South Africa's Generational Economy

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Declaration of Own Work

I, Morné Jacques Oosthuizen, hereby declare that this thesis is my own unaided work, both in concept and execution, and that apart from the normal guidance from my supervisor, I have received no assistance.

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Declaration of Included Publications

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1. Oosthuizen, M., 2015. 'Bonus or Mirage? South Africa's Demographic Dividend.' *Journal of the Economics of Ageing*. 5:14-22, doi:10.1016/j.jeoa.2014.08.007.
2. Oosthuizen, M., 2018. 'Counting Women's Work in South Africa: Incorporating Unpaid Work into Estimates of the Economic Lifecycle in 2010.' *CWW Working Paper* WP8. Counting Women's Work, November 2018. Available at: www.countingwomenswork.org.
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Abstract

While countries around the world have experienced unprecedented shifts in their population age structures over the last 70 years, it has only really been over the last 20 years that research into the impact of the structure of the population on the economy has gained momentum. Analytically, it is the recognition that engagement in the economy and the resulting economic flows between individuals vary with age that underpins this impact: children consume more than they produce; prime working-age cohorts produce more than they consume, transferring surpluses to others or saving them for old age; and the elderly use transfers from others, asset income or dissaving to finance their consumption given low levels of labour income.

These economic flows at each age are quantified by the National Transfer Accounts (NTA) methodology, providing a view of the so-called *generational economy* and allowing us to see how different age groups produce, consume, share, and save resources at a given point in time. NTAs are constructed from a variety of data sources—including household survey data, administrative data, national accounts data and population data—to be consistent with National Accounts and can be thought of as age-disaggregations of various national accounting aggregates. NTAs have been constructed for a growing number of countries around the world, with South Africa one of the first countries on the African continent to have constructed NTAs.

This thesis utilises the NTA methodology to construct partial or full accounts for South Africa for five years between 1995 and 2015. These accounts are used to analyse three aspects of the generational economy or economic lifecycle. First, the estimates are used to estimate the magnitude of South Africa's demographic dividend, the potential economic benefits that arise due to the changing population age structure as the working-age population grows relative to the total population. Second, the NTA estimates for 2015 are disaggregated by race to assess differences in the economic lifecycle across these groups, which are used as proxies for socioeconomic status, and to assess the implications of high levels of inequality on the estimates themselves and on projections of the profiles into the future. Finally, by incorporating time use data to estimate time allocations to unpaid housework and care activities for men and women across the lifecycle, the exclusion of non-market services from the national accounts production boundary, and therefore from NTA, is addressed, making it possible to properly assess the full economic contributions of men and women across the life course.

Acknowledgements

In early December 2008, an unexpected invitation arrived for me to attend a conference half-way around the world, as one of five African teams aiming to do research using a methodology I had never heard of. A couple weeks later, I was introduced to National Transfer Accounts (NTA) and have been hooked ever since. It has been an absolute privilege working with the amazing group of people that constitute the growing NTA network, led by Professors Ronald Lee and Andrew Mason. Thank you all for your exciting ideas, your interest in and support for my research, your insightful advice, and your friendship.

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Chapter 1

Introduction

1.1 Background and Motivation

Globally, populations are in a state of flux. Following at least 250 years of stability (Lee 2003), societies around the world have been experiencing rapid shifts in the age structure of their populations. The post-war baby boom experienced in the United States and various other Western countries coincided, in many developing countries, with the start of the demographic transition. This transition, from a steady state of high fertility and high mortality to one of low fertility and low mortality, set off a population boom in these countries as mortality—and child mortality in particular—declined sooner than fertility (Bloom *et al.* 2003).

Globally, growth of the population under the age of 25 was over two percent per annum until 1972, by which time this group accounted for almost 56 percent of the population (own calculations, United Nations 2017). By 1976, the 25-59 year old population was growing, in absolute terms, more strongly than the under-25 population, and is expected to peak at almost 46 percent of the global population in 2019. While many countries, particularly in the developing world, continue to have young populations, increasing numbers of countries are now facing rapid growth in their elderly populations. The population aged at least 60 years is expected to increase rapidly over the coming decades, from 12.3 percent of the population in 2015 to 18.0 percent in 2036 and to 24.1 percent by 2070. In absolute terms, this is equivalent to an almost tripling of the elderly population from 906 million to over 2.5 billion within 45 years.

These shifts "set in motion a vast array of social and economic processes that led to profound changes in society and to important growth in the economy" (Reher 2012, p.11). A key mechanism through which this effect on the economy operates is through variations in both income and consumption over the lifecycle.

Over the course of an individual's life, the ability to produce or earn varies dramatically: when young, earnings potential is low, constrained by low productivity and norms around children's engagement in economic activity; when old, earning potential falls with productivity and may be further depressed by illness or norms around retirement, for example. Between these ages, productivity—and therefore earnings—is highest. At the same time, while consumption may vary by age, the degree of variation is significantly smaller with children typically consuming less than adults. As a result, amongst the youngest and oldest members of society, consumption typically exceeds labour income, while the opposite is true amongst working-age adults. This gives rise to resource deficits amongst the young and the old, and a surplus amongst working-age cohorts.

Clearly, though, children and the elderly are able to access the surplus resources generated within the working ages, either through transfers from individuals in those cohorts or by using or leveraging their own resources generated during their own productive years. Changing population age structure means that the relative weights of these groups—economically dependent children, economically independent adults, and economically dependent elderly—change over time, with important implications for the overall level of dependency in a given society, for the volumes of resource transfers between cohorts, and for the institutions and mechanisms that mediate these transfers.

It is these patterns of resource flows across and between generations that the National Transfer Accounts (NTA) methodology aims to capture. Once these flows are quantified, it is possible to assess and analyse the economic lifecycle, or the "patterns of consumption and earnings across age that lead to a mismatch between material needs and the ability to satisfy those needs through own labour" (United Nations 2013).

Within the global context, South Africa's population is still relatively young, with half the population under the age of 26.1 years in 2015, compared to 29.6 years globally and 18.3 years in Sub-Saharan Africa (United Nations 2017). The population is, though, expected to continue to age over the rest of the century: the fertility rate fell by more than half from 5.8 to 2.4 births per woman between 1965-70 and 2015-20, and life expectancy at birth has increased from 54.8 years to 59.2 years over the same period. By 2065, the country's median age is projected to be 37.6 years, roughly equivalent to the median currently observed in China.

South Africa, therefore, currently finds itself in the midst of a period of favourable demographic change that is lowering dependency rates and boosting economic growth. This period of favourable demographic change—referred to as the *demographic dividend*—is temporary, though, and is not expected to last for much longer; at that point, population ageing will again raise dependency rates, with the population aged 60 years and above growing by more than two percent per annum until the late 2050s. This poses significant challenges to policymakers and the appropriate design of institutions mediating transfers, both public and private, between cohorts. NTA provides a lens through which to analyse the demographic dividend, to determine its timing and quantify its potential impact on living standards, both in the past and in the future.

However, South African society still bears deep scars in the aftermath of apartheid and stark inequalities exist across a wide range of social and economic spheres. While many lower-income countries are confronting the challenge of "getting rich" before they "get old", this imperative may be obscured in high inequality settings. At the same time, general improvements in life expectancy mean that the composition of older cohorts is likely to change in meaningful ways in the future, with important implications for policymaking.

1.2 Structure and Contribution

The rest of the thesis is broadly structured as follows. Chapter 2 reviews three broad areas of the literature relating to demographic dividends; to NTAs for sub-populations; and to unpaid work, gender and time use. Chapter 3 details the NTA methodology, as well as the methodologies for estimating demographic dividends, constructing NTAs for sub-populations, and for constructing National Time Transfer Accounts.

Chapter 4 focuses specifically on South Africa's demographic dividend and the potential benefits that its changing population age structure presents. Relatively little has been written on South Africa's demographic dividend apart from various outputs that draw on early versions of South Africa's original NTA profiles for 2005 (for example, Oosthuizen 2013, 2014, 2015). Indeed, no other published work that specifically quantifies the dividend for South Africa has been located. The chapter answers three core questions. First, what are the estimated magnitudes of South Africa's first and second demographic dividends? Second, to what extent are the projected dividends robust to updated estimates of the generational economy? Third, what types of policy options are available to maximise the demographic dividend that is eventually realised?

In Chapter 5 the focus shifts to inequality and its implications for estimates of the generational economy. Differences in the patterns of resource flows across generations have been observed between countries of differing income levels, suggesting that the same may be true of sub-populations within countries. South Africa has over many years been ranked as one of the world's most unequal societies, and race continues to be closely intertwined with socioeconomic status. Using race-disaggregated NTAs for 2015, the chapter explores the following questions. First, how and to what extent does the economic lifecycle differ across race within South Africa? Second, how do the systems of intergenerational flows differ across groups and what are the implications for the demographic dividend? Finally, what do the findings suggest for the construction of NTAs in high-inequality countries? This chapter adds to the relatively sparse literature on sub-population NTAs and, apart from work on gender, represents the first known attempt at constructing full NTA profiles for sub-populations in Africa. The results presented are the first for a high inequality country where classification of individuals is done on the basis of individual, rather than household (or household head), characteristics. As far as I am able to tell, it is also the first effort at demonstrating the potential impact that inequality can have on projections of NTA profiles into the future.

Chapter 6 continues with the analysis of sub-populations, but considers gender instead of race. NTAs are integrally linked to the System of National Accounts (SNA), which defines economic production to exclude non-market services. These services, which are overwhelmingly produced within households and primarily by women, are therefore excluded from aggregate measures of production, such as GDP, and from estimates of the generational economy. Using time-use data, it is possible to derive gender-disaggregated estimates of the production, consumption and transfers of such services between age groups, consistent with the NTA approach, and combine these with gender-disaggregated NTAs. The chapter addresses three key questions. First, what are the gender-specific patterns of household production across the lifecycle, in both temporal and monetary terms? Second, what is the total economic contribution of males and females, and how much of this is accounted for by household production? Third, what are the implications of these patterns of household production and consumption for the demographic dividend in South Africa and the potential for a gender dividend? The estimates presented in Chapter 6 add to the recent literature on so-called National Time Transfer Accounts (NTTA). The majority of these studies originated from the *Counting Women's Work* project, a project within the global NTA network, and from the European Union's *Agenta* project. The estimates presented here are the first such estimates for South Africa—and one of the first on the continent—and provides updated estimates of the value of household production in South Africa. Importantly, the analysis considers age explicitly and it is therefore possible, for the first time, to gauge the variation in production (and consumption) of unpaid work across the lifecycle.

Chapter 7 concludes.

Chapter 2

Literature Review

2.1 The Demographic Dividend

2.1.1 Demographic Change and the Economy

There is a long tradition of considering the relationship between population and the economy, beginning with Malthus in 1798. This research has primarily focussed on the relationship between the rate of population growth and the economic growth rate, with Bloom *et al.* (2003, p.1) categorising this work into three broad views, namely pessimist, optimist, and neutralist, depending on whether one views population growth as constraining, promoting or having no effect on economic growth.

