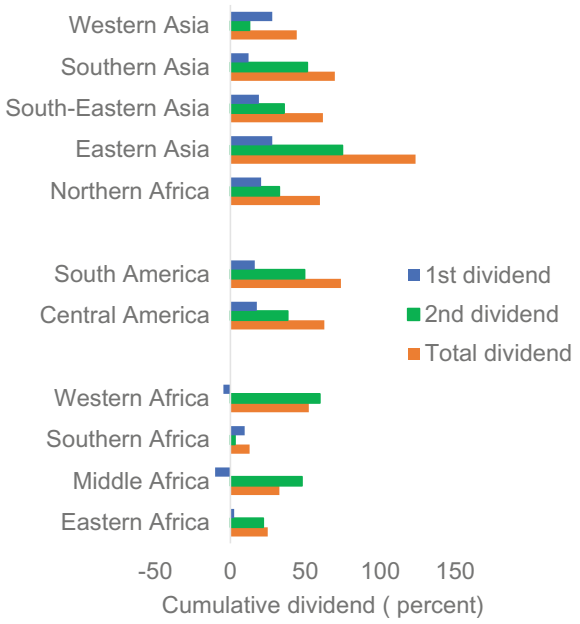

Fig. 6.5 Cumulative first and second dividend 1955–2015 (percent) by region (Mason et al., 2017)

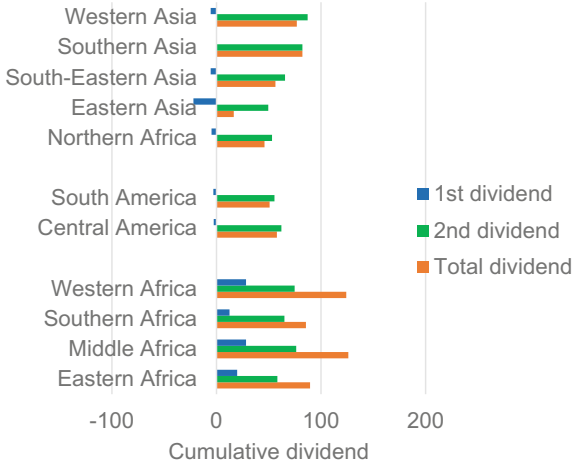

Fig. 6.6 Projected cumulative dividend 2015–2075 (percent) by region (Mason et al., 2017)

As expected from the discussion in the previous section, the cumulative effects of the first dividend are highest in Asia/N.Africa and Latin America and smallest in sub-Saharan Africa. In fact, the dividend is negative in Western and Middle Africa. In these two sub-regions fertility changed little but child mortality dropped rapidly, resulting in a slight increase in the child population.

The cumulative effects of the second dividend for the period 1955–2015 are larger than the first dividend in all regions. As is the case for the first dividend, the second

and total dividends are highest in Asia/N.Africa and L. America. In Eastern Asia the cumulative impact of the total dividend reaches 123% which means that the GDP per capita in 2015 was 123% larger than what it would have been without the dividend.

Mason et al. (2017) also look toward the future and project the dividend from 2015 to 2075. This exercise relies on the medium variant of the UN population projections. The results are presented in Fig. 6.6.

In the future the regional differences in cumulative first dividends from 2015 to 2075 are mostly the reverse of what was observed for 1955–2015. That is, the first dividend is negative in Asia/ N. Africa and Latin America, but positive in sub-Saharan Africa. In contrast, the future second dividend is substantial in all regions. It might seem surprising that the first and second dividend can have opposite impact. For example, in East Asia which has substantial negative future first dividend of −22% (because of low fertility in the past and rapid population aging), but it has substantially positive second dividend because of investments in physical and human capital that were made in previous years. As a result, this subregion still has a positive total dividend of 17% between 2015 and 2075.