More recently, however, there has been growing recognition that the age structure of the population, rather than simply the population size or its rate of growth, may impact on the economy (Bloom and Williamson 1998; Bloom *et al.* 2003; Mason 2005; Mason and Kinugasa 2008; Bloom and Canning 2011; Williamson 2013; Mason *et al.* 2017). Pool (2007, p.28) argues that it is not the existence of age-structural transitions—"long-term shifts through a series of phases from 'youthful' to 'old' population structures"—that has triggered interest in them, but rather "the change in their direction, particularly towards ageing, plus their accelerated velocity that, on a human time scale, has appeared so abruptly". Although this literature has really developed over the past twenty years, recognition of the importance of changing population age structures traces back to the work of Coale and Hoover (1958), which focuses on India.

The primary mechanism through which populations' age structures change is known as the demographic transition. The demographic transition sees a society move from an equilibrium characterised by high fertility and high mortality, to one characterised by low fertility and low mortality. In the initial stages of the transition, mortality falls first and particularly so for children (Bloom *et al.* 2000, p.258). Improved survival among young cohorts creates a boom generation that is larger than preceding generations and a surge in the population growth rate as parents take time to adjust their fertility decisions. However, once fertility is adjusted downwards to account for lower mortality, the population growth rate falls and cohort sizes eventually start falling. As the boom cohorts enter the working ages, the working-age population grows relative to the total population, implying relatively fewer dependants per worker. The final stage of this transition includes rapid expansion of the elderly population as the boom cohorts reach retirement age.

The result of these shifts is that the proportion of the population accounted for by those of working age (i.e. between the ages of 15 and 64 years) first rises and then falls as the boom generation works its way through the population age structure from childhood into adulthood and, eventually, into old age. It is this rise in the share of the working ages within the total population which gives rise to a demographic opportunity, a period during which dependency on the working-age population falls, releasing resources for increased consumption, investment in human capital or saving. Put slightly differently, countries at this point in the demographic transition "have proportionally large working-age populations and relatively light dependency burdens, and therefore the demographic potential for high economic growth" (United Nations 2004, p.71). This effect of lower dependency operates through both public and private (familial) systems (Pool 2007, p.28).

It is the concept of dependency that originally anchored analysis of this demographic opportunity, with the key indicator being the dependency ratio, i.e. the ratio of the dependent population to the working-age population. Thus, some of the earliest work concerning the macroeconomic effects of changes in the structure of the population, that by Coale and Hoover (1958), hinges on the dependency ratio. Writing before the the term was coined, their description of the demographic dividend is clearly recognisable:

> The pace of economic development depends on the diversion of resources from consumption to uses that raise future output. A population with a high ratio of dependents to producers consumes more of a given output and devotes less to investment. Thus, high fertility, which produces a high level of dependency, promotes consumption at the expense of investment. During an interim of 2 to 3 decades either sustained or reduced fertility would result in approximately the same number of available workers. With fewer dependents, the population with reduced fertility could invest more and hence gradually produce more. With progressively fewer consumers dividing a progressively larger total product, reduced fertility would result in markedly higher economic welfare. Higher levels of consumption would in turn strengthen the forces leading to higher output through better incentives and improved physiological capacity. (Coale and Hoover 1958, p.333)

Similarly, Bloom *et al.* (2000, 2003) rely on this metric—the dependency ratio—in their analyses of the demographic dividend. The use of dependency ratios was formalised in terms of the definition of the "demographic window" by the United Nations, defining it as that period during which "the proportion of children and youth under 15 years falls below 30 percent and the proportion of people 65 years and older is still below 15 per cent" (United Nations 2004, p.2).

While these very specific age cutoffs indicating dependence and non-dependence correspond with those defining the working-age population, they are arbitrary in the current context, as Mason and Lee (2007) note, and substantial proportions of the population on either side of each of the cutoffs are incorrectly identified as productive or dependent. Indeed, as Dramani and Oga (2017, p.86) note, these "fixed productive age limits . . . do not take into account current demographic, economic and social circumstances", nor do they account for the gradual shift of the population into or out of the labour force as age increases. Further, these cutoffs ignore cross-country or inter-temporal differences in patterns of consumption and income that may arise due to institutional and other factors (Prskawetz and Sambt 2014, p.964). Finally, two countries with identical total dependency ratios—the ratio of the dependent population, including children and the elderly, to the working-age population—can, according to the definition of the window of opportunity above, be classified differently.

By bringing the NTA data to bear on the concept of the demographic window, the concerns around the arbitrary nature of the cutoffs and the one-zero switch between dependence and non-dependence are addressed. Further, NTA has the advantage of consistency, with country-level estimates constructed according to a single methodology. The use of NTA labour income and consumption profiles therefore represents a refinement of the window of opportunity concept, allowing for a gradual transition between dependence and non-dependence and the possibility of variation across countries. Instead of a demographic window, however, the NTA literature speaks about the demographic dividend. Nevertheless, the use of dependency ratios is often a fallback position for discussion of the demographic dividend, even where the limitations of the approach are recognised (see, for example, UNFPA 2014). The demographic window is also the lens through which the World Bank (2015) assesses South Africa's chances of harnessing the demographic dividend.

One of the innovations of the NTA approach is that it distinguishes between two demographic dividends (Mason and Lee 2007). Both dividends arise from the process of the demographic transition, but occur at different stages and for different reasons. The first demographic dividend arises as a result of the boom generations entering the productive working ages. *Ceteris paribus*, this phenomenon results in the number of effective producers—the population-weighted labour income profile, or aggregate labour income—rising more rapidly than the number of effective producers—the population-weighted consumption profile, or aggregate consumption. As a result, the quantum of claims on the labour income produced by those engaged in the labour market declines in relative terms, releasing resources for consumption, saving or investment. Thought of differently, falling dependency ratios at this stage of the demographic transition imply fewer children per working-age adult, freeing up resources that previously would have been consumed by additional children, allowing living standards to rise. Instead of using dependency ratios, though, the NTA approach analyses the first dividend in terms of the economic support ratio. This ratio is discussed in more detail in Section 3.2, and is calculated as the ratio of the number of effective producers to the number of effective consumers. The first demographic dividend therefore refers to the period during which the support ratio is rising; where the support ratio is declining, the first demographic dividend is negative and indicates that the changing age structure of the population is a drag on economic growth.

In contrast, the second dividend arises as the boom generations approach retirement age. Rising longevity results in increased demand for lifecycle wealth as working age cohorts are faced with extended periods of retirement, during which they are economically dependent and reliant on transfers from their families, transfers from the state, their own accumulated savings, or a combination of the three. Thus, working-age cohorts increasingly accumulate wealth to support themselves during old age, a process facilitated by lowered fertility. At the same time, with fewer children, working-age cohorts are able to invest more in the education and health of their offspring. This accumulation of financial and human capital, through capital deepening and higher incomes, may permanently raise incomes and is referred to as the second demographic dividend (Mason and Lee 2006, p.15). Where these accumulated savings are invested abroad, they give rise to inflows of asset income and contribute to the second dividend in that way.

Bloom and Canning (2011) and Bloom *et al.* (2017) think of the demographic dividend slightly differently, viewing it as consisting of accounting and behavioural effects. The accounting effects arise due to the growth of the working age population as the boom generations enter these ages, and due to the fact that these ages are also key in terms of saving. Together, these factors underpin the accumulation of capital, both physical and human, and technological progress (Bloom and Canning 2011, p.1). Behavioural effects entail the reallocation of resources away from investment in children and young people to investments in infrastructure, technology, worker training and development of institutions; rising female rates of labour force participation associated with falling fertility rates; and increased savings linked to the need to finance consumption during longer post-retirement lives (Bloom and Canning 2011, p.2). There is, though, something of a blurring of terminology; for example, in their analysis of the potential for a dividend in Africa, which is not NTA-based, Canning *et al.* (2015, p.49) also use the language of the first and second dividends.

In her analysis of the demographic dividend in the Indian context, Desai (2014) views the demographic transition as giving rise to a "demographic deposit" and a "demographic debt". Since child-related expenditures fall in relative terms as the boom generations move into the labour market, Desai (2014, p.3) views the first demographic dividend as akin to generating savings: "[whether] these savings are stored under the mattress or placed in an interest bearing account is a choice that determines whether we really reap the true demographic dividend". The demographic debt, in contrast, is owed to future elderly generations: the "social and demographic transformations of the present . . . transform the conditions under which the future elderly will live", with the extent to which society meets this obligation being strongly influenced by the institutional context (Desai 2014, pp.3-4). This is a useful reimagining of the demographic dividends, particularly from the perspective of policymaking, since it highlights aspects of intergenerational equity or intergenerational solidarity that may be under-emphasised in analyses of the dividends.

While different approaches put different durations on the demographic window or dividend, it is consistently recognised that the demographic dividend is a temporary phenomenon (Bloom and Williamson 1998; Bloom *et al.* 2000, 2003; United Nations 2004; Pool 2007; Eastwood and Lipton 2012; Ahmed *et al.* 2014; UNFPA and AFIDEP 2015; Moultrie 2017). At the lower end, Ahmed *et al.* (2014, p.2) suggests a "20 to 30 year window", while others suggest periods two or three times as long (Eastwood and Lipton 2012, p.26; Desai 2014, p.2). NTA research also highlights the transitory nature of the effect of population change on the economy in terms of both the first and second demographic dividends. However, the research emphasises that, while the positive effect of the first dividend dissipates and is eventually eroded when the boom generation enters retirement, the second dividend can have a permanent impact on incomes. Mason and Lee (2006, p.11) note that although the "rapid pace of asset accumulation [that launches the second dividend] is also transitory", "per capita assets and income stabilize at a level that is permanently higher . . . [and in] this respect, the second dividend persists whereas the first dividend is transitory". Similarly, Bloom *et al.* (2000, p.281) link the possibility of higher per capita incomes after the completion of the demographic transition to the link between life expectancy on the one hand and education and savings rates on the other.

The transitory nature of the first dividend does not, however, imply licence to ignore it since it is a critical springboard into the second dividend. Mason *et al.* (2017, p.13) outline the link between the two dividends as follows: the "first dividend generates additional resources that may or may not be used in pro-development ways . . . [while the] second dividend reflects economic forces that induce families to use more of these resources to accumulate assets (and human capital), thereby generating more rapid economic growth". Indeed, without the first dividend, the ability of working-age cohorts to accumulate assets is significantly constrained, limiting the potential for a second dividend.

One area in which methods such as the conventional NTA approach fall short relates to unpaid care work. Pool (2007, p.33) highlights this shortcoming as originating from a reliance on a combination of demographic variables and "economic factors that measure only part of the situation" to model the second demographic dividend. Specifically, he notes that these estimates are typically completely silent on the issue of unpaid household services (i.e. direct and indirect care activities) that may be materially impacted by changing population age structures. The issue of unpaid care work within the context of NTA is addressed in more detail in Chapter 6.

2.1.2 Policy and the Demographic Dividend

Critical to any consideration of the demographic dividend is that it represents a *potential* boon to the economy. This is a point that is made repeatedly, from the outset, in the literature: without a supportive environment—economic, institutional, policy—the demographic dividend will not be harnessed and the opportunity will be lost (Bloom *et al.* 2003; United Nations 2004; Bloom and Canning 2011; Eastwood and Lipton 2012; Ahmed *et al.* 2014; World Bank 2015; Groth and May 2017b). Lee and Mason (2006, n.p.), for example, notes that the positive outcomes associated with the dividend "are not automatic but depend on the implementation of effective policies", and highlight the fact that "the dividend period is a window of opportunity rather than a guarantee of improved standards of living".

As a result, countries have had varying degrees of success in realising the dividend. East and South-East Asian countries are typically held up as countries that have been particularly successful in this regard (Bloom *et al.* 2003; Mason 2005); Ireland is another good example (Bloom *et al.* 2003, p.35). Latin American countries, though, have typically not been successful in this area (Mason 2005, p.3). In contrast, not being far advanced in the demographic transition, the demographic dividend still very much represents an opportunity for countries in Sub-Saharan Africa.

Bloom *et al.* (2003) spend considerable attention on the importance of the policy environment for the successful harnessing of the demographic dividend. They identify four areas of policy that are particularly important for the dividend, namely public health, family planning, education, and economic policy (Bloom *et al.* 2003, p.xiii). More recently, the UNFPA and

AFIDEP (2015, p.viii-ix) have identified four main policy thrusts, namely the acceleration of fertility decline through improvements in access to family planning, female education and child survival; economic policy aimed at creating jobs in a context of inclusive growth; investment in the quality of human capital, in terms of both education and health; and the strengthening of institutions. While the more recent NTA literature appears to place slightly less emphasis—or, at least, less direct emphasis—on family planning, there appears to be broad agreement on policy priorities related to health, education, savings and the labour market. Lee and Mason (2006, n.p.) provide a sense of the complexities involved in policymaking for the demographic dividend by noting factors relevant to productivity at different ages. For younger adults, these factors include "schooling decisions, employment practices, the timing and level of childbearing, and policies that make it easier for young parents to work", while at older ages they include "health and disability, tax incentives and disincentives, and, particularly, the structure of pension programs and retirement policies" (Lee and Mason 2006, n.p.).

Health: Bloom *et al.* (2003, p.69) highlight the fact that health policy is fundamental to the achievement of the demographic dividend in that such policy can initiate the demographic transition itself: "Improved sanitation, immunization programs, antibiotics, and contraceptives initiate the declines in mortality that lead to declines in fertility, which together cause changes in the age distribution and size of a population". At the same time, the magnitude of the demographic dividend can be impacted by the pace of the demographic transition (Canning *et al.* 2015, p.32; UNFPA 2014, p.21; Drummond *et al.* 2014, p.5), implying a role for policymaking in this area too. Canning *et al.* (2015, p.32) identify scope for policy aimed at hastening the demographic transition by extending access to family planning services, lowering rates of child mortality, and improving educational outcomes for girls and women; the UNFPA and AFIDEP (2015, p.25) make policy recommendations along similar lines to encourage a more rapid decline in fertility.

Interventions along these lines can have substantial impacts. It is estimated, for example, that "fulfilling just one-third of the unmet need for contraceptives in Kenya, Senegal, and Nigeria could lead to respective 16%, 12%, and 9% increases in the countries' per capita incomes by 2030" (Bloom *et al.* 2017, p.67, referring to the results of Bloom, Humair, Rosenberg, Sevilla and Trussel (2014)).

Declining fertility may impact economic growth, thereby intensifying the demographic dividend, by raising female labour force participation. Bloom *et al.* (2009, p.80) find that this impact on participation rates is substantial. Based on a panel of 97 countries over the 1960-2000 period, they find that a fall in the total fertility rate of four births per woman—which, they argue, is not uncommon over the course of the fertility transition—is associated with "an increase in female labor supply during the fertile years by about 8 years, close to 18% of a woman's normal working life of 45 years" (Bloom *et al.* 2009, p.97).

Beyond triggering and helping sustain the demographic transition, however, appropriate health policies are key to ensuring a healthy, productive population. As Bloom and Canning (2011, p.3) note, "[better] health means that students learn more quickly, workers produce more effectively, foreign investors are more likely to be attracted, and savings rise". Recent experience has shown that a lack of resourcing of the health system or an inadequate response to health crises can seriously jeopardise the demographic dividend, with the HIV/AIDS pandemic being a particularly pertinent example. Whiteside and Zebryck (2017, p.299), for example, argue that HIV/AIDS placed the demographic dividend "under threat in parts of Africa", due to the fact that it has tended to impact younger working-age adults. Without robust interventions, HIV/AIDS undermines a population's productive capacity by limiting labour market engagement by those living with the disease, and eventually negatively impacts the size of the working-age population when they die; further, those required to care for sick family members may see their own ability to find and keep employment negatively impacted.

Education: Investment in education makes sense for the harnessing of the demographic dividend for a number of reasons. Perhaps the most obvious reason is that better educated workers are able to earn more in the labour market than those with less education, raising per capita incomes and boosting both the first and second demographic dividends. Further, there is evidence to suggest that more educated populations may benefit most from the demographic dividend (Drummond *et al.* 2014, p.5).

Investing in girls' education, in particular, has a number of effects that reinforce the demographic dividend. Since higher levels of education are associated with higher opportunity costs of not working, investing in education encourages greater labour force participation amongst women (Psacharopoulos and Tzannatos 1989; Diwan and Vartanova 2017; International Labour Organisation 2017). More educated women, according to Diwan and Vartanova (2017, p.13), are also less likely to hold strongly patriarchal values and have greater bargaining power within their households, both of which ease their participation in the labour force. In turn, more education is associated with delayed marriage and childbearing, and possibly lower lifetime fertility although this effect, if any, is small (Chakravarty *et al.* 2017; Heath and Jayachandran 2017).

Overall, there is evidence from NTA research of a quality-quantity trade-off in terms of investing in human capital. Lee and Mason (2010, p.177) find, using NTA data for 19 countries, that "human capital expenditures per child are substantially higher where fertility is lower, to the extent that the product of the total fertility rate and human capital spending per child is roughly a constant share of labor income across countries". Thus, it appears that part of the proceeds from the first dividend may be allocated to human capital accumulation, "reinforcing the economic benefits of fertility decline" and potentially "[reducing] or at least [postponing] the support problems brought on by population aging" (Lee and Mason 2010, p.177). Mason and Lee (2012, p.29) find an elasticity of -0.83 between spending on human capital accumulation and the total fertility rate, based on estimates from 34 countries. A fall in the number of births per woman of 10 percent is, therefore, associated with an approximately eight percent rise in per capita spending on human capital accumulation. However, the authors find that this relationship is weakened in low-income countries, implying weaker second demographic dividends than would normally have been expected given the experience of other countries (Mason and Lee 2012).

Savings: Key to the second demographic dividend is the way in which society chooses to support the elderly (Lee and Mason 2006). Thus, the "mechanism by which assets are shifted across age groups is important because it determines whether population ageing leads to the accumulation of assets or to the expansion of public and private transfer programs" (Mason and Lee 2007, pp.979-980). There are already examples of countries that are expected to forfeit substantial parts of the potential benefit of the second dividend: based on NTA estimates for a number of European countries, Prskawetz and Sambt (2014, p.1004) conclude that a "positive wealth effect is not anticipated in most parts of Europe because the consumption of the elderly is predominantly financed through public transfers . . . [resulting in] little incentive to accumulate assets".

Canning *et al.* (2015, p.149) highlight three channels through which the demographic transition can raise saving rates. Firstly, increased spending on education may result in higher per capita incomes. Secondly, the increased proportion of the population in the prime working ages where individual-level savings are typically highest can raise the aggregate savings rate, even in the absence of behavioural change at the individual level. Thirdly, the prospect of longer periods of retirement, combined with having fewer children, may stimulate higher savings rates. As Bloom *et al.* (2017, p.65) put it, "because a large number of children often substitutes for old-age insurance in societies where social security systems are poorly developed . . . , a decline in fertility implies that savings for retirement rise". Comparing later cohorts of working-age adults with their predecessors, Williamson (2013, p.12) points to three possible reasons for higher savings rates amongst the former. First, higher savings rates may be the outcome of cohorts adjusting to longer life expectancy; second, health improvements reduce uncertainty about mortality, encouraging higher saving among these cohorts; and third, smaller families, increased geographical mobility of children, and longer periods of retirement all promote higher rates of saving.

The second demographic dividend is dependent on the accumulation of savings over individuals' working lives. Mason and Lee (2006, p.32) note a number of potential constraints on this accumulation, including that "[individuals] may not understand the implications of an extended retirement or may be incapable of exercising the self-control required to forego current consumption [or that underdeveloped] financial markets in many countries may limit the investment opportunities available to consumers". Further, policymakers must take care to ensure that social security systems are supportive of individual saving, and do not promote early retirement or create disincentives to working longer where individuals may choose to do so (Canning *et al.* 2015, p.163).

Employment: The labour market is central to the realisation of the demographic dividend: "[the dividend] can only be achieved if the burgeoning working age population can be gainfully employed and if the boost in savings (and thus investment) predicted by theory can be realized" (Ahmed *et al.* 2014, p.27). In many countries, ensuring that quality jobs are created in sufficient numbers to absorb rapidly growing numbers of labour market entrants represents a significant challenge. It is estimated, for example, that between 2016 and 2063 an average of 1.7 million new jobs per month must be added in Africa to absorb the expected growth of the working-age population over the period, assuming participation and unemployment rates remain constant (Ewinyu *et al.* 2018). The magnitude of the increase leads Canning *et al.* (2015, p.35) to argue that, without materially higher rates of economic growth, employment policies targeting young labour market entrants and women will not be successful in ensuring the absorption into productive employment of the growing labour force.

Depending on the particular country context, policy options may vary. Bloom *et al.* (2003, p.75), for example, highlight "[open] economies, flexible labor forces, and modern institutions" as key factors, noting that the establishment of social safety nets and interventions aimed at facilitating the movement of workers out of occupations and sectors in decline may be essential in making flexibility more palatable to workers. What is clear, however, is that without the requisite economic growth, these job opportunities will not materialise and investments in human capital—education in particular—will not yield their expected returns. Crucially, however, cohorts in the productive ages will be constrained in their ability to accumulate assets in preparation for their retirement, thwarting the realisation of the second dividend before it has even started.

The labour market has the additional significance of arguably being the most effective way in which working-age adults—and, in particular, the youth—are included within the economy and are able to directly access the benefits of economic growth. However, a poorly performing labour market has the potential to derail the demographic dividend: "If the rapid and unprecedented demographic growth of SSA is a powder keg, the detonator might well turn out to be the unavailability of new jobs" (Groth and May 2017a, p.501).

Institutions: Given the policy complexities and long time horizons over which various policies operate, it is unsurprising that the quality of institutions is identified as important for the harnessing of the demographic dividend (Bloom *et al.* 2003; Lee *et al.* 2006; Bloom *et al.* 2007; Eastwood and Lipton 2012; UNFPA and AFIDEP 2015; Zuber *et al.* 2017). Indeed, Mason and Lee (2006, p.14) specifically identify investment in stronger institutions as one of the ways in which the first dividend can be applied. The term is used very broadly and encompasses aspects such as political freedoms and openness; levels of corruption; openness of trade; infrastructure quality (including education, healthcare, communications and transport infrastructure); and appropriate labour market regulation (Bloom *et al.* 2007, p.4).