The regional estimates presented in Figs. 6.5 and 6.6 and in Table 6.1 were all taken from Mason et al. (2017). This study does not contain country specific estimates. However, two recent studies provide comparable country projections of the dividend: one on Democratic Republic of the Congo by Hassan et al. (2019) and another on Nigeria by Mason et al. (2016). These two studies produce a cumulative estimates dividend to 2075 of 88% for Congo DR and 84% for Nigeria.

To summarize, the first dividend yields a mechanical but transitory bonus, that is more-or-less automatic because it depends only on a changing age structure (but assumes no offsetting changes in labor force participation or productivity). The second dividend transforms that bonus into greater productivity and sustainable development. This outcome is not automatic but depends on the implementation of effective policies that encourage savings and productive investments such as in a well-educated labor force. The dividend provides an opportunity for accelerated GDP growth, rather than a guarantee of improved standards of living (Lee & Mason, 2006).

6.6 Multi-sectoral Benefits from Fertility Decline

The preceding sections of this chapter focused on the stimulus to economic growth that countries derive from the demographic dividend. This focus is understandable given the high levels of poverty that still exist in much of the developing world. But the dividend is only one of the many benefits provided by fertility decline and the resulting slower population growth. As women have fewer children, several other development sectors benefit:

Women's empowerment: Women with smaller families have more time and freedom to participate in the formal and informal labor force and civic life;

Health: The reduction in unintended pregnancies and the wider spacing of pregnancies reduce maternal mortality and morbidity and improve infant and child survival and health;

Government: Lower fertility means less pressure on the education and health care sectors and on the country's infrastructure (e.g., transportation, communication, energy, water and sanitation). If population growth continues at a rapid pace, high unemployment rates, explosive growth of slum populations, overcrowded schools and health facilities, and dilapidated public infrastructure will continue to hamper development;

Environment: Reduced pressure on natural resources on which people's lives depend (e.g., fresh water, soil, forest, arable land, energy, etc.) and reduced air, water, and soil pollution; and.

Social/Political stability: With a slower-growing youth population there is less competition for jobs and fewer unemployed youth, thus making political environments more stable.

A fuller examination of the links between the fertility and contraceptive transition and these multi-sectoral effects is beyond the scope of our analysis, but the interested reader can find more detail and extensive references in Starbird et al. (2016). These wide-ranging positive effects of fertility decline make government investments in programs to promote contraceptive use and fertility control more appropriate and consequential.

6.7 Conclusion

In recent decades the literature on the effect of population on development has focused on the demographic dividend. There is now a near consensus—supported by the evidence summarized above—that the dividend is substantial. It is caused by a decline in fertility which leads to a changing age structure with rising numbers of workers and fewer dependents. This increase in the support ratio directly raises the GPD per capita (i.e., the first dividend) and leads to higher savings which allow intensification of human and physical capital (i.e., the second dividend). In general, the second dividend is substantially larger and lasts longer than the first dividend. The first dividend can last many decades, but is ultimately transitory, while the second dividend results in higher productivity and sustainable growth, yielding lasting benefits.

The duration and magnitude of these dividends vary from country to country and depend heavily on the pace and magnitude of the fertility decline. Over the six decades from 1955 to 2015, the first and second dividend together were highest in Asia, N.Africa and Latin America (where the fertility transition was completed quickly and early) and lowest in SS Africa (where the fertility transition was slower and later). Projections for the next six decades to 2075 expect the situation to reverse with the dividend in Asia likely to be smaller than in SS Africa.

Past acceleration in economic growth brought about by the dividend has not been sufficient for a developing country to "vault into the ranks of the developed" (National

Research Council, 1986). But this is obviously an inappropriate expectation. The dividend should be seen as an important stimulus to economic growth during a period when countries are typically still poor. The past dividend has boosted GDP per capita by 50 to more than 100% in most of Asia, N.Africa and Latin America.

The key policy question arising from the now well-established demographic dividends and the multiple other benefits from fertility reduction is whether family planning programs can accelerate fertility decline. This next chapter will take up this still controversial issue.

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