Institutional quality is fundamental to the attainment of the demographic dividend in two respects. Good quality institutions help to create the economic, social, legal and policy context that is supportive of the demographic dividend process, while also helping balance the costs and benefits of policy interventions across generations. Critically for many developing countries, "corruption and rent seeking by an extractive ruling elite could lead to a situation in which the gains from declining fertility are largely wasted and a demographic dividend does not emerge" (Bloom *et al.* 2017, p.71).

A multiplicity of interrelated factors exert an influence over the extent to which countries are able to prepare for and harness the demographic dividend. As such, it is clear that policy interventions in one particular area will have only limited success. Instead, policymakers are required to be active across a range of areas, from population policy to education and skills development, to health, to economic policy that includes all sections of society within the growth process, and to the development and strengthening of institutions. Importantly, policy interventions need to be contextualised and assessed in terms of their effects over various time horizons. In this context, Mason and Lee (2012, p.20) argue that "any particular policy must be fully evaluated, not pursued solely because it raises the support ratio or yields a greater first demographic dividend".

2.1.3 The Demographic Dividend Globally and in Africa

There is a growing body of evidence that attempts to quantify the demographic dividends in countries around the world. One strand of the research estimates dividends econometrically using cross-country regressions (either cross-sectional or panel) that include some indicator of the population age structure—such as the proportion of the working-age population within the total population—as an independent variable (for example, Bloom and Williamson 1998; Bloom *et al.* 2000; Eastwood and Lipton 2011; Drummond *et al.* 2014). Estimates derived from simulations using macroeconomic models represent a second strand (for example, Ahmed *et al.* 2014). NTA-based estimates of the demographic dividends constitute a third strand, although these estimates are also simulations (for example, Lee *et al.* 2000; Mason and Lee 2006; Prskawetz and Sambt 2014). This literature incorporates information on age-related changes in production, consumption and other flows to simulate the effect of changing demography on the economy. With the growth in the number of countries for which NTA estimates exist, these estimates have been used to model the demographic dividend for non-NTA countries (Mason *et al.* 2017).

Numerous estimates of the demographic dividends across different sets of countries over different time periods therefore exist, with much emphasis on East Asia as the prime example of a strong dividend and on Africa as urgently in need of a strong dividend. However, all agree that the effect of the changing structure of the population on the economy is not insubstantial. Bloom and Williamson (1998, p.450) find that population dynamics are important in explaining per capita GDP growth in East Asia and attribute up to one-third of economic growth during the 1965-1990 period to these factors. More recently, Bloom et al. (2014, as cited in UNFPA 2014, p.19) estimate that the demographic dividend accounted for one-third to one-half of increased per capita incomes in five East Asian countries (China, Hong Kong, Japan, Singapore, and South Korea) over the three decades to 1995. In currency terms, the authors estimate this is equivalent to an additional \$2 500 and \$3 740 per capita in 1995 international dollars.

Eastwood and Lipton (2011) calculate demographic dividends in Asia and Sub-Saharan Africa assuming that the dependency ratio is unrelated to productivity, the labour force participation rate, and the unemployment. They estimate this dividend at 0.41 percent per annum during the 1965-2005 period for Asia, and 0.03 percent over the same period for Sub-Saharan Africa; for the 1985-2025 period, however, the dividend is substantially larger in Sub-Saharan Africa at 0.32 percent per annum and is marginally higher than the Asian average of 0.30 percent (Eastwood and Lipton 2011, p.23). These figures reflect the differences between the two regions in terms of their progress through the demographic transition. Drummond *et al.* (2014) develop an overlapping generations model and, using data for 167 countries, estimate demographic dividends for Sub-Saharan Africa. They find that a one percentage point increase in the share of the working ages within the population is associated with a 0.5 percentage point increase in the real per capita GDP growth rate. The UNFPA (2014, p.21) estimate that the demographic dividend across Sub-Saharan Africa could be worth at least \$500 billion per annum over three decades—a boost currently equivalent to approximately one-third of GDP—but only if national governments implement appropriate policies.

Using the latest NTA estimates from 60 countries, Mason *et al.* (2017) model the demographic dividends for a further 106 countries, allowing them to construct a picture of the demographic dividends across countries and world regions. To aid comparability, they measure time from the start of the first dividend in each country and cover a span of 150 years in each country. Table 2.1 summarises their estimates of the first and second dividends for five world regions. A number of interesting points emerge from the table.

Table 2.1. Regional Estimates of the First and Second Demographic Dividend (percent per annum)

Region	**Start of first dividend**	**Peak dividend (dividend year)** First	Second	Both	**Ave. dividend, first 100 years** First	Second	Both
Africa	1993	0.82 (25)	1.33 (51)	1.80 (48)	0.32	0.67	1.00
Americas	1975	0.84 (19)	1.15 (43)	1.51 (33)	0.15	0.67	0.82
Asia	1973	1.38 (20)	1.88 (42)	2.35 (34)	0.18	0.72	0.90
Europe	1962	0.68 (22)	1.24 (37)	1.35 (28)	-0.08	0.56	0.48
Oceania	1974	0.66 (14)	1.24 (38)	1.50 (28)	0.09	0.71	0.80

Source: Mason *et al.* (2017, p.35).

First, the demographic transition, and therefore the demographic dividend, is delayed in Africa relative to other regions (Guengant 2017, p.20). The first dividend is estimated to start in 1993 in Africa, roughly 20 years after the Americas, Asia and Oceania, and 31 years after Europe. Second, the second demographic dividend is substantially larger than the first dividend in all five regions. This is true in terms of the level at which each of the dividends peak, and it is also true in terms of the average dividend over the 100-year period. The peak first dividend ranges between 0.66 percent (Oceania) and 1.38 percent (Asia), compared to the second dividend peak of between 1.15 percent (Americas) and 1.88 percent (Asia). Third, while the dividends in Africa do not peak as high as they do in Asia or the Americas, the continent has the highest average first dividend and the highest average total dividend over the 100-year period. However, Mason *et al.* (2017, p.35) caution against inferring too much into comparisons of the magnitudes of the dividends across regions, given the long time horizon, the differences in the timing of the dividends, and the complex array of factors that impact the eventual realisation of the second dividend.

Dramani and Oga (2017) draw on NTA estimates for 16 African countries—although only four are outside of West Africa—to discuss demographic dividends on the continent. Unfortunately, they do not provide estimates of the demographic dividend over time; instead, they provide estimates of the rate of change of the support ratio (the first dividend) for 2015-2016. Reflecting the late start of the first dividend in Africa as highlighted in Table 2.1, they find that 15 of the 16 countries were already experiencing a rising economic support ratio and positive first demographic dividend in 2016—ranging from 0.10 percent in Mozambique to 0.73 percent in Ethiopia—the exception being Niger (Dramani and Oga 2017, p.94). Of the 16 countries, the only country projected to see its first dividend period end before 2045 is South Africa (Dramani and Oga 2017, p.96).

The delayed advent of the demographic dividend among African countries is linked to persistently high fertility, which slows the pace of the demographic transition (Bloom and Canning 2011; Mason and Lee 2012; Canning *et al.* 2015; UNFPA and AFIDEP 2015; Shapiro and Hinde 2017). In some ways, the transition in Africa is viewed as "atypical" (Drummond *et al.* 2014, p.7). As Ahmed *et al.* (2014, p.4) notes, "changes in [Sub-Saharan Africa's] demographics have been much slower than in . . . comparator regions", while Shapiro and Hinde (2017) find the slower pace of fertility decline in the region is robust to different methods of identifying the onset of the fertility transition. Indeed, writing less than a decade ago, Eastwood and Lipton (2011, p.16) notes that "[among] populous countries of [sub-Saharan Africa], only South Africa provides a precedent for an absolute fall in total fertility, from its peak, comparable to Asia's". Due to the relatively slow demographic transition, in addition to the first dividend starting later in Africa, it also evolves more slowly and has a lower peak; nevertheless, the continent's first dividend is "very long-lasting" (Mason *et al.* 2017, p.24). When the first dividend turns negative, it is also not as strongly negative as observed in other regions (Mason *et al.* 2017, p.27).

Reher (2012, p.13) identifies three factors that determine the extent of the potential benefits from the demographic window, namely the pace of demographic change, the peak population growth rates attained in the aftermath of the initial fall in mortality, and the ability of societies to regulate population pressures at critical points. The latter refers primarily to the 'safety valve' of mass migration to low density destinations. In all three respects, Reher argues that later demographic transitions are occurring in contexts where all three factors are less favourable. In other words, in these later transitions, it is likely that the speed of the transition is more rapid (although this is not the general case in Africa), that peak population growth rates are higher, and that options for regulating population pressure are more limited. Further, the countries across the continent suffer from numerous institutional weaknesses that constrain their ability to prepare their populations and economies to harness the demographic dividends (UNFPA and AFIDEP 2015, p.viii).

Linked to the effects of the demographic transition on economic growth and per capita incomes, Ahmed *et al.* (2014) shows that the demographic dividend is likely to have a positive effect on poverty reduction efforts across Africa. Further, the importance of the demographic dividend is amplified in contexts of slower economic growth rates. Simulating the effects of the demographic dividend under high and low growth assumptions for the 2007-2030 period, Ahmed *et al.* (2014, p.18) estimates a reduction in the poverty headcount of 40 million and 60 million respectively, from an estimated 361 million in 2007. Under the low growth assumption, this reduction is equivalent to over 13 percent of the baseline reduction in the poverty headcount; under the high growth assumption, it is equivalent to around 19 percent of the baseline reduction.

One advantage of the delayed start and slower evolution of the demographic dividend in African countries is the additional leeway it provides for policymaking. As Pool (2007, p.32) argues, ensuring the appropriate policy environment in time to harness the dividend is expected to particularly difficult "in those countries in which the period of its availability is accelerated and short". At the same time, it is clear that the policy challenge in the majority of African countries is immense. The potential therefore exists for a wide range of possible outcomes as countries try to respond to the demographic dividend: "The success stories are brilliant, in some cases even luminous, but so are those indications that many societies continue to be far from sufficiently developed to confront the new situation with confidence" (Reher 2012, p.13).

2.2 Inequality and National Transfer Accounts

As their name suggests, National Transfer Accounts were originally conceived of as describing the generational economy at a national level. However, the growth in the number of countries constructing NTA estimates—of which many are developing countries—has brought an increasing level of diversity amongst NTA countries in terms of variables such as income level, population dynamics and socioeconomic context. This has led to increasing interest in the interplay between inequality and NTA estimates, as evidenced by the establishment of the Inequality Working Group within the NTA network.

There are two broad and inter-related areas of interest related to inequality as it relates to NTA. Firstly, there is interest in describing and analysing variations across different subnational populations in the patterns of economic flows across the lifecycle. Secondly, there is the question as to the extent to which inequalities within a country may affect projections of national-level NTA profiles over time.

2.2.1 National Transfer Accounts for Sub-Populations

The description and analysis of sub-population NTAs is useful in understanding potential differences in behaviour that exist in response to different constraints, contexts or norms faced by these groups, and may be able to highlight key issues related to the generational economy from a policy perspective. However, relatively little has been published describing sub-population NTAs, while nothing seems to exist that assesses (or even explicitly recognises) the implications of inequality on projections of NTA profiles.

The work on inequality within the context of NTAs has been dominated by Latin American countries, who have framed their sub-populations in terms of socioeconomic status (SES). The earliest research on the issue is that by Turra and Queiroz (2005) using Brazilian data for 1996, with a particular focus on public and private transfers. The authors use the educational attainment of the household head—0-4 years, 5-8 years, 9-11 years, and 12 years or more—to create four SES groups. Education of the household head has also been used to define SES categories in research on Mexico (Fernàndez-Varela and Mejía-Guevara 2012; Mejía-Guevara 2015). Mejía-Guevara (2015, p.25) justifies the choice of educational attainment as a proxy for socioeconomic status by noting that education "shapes income, work, and economic conditions; it determines the likelihood of being employed, the job position and income associated".

Bucheli and González (2011) also use educational attainment, but broaden the measure so as not to focus on the household head as the sole determinant of socioeconomic status in their analysis of Uruguay. Instead, they construct a four-category SES variable using the number of years of education averaged across all adult household members, with the lowest group averaging up to 6 years of education and the highest 12 or more years.

While these studies define groups according to educational attainment precisely because of its ability to proxy for socioeconomic status and cross-country comparability, Tovar and Urdinola (2014, p.167) argue that education is "endogenous to the underlying idea of intergenerational transfers". They contrast sub-population NTA profiles constructed using educational attainment of the household head with those based on quartiles of a multi-dimensional quality of life index (MQLI). This MQLI builds on the preceding work in that it includes education of the household head and average education of other adult household members as components; however, it goes further to include variables such as access to refuse collection, water source, type of fuel for cooking, and the materials used in the construction of the dwelling (Tovar and Urdinola 2014, p.173). The authors show that use of educational attainment of the household head rather than the MQLI to proxy for socioeconomic status yields anomalies in the case of Colombia that may impact on the interpretation of results.

While the point made by Tovar and Urdinola (2014) focuses on the endogeneity of educational attainment, the ability of educational attainment to distinguish different levels of socioeconomic status may also simply be weaker in certain contexts. This may occur, for example, where expansion of access to education over time results in rising educational attainment for younger cohorts: a 70-year old with only primary education may have faced a very different labour market compared with a 30-year old with the same level of education, which may likely lead to significant differences in socioeconomic status. Similarly, changing quality of education over time or changing minimum education requirements for specific occupations may have similar types of effects on the link between educational attainment and socioeconomic status. Expansion of access to education may also result in the education of the household head being very different from that of other younger adult household members. For example, in Colombia, just six percent of the population reside in households where the head's educational attainment is higher than that of all other adult household members; in contrast, 42 percent reside in households where the head has the lowest attainment (Tovar and Urdinola 2014, p.177-178). Further, as Tovar and Urdinola (2014, p.169) note, in contexts where household heads are increasingly not the only income earner within households (as would arise with greater employment of women, for example), the link between education of the household head and the household's socioeconomic status is further weakened. Their key argument is that educational attainment on its own is unable to accurately distinguish differences in socioeconomic status in the Colombian context, hence their preference for the MQLI which incorporates other variables.

Some work on sub-population NTAs has also been done in Europe, again with education as the variable of interest. The key difference between this work (Hammer 2015; Rentería *et al.* 2016b) and the Latin American work is that it uses educational attainment at the individual, rather than the household, level. This change in approach immediately creates an important challenge: how should children and young adults, the vast majority of whom may still be within the education system, be classified? Rentería *et al.* (2016b) effectively make two different decisions, one for the labour income profile and one for the consumption profile. In the construction of the consumption profiles, they treat the population under the age of 25 years as a single group: these individuals are allocated the mean per capita household consumption (i.e. the per capita values from the conventional consumption profile). The result is a single profile up to age 24 at which point it splits suddenly into four separate profiles corresponding to each of the sub-populations. In contrast, no special consideration is given to this age group in the construction of the labour income profiles, resulting in four separate labour income profiles that cover the entire life course. Indeed, this different treatment is not discussed by the authors at all and the underlying rationale is unclear.[1]

Hammer (2015) takes a different approach to creating the three categories used in his study: individuals who have completed their formal education are assigned to a particular group on the basis of their highest level of education, while those who are still enrolled in the education system are assigned on the basis of the qualification they are pursuing. The effect of this approach is to create a single profile at young ages, which gradually separates into the three profiles from the age at which individuals are able to move out of the lowest educational category.

Another strand of the literature has linked the definition of groups more closely to standard money-metric measures typically associated with the analysis of poverty and inequality. Thus, for example, unpublished research by Abrigo (2011) constructs terciles based on a ranking of Philippine households according to per capita labour income. Similarly, using Peruvian data, Angulo (2011) constructs NTA profiles for quintiles based on household per capita consumption, while Shen and Lee (2014) construct quartiles based on per capita income. However, using income- or consumption-based measures for defining sub-populations can be problematic. Specifically, these measures suffer from the same type of endogeneity problem as educational attainment. Indeed, the problem may be more severe here, and may be exacerbated by the type of analysis envisaged: income or consumption are both the basis of the categorisation and the outcome of, or at least strongly correlated with, various aspects of the generational economy.

Sub-populations may also be defined in ways that are not explicitly linked to money-metric and non-money-metric measures of welfare or inequality. For example, geographic location—specifically the rural-urban divide—has been used to delineate sub-populations (for example, Maliki (2011) for Indonesia, and Li *et al.* (2011) and Shen and Lee (2014) for China. These categorisations are defined at the household level, but it is also possible to categorise individuals based on their own characteristics. One such characteristic is gender (for example, Shen *et al.* 2016), which forms the basis for the analysis in Chapter 3. Nevertheless, these groupings are implicitly based on perceptions of inequalities or differences between groups, without which there would be no reason to construct the group-specific profiles.

2.2.2 Findings from Disaggregated NTAs

Most of the research on sub-population NTAs is focussed on describing and explaining the differences (or lack thereof) in patterns of resource flows across these groups. As a result, the research tends to be narrowly focussed on implications for the particular country, rather than on trying to draw out conclusions or recommendations for a broader set of countries. There are, though, some common themes that can be drawn from the existing research.

First, unsurprisingly, there are substantial differences in the monetary value of resource flows across groups. In Colombia, for example, per capita labour income for the top quartile of the MQLI is, at its peak, more than double that of the second quartile (Tovar and Urdinola 2014, p.176). In Mexico, mean per capita consumption amongst the population residing in households

[1] One possibility is that the authors take the position that, if individuals are generating labour income, their participation in the education system is ended and their membership of one of the educationally-defined groups is settled. This, however, ignores the possibility of individuals working while still attending an educational institution. Further, such an assumption would provide the basis upon which to differentiate consumption, even if only for those who are earning labour income; however, the authors do not do so.

whose heads have not completed primary education is estimated to be half the national average across the life course (Mejía-Guevara 2015, p.26). Based on Brazilian data for 1996, mean per capita consumption for 30-39 year olds in households whose heads have at least 12 years of education is estimated to be more than five times that of their counterparts in households with heads with less than five years of education (own calculations based on Turra and Queiroz 2005); for labour income, the ratio is close to 8.5 times.

Second, there are differences, sometimes significant, in the patterns of resource flows with respect to (1) the timing of peaks or troughs; (2) the timing of transitions between net inflows or net outflows; and (3) the relative levels of different types of flows. For example, Tovar and Urdinola (2014, pp.177, 182) find that per capita labour income peaks between the ages of 35 and 55 years for individuals in the top quartile, compared to 45 to 50 years for those in the bottom quartile; and that the transition from lifecycle deficit to lifecycle surplus, and the subsequent return to deficit, occurs at younger ages for those in lower quartiles. Rentería *et al.* (2016b, p.660) show that the Mexican population in the lowest two educational categories (less than primary, and primary) are unable to generate a lifecycle surplus at any age, while even those with secondary education generate only a small surplus over a narrow age range. Mejía-Guevara (2015, p.27) finds substantial differences between the top and bottom SES categories in 2004 in the financing of consumption amongst 0-19 year olds. In the top group, private transfers account for almost 100 percent of consumption, compared to 39.8 percent in the bottom group (with another 48.0 percent and 11.9 percent financed by public transfers and labour income respectively). Similarly, Turra and Queiroz (2005, p.9) find that, for children in low SES households, consumption is financed through both public and private transfers, while private transfers are substantially more important in this regard in high SES households.[2] Their findings also seem to suggest later transitions from lifecycle deficit to surplus and back to deficit for higher SES individuals compared with those in lower SES groups, as well as later transitions from net private transfer inflows to outflows and back to inflows (Turra and Queiroz 2005, p.18). However, the authors construct their estimates using ten-year age cohorts, which obscures the true timing of the transitions.

In his analysis of Austrian data, Hammer (2015, p.20) defines three educational groups—basic education, higher secondary education, and tertiary education—and finds that, although the period of lifecycle surplus is almost identical across the three groups, their timing differs significantly. Individuals with basic education begin generating a lifecycle surplus at age 21, while those with tertiary education only generate a surplus at age 28; the two groups return to deficit at ages 58 and 66 respectively. Further, based on the profiles presented (Hammer 2015, p.16), the gap in per capita private consumption between those with basic education and those with tertiary education appears to increase with age over the life course. Estimates for Spain show that, while all groups generate a lifecycle surplus at some point over the life course, surpluses are extremely small and brief for those with less than primary education; in contrast,

[2] The study by Turra and Queiroz (2005) is relatively old in terms of the development of the NTA methodology and appears to use certain methods—for example, the allocation of consumption to individual household members using Engel equivalence scales—that are not (or are no longer) part of the standard NTA methodology. The authors were also unable to construct profiles of asset-based reallocations. As such, the results may not be strictly comparable with those published more recently.

those with post-secondary education generate substantially larger per capita surpluses than those with less education, and over a wider age range (Rentería *et al.* 2016b, p.660).

Related to the above, inequalities in access to public transfers not evident in national profiles are clearly revealed in a number of cases. In Colombia and Brazil, for example, the sub-population profiles reveal the ability of individuals of higher socioeconomic status to secure higher per capita public transfer inflows, such as from public pensions, at older ages than those in lower socioeconomic groups (Tovar and Urdinola 2014; Turra and Queiroz 2005). Shen and Lee (2014) focus their analysis on benefit incidence of public expenditure and find, in terms of education, higher levels of per capita public spending for individuals in the top quartile under the age of five and particularly after age 15 as lower income groups face greater constraints in terms of access to secondary and higher education (Shen and Lee 2014, pp.13-14). However, amongst older cohorts, in terms of both healthcare and pensions, public spending is found to be strongly skewed towards the top quartile (Shen and Lee 2014, pp.15-18).

2.2.3 Inequality and Projections

NTA profiles are commonly used in projections that aim to simulate the effects of changing population age structures on national economies. For example, in the estimation of the first demographic dividend, static age profiles of consumption and labour income calculated from cross-sectional data are projected decades into the future. Inequality *per se* does not pose problems in this regard; however, where inequalities interact with demography, there may be important implications for projections over time. In particular, complications arise where membership of a particular sub-population is correlated with that sub-population's progress in terms of the demographic transition.

In many contexts, for example, lower socioeconomic status may be associated with relatively higher fertility and lower life expectancy. The result is that the composition of cohorts may vary systematically with age, with higher SES groups accounting for disproportionately large shares of older cohorts, and that it may vary within cohorts over time.

The impact of this composition effect is implicitly recognised in work by Rentería *et al.* (2016b), who use NTA profiles for educationally-defined groups to assess the separate contributions of demographic change and education on the first demographic dividend. The authors combine these sub-population profiles with population projections by age, sex and level of education, published by the Wittgenstein Centre for Demography and Global Human Capital for the 1970-2100 period. Thus, they are "able to evaluate the impact of population age structure on the support ratio while taking into account that changes in education also influence the level of production and consumption" (Rentería *et al.* 2016b, p.652).

Unfortunately, since the impact of estimating the demographic dividend from profiles for separate sub-populations as opposed to national profiles was not their focus, the authors do not present a comparison of the two sets of estimates and it is therefore not possible to directly ascertain the extent to which the estimates are affected.[3] However, the authors do note that

[3]Prskawetz and Sambt (2014) presents estimates of the demographic dividend for Spain constructed from standard NTA profiles, but they do not use the same population projections or the same base year (profiles are constructed using data for 2000, as opposed to the 2006 profiles used by Rentería *et al.* (2016b)).

"education expansion delays the start of the negative growth of the support ratio" (Rentería *et al.* 2016b, p.668), suggesting that using the sub-population estimates has a non-negligible impact on projections of the support ratio and demographic dividend.

The consequences of inequality for projections of NTA profiles, operating through differences in demography, have not been explored in much detail. To date, there does not appear to be any literature that either attempts to quantify the effect or contrasts projections of national-level profiles with those derived from profiles for sub-populations.

2.3 Gender, Household Production and National Transfer Accounts

2.3.1 Gender and the Generational Economy

National Transfer Accounts describe the nature of the generational economy in a particular society, mapping the flows of resources between age groups as they produce, consume, share and save. The exact pattern of these flows across the lifecycle is determined by the combined effects of, amongst others, individual choices, the institutional context, and social and cultural norms. Together, age profiles of these flows provide a view of the systems of support through which consumption is financed at different ages across the lifecycle.

While the NTA describes the mean flows for each age cohort, there are various reasons to expect that the support systems for men and women over the life course may differ from each other in fundamental ways. Girls and boys may differ in terms of their access to education or health, as well as in terms of the quality of the services accessed. They may also be required (or allowed) by their households to enter the labour force at different ages. During the working ages, women may be less likely to find employment and, if they are employed, may be more likely to find themselves in less secure, less remunerative employment than men. During their reproductive ages, many women spend extended periods of time out of the labour force, which may aggravate their relative disadvantage in terms of employability upon their re-entry. These differing employment histories may result in lower employment-based pensions for women during retirement relative to men (United Nations 2013), leaving them more vulnerable to old age poverty. Further, men and women may have significantly different experiences in terms of the extent of family support available, inheritance customs, and taxation regimes, amongst others. Finally, from a lifetime perspective, women's longer life expectancy exacerbates gender inequalities as they may need to rely on fewer resources over a longer period of time. As a consequence, estimating NTAs separately for males and females would be useful in providing a deeper understanding of the generational economy and the possible effects of these differing contexts.

Gender-disaggregated NTAs, however, typically reveal substantial differences in the labour income profiles of males and females: per capita labour income tends to be significantly higher for males than for females. Thus, although gender differences in the consumption profiles tend to be more muted, both the timing of the lifecycle surplus period and the magnitude of the surplus itself vary by gender. Indeed, in some cases, females are found to produce no lifecycle surplus at any age. Hammer *et al.* (2015) present this type of result for ten European countries, including Sweden which is widely viewed as a world leader in terms of gender equality. Similar findings have been made in other countries around the world, including India (Ladusingh 2013), Costa Rica (Jiménez-Fontana 2015), and Ghana (Amporfu *et al.* 2018).

These large differences in labour income profiles exist despite a large body of evidence that shows that women spend as much time as men, if not more, in productive activities (Goldschmidt-Clermont and Pagnossin-Aligisakis 1999; Antonopoulos 2008; Folbre 2013). Amarante and Rossel (2017, p.17) find that, in the four Latin American countries they study, women spend between two percent (Mexico) and 18 percent (Peru) more time working than men. In terms of regional averages, they find no difference between men and women in the four Nordic countries and nine percent more time for women in the four Eastern European countries for which they had data. Based on their review of studies of Latin American countries, Campaña *et al.* (2017, p.36) conclude that “the total time worked by women always exceeds that worked by men”. Specifically, they estimate that women work longer than men by 1.66 hours per week in Peru, 3.67 hours in Mexico, and 6.34 hours in Ecuador (Campaña *et al.* 2017, p.41). This finding is, however, not universal. In Iran, for example, Tabatabaei *et al.* (2013, p.8) find no real difference between men’s and women’s time spent in productive activities (395 minutes and 390 minutes per day respectively), Kluge (2014, p.720) finds that women in Germany contribute 46 percent of aggregate time spent in productive activities, while Hakim (2010) claims that men in Sweden, Norway and the Netherlands spend more time in productive work than women (although she does not provide any data to confirm this). In South Africa in 2000, Wittenberg (2009, pp.14, 15) confirms econometrically that women allocate more time to productive activities than men, finding that “men spend almost an hour [per day] less on all types of work than women, after controlling for all the measured characteristics” and, furthermore, that the gap increases markedly with age. It is therefore not the case that gender-disaggregated labour income profiles accurately reflect real differences in the productive contributions, broadly defined, of males and females.

2.3.2 The System of National Accounts and the Production Boundary

NTAs are integrally linked to the System of National Accounts (SNA) and therefore implicitly use the same production boundary. The United Nations *et al.* (2009, p.97) define economic production as “an activity carried out under the control and responsibility of an institutional unit that uses inputs of labour, capital, and goods and services to produce outputs of goods or services”. The SNA production boundary, though, is narrower and excludes “activities undertaken by households that produce services for their own use” (United Nations *et al.* 2009, p.98). In effect, the SNA defines as economic production the production of goods, whether paid or unpaid, and of paid services; unpaid services are not included within the SNA production boundary, nor are services provided to households by volunteers (United Nations *et al.* 2009, p.543).[4] Specifically, the SNA production boundary excludes:

a. The cleaning, decoration and maintenance of the dwelling occupied by the household, including small repairs of a kind usually carried out by tenants as

[4] There are two key exceptions to this, namely service provided by owner-occupied housing (imputed rent) and services produced by paid domestic workers (United Nations *et al.* 2009, p.98).

well as owners;

b. The cleaning, servicing and repair of household durables or other goods, including vehicles used for household purposes;

c. The preparation and serving of meals;

d. The care, training and instruction of children;

e. The care of sick, infirm or old people;

f. The transportation of members of the household or their goods (United Nations *et al.* 2009, p.98).

While these distinctions may appear arbitrary in some ways, various justifications are provided. The inclusion of the production of all goods is justified by noting that the production of goods and the decision as to whether or not to consume them within the household are separate from each other, rather than simultaneous as in the case for services (United Nations *et al.* 2009, p.98). The exclusion of the production of services within the household for own consumption is justified due to the "relative isolation and independence of these activities from markets, the extreme difficulty of making economically meaningful estimates of their values, and the adverse effects it would have on the usefulness of [national accounts] for policy purposes and the analysis of markets and market disequilibria", noting also that inclusion of these services would impact labour statistics, rendering unemployment virtually impossible (United Nations *et al.* 2009, p.99).

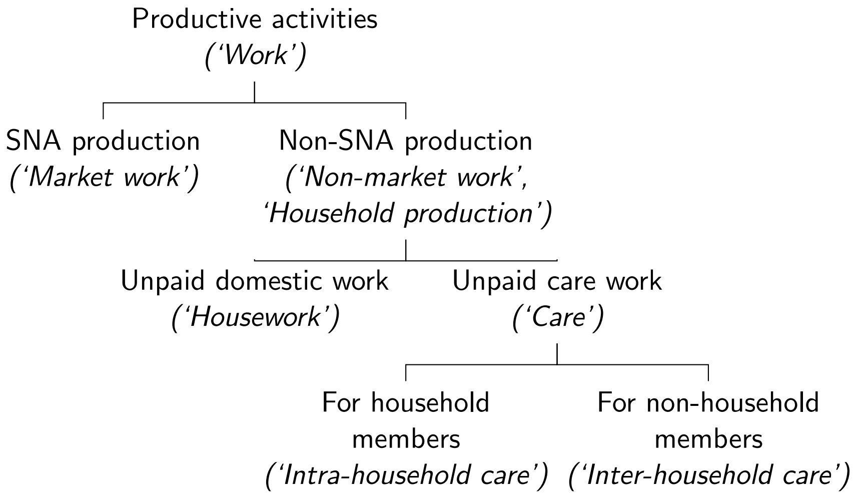
The exclusion of unpaid services from the SNA production boundary is not, however, uncontroversial with particularly strong critiques coming from feminist economists, who argue that the omission of the production of these services means that the accounts are incomplete and specifically undervalue the economic contributions of women (Reid 1934).

At this point it is worth clarifying terminology used in this paper and outlined in Figure 2.1.[5] All productive activities are deemed to be work, which can be either paid or unpaid. Paid work falls within the SNA production boundary, while this is true of only certain activities within unpaid work, such as subsistence production, or unpaid family work. Market work, or SNA work, includes all productive activities where the output is included within national accounts measures of production. This includes activities that give rise to market goods and services, and non-market goods. Market work may take the form of employment, self-employment, or working unpaid in a household enterprise, for example. Non-market work—also referred to as non-SNA work, "non-market household production activities" (Ironmonger 1996, p.37), or simply household production—comprises productive activities that give rise to unpaid services that may be consumed within the household or by others outside the household (i.e. volunteer work or help in other households). Non-market work can be separated into two main types of activities: care work on the one hand, including also unpaid care for non-household members, and all other household production activities on the other. The latter may be referred to as housework, household chores, or housekeeping activities. Some authors refer to non-SNA work simply as "care work" (Budlender 2008, for example), and in this context Folbre (2013, p.i136)

[5] There is substantial variation and overlap in the terminology used in this area (Folbre 2006; Antonopoulos 2008; Folbre 2013). The terminology used here is just one possible delineation of activities.

uses the terminology to "interactive care work" and "support care work" to distinguish between what is termed here as unpaid care work and unpaid domestic work.

Figure 2.1. Types of Work



The delineation of the production boundary to exclude unpaid services means that national accounts aggregates underestimate total production by some margin. In response, there has been a push to formally measure household production as a complement to existing national accounts. Growing interest in quantifying household production has promoted the proliferation and increasing harmonisation of time-use surveys and, on the back of this growing data resource, estimates of household satellite accounts. There is now an extensive literature on the valuation of household production and the production of these satellite accounts (Ironmonger 1996; Landefeld and McCulla 2000; Abraham and Mackie 2005; Budlender 2008; Landefeld *et al.* 2009; Poissonnier and Roy 2015). Household satellite accounts follow an input approach to valuing household production, which tries to value all the inputs to the household production process, including labour, capital and intermediate inputs.[6]

The production of satellite accounts to the SNA that measure non-market work allows the estimation of the extent to which GDP underestimates total production. In their review of a number of studies, Poissonnier and Roy (2015, p.355) find that most estimates are within the range of 30 percent to 50 percent of GDP. Using 1992 data for Australia, Ironmonger (1996) estimates the value of non-market work—or what he terms "Gross Household Product"—to be almost as large as "Gross Market Product" (calculated as GDP less value added by owner occupied housing, which is included within gross household product): gross household product is estimated to represent 48.5 percent of total production (or "Gross Economic Product"). In the United States, the effect of including household production in GDP is to raise it by 43 percent in 1946 and 24 percent in 1997 (Landefeld and McCulla 2000, p.300). Other estimates include 40 percent of GDP in Catalonia (Carrasco and Serrano 2011, p.78), and 33 percent of GDP in France (Poissonnier and Roy 2015, p.373). Folbre (2013, p.i144) summarises the situation well when she says "the satellite metaphor is misleading, since the size of the additions to extended GDP is closer to that of a large moon or small planet".

[6]The approaches to valuing household production will be discussed in more detail in section 3.4.1.

In non-satellite account calculations, the consideration of capital in the valuation of non-market work is relatively uncommon, with most studies simply valuing labour. Based on generalist replacement wages, Miranda (2011) finds that unpaid work in 25 OECD countries is equivalent to between 19 percent and 53 percent of GDP; as the author notes, these estimates are certainly underestimates given that they cover only the population aged 15-64 years. Budlender and Brathaug (2004, p.39) estimate unpaid work in South Africa in 2000 to be equivalent to 24 percent of GDP (using specialist wages), although alternate methods and data sources provide a range of estimates between 11 percent and 50 percent of GDP. In their analysis of six countries—Argentina (specifically, Buenos Aires), India, Nicaragua, South Africa, South Korea, and Tanzania—and a variety of wage rates, Budlender (2008, p.38) estimate the value of non-market work (what they term "unpaid care work") to be as low as seven percent and as high as 63 percent of GDP. While they do not present any valuations using specialist replacement wages, the valuations using generalist replacement wages range from 10 percent in Argentina, to 39 percent in India, with South Africa at 15 percent. In Iran the value of unpaid work is estimated at 7.6 percent of GDP based on time-use data for urban married housewives and replacement wages (Tabatabaei *et al.* 2013, p.23); based on this, the authors suggest a lower bound of 15 percent of GDP once unmarried women and men are included. In Guatemala, Gammage (2010, p.98) estimates the value of non-market work at between 25.7 percent and 34.2 percent of GDP, depending on the valuation method used. Similarly, estimates for the European Union range between 17.0 percent and 31.6 percent (Giannelli *et al.* 2011, p.2120).

More recently, Van De Ven *et al.* (2018, pp.21) present results for the G7 economies using both the replacement and opportunity cost methods: they find that the value of the time spent in household production ranges between 11.5 percent (Canada) and 23.7 percent (Italy) of GDP based on the replacement cost approach, and between 41.1 percent (Canada) and 66.4 percent (Germany) of GDP based on the opportunity cost approach. They further estimate the value of capital services to add roughly two to three percentage points of GDP to the total value of household production. Thus, they conclude, "[depending] on the country and the valuation method, the level of GDP is increased by 15% to almost 70%" by including the value of household production.

It is clear, though, that there is substantial variation in the estimated value of household production across countries, but also across methods within countries, a point highlighted by various authors (Chadeau 1985; Goldschmidt-Clermont and Pagnossin-Aligisakis 1999; Budlender 2008; Carrasco and Serrano 2011; Miranda 2011).

The inclusion of estimates of the value of household production within a measure of total production has another important effect: it lowers the estimated rate of growth of total production or national income over time (Chadeau 1985; Landefeld and McCulla 2000; Landefeld *et al.* 2009; Poissonnier and Roy 2015). This is due to the fact that women's increased participation in the labour market over time has been associated with declines in household production and the shifting of production to the market that previously took place within the home. Further, as Landefeld and McCulla (2000, p.291) note, not incorporating household production within measures of total production may accentuate the gap in reported output between developed and less developed countries, the latter characterised by a larger share of unpaid work within total production. Finally, since the magnitude of household production varies across income groups, omitting household production from incomes will impact on measures of changes in inequality over time (Abraham and Mackie 2005, p.62).

2.3.3 Engagement in Productive Activities in Time Use Data

Time-use data has enabled more detailed analyses of the extent of time allocated to productive activities in general, and to the types of productive activities in particular, at national or sub-national levels. Analyses of these datasets confirm the substantial amounts of time spent performing productive activities and, relative to time spent in market work, the relatively large amounts of time spent in non-market work. Miranda (2011, pp.8-9) finds that across 29 OECD and OECD enhanced engagement countries for which there are data, people aged 15-64 years allocate 3.4 hours per day, or 14 percent of their time, to unpaid work. This is compared to 19 percent of time on average that is allocated to paid employment or study. Non-market work has been found to consume significant amounts of time in a number of countries. Goldschmidt-Clermont and Pagnossin-Aligisakis (1999, p.527), for example, conclude that "labour inputs into non-SNA activities are of the same order of magnitude as labour inputs into SNA activities" on the basis of data for 14 countries.

Knowing the extent to which GDP may underestimate total production does not help address the challenge posed by gender-disaggregated NTAs. This is due to two key results that have emerged from various analyses of time-use data: first, non-market work is disproportionately performed by women and, second, there is a strong lifecycle dimension to the intensity of engagement in non-market work.

The unequal distribution of non-market work between males and females and, in particular, the large proportion of this work performed by women and girls has been extensively documented (see, for example, Anxo *et al.* 2007; Antonopoulos 2008; Budlender 2008; Giannelli *et al.* 2011; Miranda 2011; Amarante and Rossel 2017; Campaña *et al.* 2017). Data presented by Budlender (2008, p.14) suggests that women account for between 74 percent and 90 percent of total time in non-market work in her sample of six countries. Amarante and Rossel (2017, p.16) find that women in Colombia, Mexico, Peru and Uruguay spend between 2.7 hours and 4.3 hours per week more than men in non-market work, while Gammage (2010, p.94) finds an even wider gap of 5.4 hours *per day* amongst the population aged 12-65 years in Guatemala. This relationship is confirmed in their econometric analysis of the data: the coefficient on the male dummies in their country-level Tobit models are all negative and highly significant. Amongst a group of 29 mainly-OECD countries, Miranda (2011, p.11) finds that women allocate almost 2.5 hours per day more to unpaid work than men, although the gap ranges from one to five hours per day. Estimates for South Africa using data for 2000 show that women spent an average of 220 minutes daily in non-market production, nearly three times the male average of 80 minutes (Budlender and Brathaug 2004, p.33).

Further, this gender difference may manifest at young ages. In South Africa, for example, Budlender (2008, p.30) finds that "[young] girls were three times as likely to do unpaid care work as young boys". Rivero (2018, p.17) finds that Mexican teenage boys have roughly five hours per week more leisure and personal time than girls of the same age due, primarily, to girls' involvement in household production activities. Zannella (2015, p.39) similarly finds higher time allocations to non-market work for Italian girls, and identifies cultural norms as a likely factor underlying this difference since both girls and boys are engaged in compulsory education.

Within non-market work, there is evidence of specialisation in particular tasks by women and men; specifically, care is particularly unevenly shared (Sambt *et al.* 2016; Amarante and Rossel 2017; Rivero 2018). In South Africa, Budlender (2008, p.16) finds that women spend almost ten times as much time on care as men (48 minutes compared with five minutes per day), the largest gender gap amongst the six countries she analyses. In their analysis of 25 EU countries, Giannelli *et al.* (2011, p.2119) find that, amongst the population aged 20-74 years, the female-to-male ratio of time spent in unpaid domestic work is 1.8:1 compared with 2.5:1 in unpaid care work. Costa Rican women are also found to specialise in care activities (as well as cooking, cleaning and laundry) (Jiménez-Fontana 2015, p.48).

Estimates of gender gaps in time spent in unpaid and total work are collated from the analysis of 102 time-use surveys from 65 countries conducted by Charmes (2015) and presented in Table 2.2. These results reveal substantial variation in the time allocations to unpaid work by males and females within regions, with particularly large gaps observed for certain Sub-Saharan African and Asian countries. Interestingly, though, the lower-bound ratios across the five regions are within a narrow band of 1.24 to 2.32. In no country did men spend more time in unpaid work than women; in terms of total work, this occurred in only ten of the 84 estimates in Europe and the Middle East and North Africa.

Table 2.2. Female-to-male ratios of time in unpaid and total work

Work Type	Region	Lower bound		Upper bound		Obs
		Country	Value	Country	Value	< 1
Unpaid Work	Middle East & North Africa	Qatar (2012-13)	1.81	Morocco (2011-12)	6.98	0/16
	Sub-Saharan Africa	Ethiopia, rural (2013)	2.2	Mali, rural (2008)	13.6	0/18
	Asia	Mongolia (2011)	2.18	Cambodia (2004)	10.44	0/12
	Latin America	Uruguay (2013)	2.32	El Salvador (2010)	5.30	0/9
	Europe	Sweden (2010-11)	1.24	Italy (1988-89)	4.49	0/30
Total Work	Middle East & North Africa	Iran, urban (Summer 2009)	0.92	Iraq, rural (2007)	1.42	6/16
	Sub-Saharan Africa	Tanzania (2014)	1.07	Mali, rural (2008)	1.49	0/18
	Asia	Pakistan (2007)	1.04	Kyrgyzstan (2010)	1.19	0/12
	Latin America	Panama, urban (2011)	1.02	Mexico (2002)	1.22	0/8
	Europe	Netherlands (2005-06); Norway (2000, 2010)	0.97	Italy (1988-89)	1.39	4/30

Source: Drawn from Charmes (2015).

In addition to gender specialisation in market and non-market work, a second key finding is that engagement in non-market work has a strong lifecycle dimension. Specifically, childbearing and -rearing involve significantly increased demands on caregivers' time and, as a result, various studies find evidence of an inverted U-shaped relationship between age and time spent in unpaid work (Budlender 2008; Amarante and Rossel 2017). In their analysis of Italy, France, Sweden and the United States, Anxo *et al.* (2007, p.24) find "large discrepancies in the gender division of labour at the different life stages ... [and that this] gender gap ... is usually smaller at the two ends of the age distribution, but larger with parenthood".

While time allocated to household production varies across the lifecycle, there is evidence to suggest that the link between the two is weaker for males than for females. For example, Anxo *et al.* (2007, p.14) find this to be the case in their analysis of Italy, France, Sweden and the United States. Similarly, Amarante and Rossel (2017, p.23) find that time allocations to non-market work are "much more responsive to the age cycle for women than men" in Colombia, Mexico, Peru and Uruguay. Further, they find econometrically that the presence of specifically young children is associated with a much stronger response in women's allocation of time to non-market work compared to men's (Amarante and Rossel 2017, p.25). In their analysis of Catalonia, Carrasco and Serrano (2011, p.74) make an even stronger observation, that "the time that men dedicate to housework appears unaffected by life-cycle events".

Various reasons are suggested for the often significant differences in time allocations to productive activities overall, by gender, and across countries. These include institutional context (Geist 2005; Anxo *et al.* 2007), social and cultural norms (Amarante and Rossel 2017; Campaña *et al.* 2017), the level of female paid employment (Miranda 2011), and whether women tend to work part-time or full-time (Stier and Lewin-Epstein 2000). Thus, the existence of less supportive institutions, of less egalitarian gender norms, and a lower prevalence of women working full-time are associated with less even distributions of total work with, as Campaña *et al.* (2017, p.36) note, negative consequences for the pace of economic development.

2.3.4 National Time Transfer Accounts

The response to these various issues within the NTA project has been the development of the National Time Transfer Accounts (NTTA) methodology, the latest version of which has been published by Donehower (2018). NTTAs are essentially the non-market work version of NTAs: they quantify mean per capita production, consumption and implied transfers of non-market work at each age. NTTAs do not, however, have counterparts for all NTA profiles: in non-market work there is no public sector, nor are there any asset-based reallocations.

The NTTA methodology is detailed in section 3.4, but the general idea is as follows. First, using time-use data, smoothed age profiles are constructed by gender and for the overall population for production, consumption and intra-household transfers related to the various activities that constitute household production. Second, appropriate wage rates are determined for each type of activity. Finally, the age profiles are expressed in monetary terms by applying the wage rates to the relevant activities. Clearly, as is the case with household satellite accounts, one of the key challenges that arises during the construction of NTTAs is one of the valuation of non-market work.

In some ways, NTTAs can be thought of as the household satellite accounts of NTA. The NTTA research therefore bridges some of the gaps between conventional National Transfer Accounts, household satellite accounts, and time-use research. The standard NTA framework, like the national accounts to which it is linked, makes no provision for non-market production, but NTTAs fill this gap. Household satellite accounts augment measures of total production from national accounts, but do so only at the aggregate level; NTTAs bring both a gender dimension and a lifecycle dimension to the analysis (although, unlike household satellite accounts, they only value labour inputs and ignore capital and intermediate goods and services). Time-use research in this area is varied in approach: some studies focus purely on time-based measures and others provide valuations; some provide estimates by gender and others simply provide aggregate measures; and some studies consider the population only in terms of gender while others acknowledge the importance of the lifecycle as a determinant of time allocations. NTTAs cover all of these issues within a common framework and approach.

Over the past few years, NTTA estimates have been constructed for a growing number of countries around the world. The earliest available NTTA-related research is the work on Thailand by Phananiramai (2011), although the focus is less on gender than on demonstrating the impact of the integration of NTTA and NTA, with time transfers estimated in aggregate and not by gender. A number of European studies have since been published, including those by Zagheni and Zannella (2013), Kluge (2014), Hammer *et al.* (2015), Zannella (2015), Rentería *et al.* (2016a), Sambt *et al.* (2016) and Vargha *et al.* (2017). New estimates are increasingly coming from outside Europe, many as part of the *Counting Women's Work* project; these include Colombia (Urdinola and Tovar 2018), Costa Rica (Jiménez-Fontana 2015, 2017), Mexico (Rivero 2018), the United States (Donehower and Mejía-Guevara 2013), Ghana (Amporfu *et al.* 2018), Mauritius (Oosthuizen and Lilenstein 2018), and South Africa (Oosthuizen 2018).

NTTA research confirms the finding in previous research on gender and non-market work that women specialise in these activities, and men in market work. Zagheni and Zannella (2013, p.940) note that in Italy, Spain, Germany and France, "[females] tend to spend more time on unpaid household activities than males at virtually all ages". Hammer *et al.* (2015, p.96) find this for the 10 European countries analysed in their paper. In Germany, the average woman is found to spend roughly four hours per day in non-market work compared with 2.5 hours for her male counterpart; limiting the comparison to those under 50 reveals an even wider gap (3.6 hours and 1.7 hours respectively) (Kluge 2014, p.717). In Mauritius, females account for 74.9 percent of total time allocated to household production in 2003, compared with 28.4 percent of time spent in market work (Oosthuizen and Lilenstein 2018, p.21).

One of the results of this specialisation appears to be that, while women's involvement in non-market work is substantial throughout the life course, that of men is typically confined to specific life stages. In Spain, for example, "[men] participate in housework only during reproductive ages" (Rentería *et al.* 2016a, p.697).

The findings in terms of total time allocated to productive activities are more context specific. In several countries, the total time spent in productive activities (i.e. market work plus non-market work) is similar across the life course for both genders, referred to by Burda *et al.* (2012) as the iso-work phenomenon. Kluge (2014), for example, finds this to be the case in Germany. In a number of other countries, though, women spend markedly more time in productive activities than men. This is true in Spain over the entire life course (Rentería *et al.* 2016a, p.693), and in Slovenia (Hammer *et al.* 2015, p.96). In Mauritius, women allocate more time to productive activities than their male counterparts during their twenties and thirties (up to 0.6 hours per day), and post-retirement (up to 1.3 hours per day) (Oosthuizen and Lilenstein 2018, pp.17-18). Amporfu *et al.* (2018, p.17) similarly find higher allocations of time to productive activities by Ghanaian females under the age of 50 years; at older ages the gap is narrower and switches sign several times. The authors find that women spend 67 hours per week on productive activities at age 35, ten hours (roughly 17.5 percent) more than men of the same age.

As with earlier time use research, the NTTA research often finds significant variation in the patterns of time use across the life course. One key variation is the double peak that is often observed in non-market work, particularly amongst women. In Hungary, for example, non-market work peaks first in the early thirties and in the late fifties (Gál *et al.* 2015, p.102).[7] Similarly, Zagheni and Zannella (2013, p.941) find evidence of a double peak for women, the first at the age of childbearing and the second around the time of retirement or when women typically become grandmothers. In Mauritius, a double peak exists for care but this is muted significantly when combined with housework (Oosthuizen and Lilenstein 2018, pp.15,16).

These variations in time allocations to productive activities over the life course have attracted some analytical attention. Sambt *et al.* (2015) investigate what they call the "rush hour of life", the ages during which time allocated to productive activities exceeds free time (excluding sleep), in Austria, Italy and Slovenia. They find no gender differences in Austria in the length or intensity of this rush hour of life, which lasts from age 20 to age 54; in Italy and Slovenia, though, the rush hour lasts longer (particularly in Italy) and is much more intense for females. This suggests differences in institutional factors and social norms with respect to the gender division of labour in these countries.

While women generally commit at least as much time as men to productive activities, men typically outproduce women once this work is valued. This is often because the wage rates used to value non-market work are relatively low. Hammer *et al.* (2015, p.96) find that men outproduce women in eight of the 10 European countries they study, the exceptions being Slovenia and Spain where women's very large time allocations to unpaid work compensate for the low wage rates.

NTTA research has produced numerous estimates of the value of non-market work relative to GDP. Phananiramai (2011) does not provide an estimate relative to GDP, but does provide the aggregate value for non-market work, namely 681 billion baht in 2004. Based on the World Bank (2018b) estimate of GDP for that year (6 954 billion baht), this implies a proportion of 9.8 percent of GDP, which is one of the lowest estimates from available NTTA research. Most estimates based on specialist replacement wages tend to cluster between 30 percent and 50 percent of GDP. This includes 2002 estimates from countries such as Bulgaria (36.0 percent of GDP), the United Kingdom (45.5 percent), and Poland (49.2 percent) (Vargha *et al.* 2017, p.928), and Costa Rica (40 percent in 2004) (Jiménez-Fontana 2015, p.50). At the upper extreme are countries such as Slovenia at 52 percent of GDP (Sambt *et al.* 2016, p.262); Belgium (53.7 percent), Italy (54.7 percent) and Germany (56.9 percent) (all 2002 estimates Vargha *et al.* 2017, p.928); and Italy (2008) at 75 percent (Zannella 2015, p.50). Countries where estimates are relatively low include Mexico (2014) at 22 percent of GDP (Rivero 2018, p.18), Latvia (2002) at 23.7 percent (Vargha *et al.* 2017, p.928), Hungary (1999/2000) at 27 percent (Gál *et al.* 2015, p.101) and Mauritius (2003) at 29.0 percent (Oosthuizen and Lilenstein 2018, p.21).

[7] Although this is in monetary value terms, this pattern is very likely not materially impacted.

Where different approaches to determining wage rates are tested, the evidence suggests that these can have a significant impact on estimates. Phananiramai (2011, p.535) finds that the total value of unpaid work is 10 percent higher when using a specialist rather than a generalist replacement wage. In Slovenia, using an opportunity cost approach, household production is estimated to be equivalent to 64 percent of GDP, more than one-fifth (12 percentage points) higher than when using a specialist replacement wage (Sambt *et al.* 2016, pp.261-2).

One of the unique contributions of NTTA is its quantification of the consumption of the outputs of non-market work by age and gender. In most instances, however, consumption profiles for males and females are quite similar, at least partly a function of the difficulties associated with determining intra-household allocations through conventional surveys and the reliance across a number of actives on a per capita sharing rule. Nevertheless, driven by consumption of care, infants and young children are without exception found to be the largest per capita consumers of non-market work, even if the levels differ across countries (Gál *et al.* 2015; Vargha *et al.* 2017). In their analysis of 14 European countries, Vargha *et al.* (2017, p.921) find that infants consumed close to seven hours of non-market work per day. This high level of consumption of non-market work is the corollary of the rush hour of life, described above.

Once market and non-market consumption are combined, infants and young children are found to be the largest per capita consumers in many countries, "[contradicting] a common wisdom that the old cost more than children" and highlighting the need to consider the "invisible" resource flows associated with household production in addition to those that occur through the market (Gál *et al.* 2015, p.104). Household production adds significantly to the total cost of children. Phananiramai (2011, p.538), for example, estimates that time transfers account for 51 percent of the cost of pre-school children. Across 10 European Union countries, Gál *et al.* (2016, p.19) find that 47 percent of the net transfer package received by children comes in the form of time transfers, compared to 33 percent and 20 percent for private and public transfers. Similar patterns are found in Spain, although Rentería *et al.* (2016a, p.696) do not provide numeric estimates.

Given differences in time allocations to non-market work and very similar patterns of consumption, women are typically net producers of non-market work and men net beneficiaries (Rentería *et al.* 2016a; Vargha *et al.* 2017). Vargha *et al.* (2017, p.924), for example, find that "while men are generally net beneficiaries ... [women] are net providers above age 21 almost until they die" in the 14 European countries they analyse.

Once NTTA production and consumption is valued and added to NTA's labour income and consumption, the impact on the lifecycle surplus is particularly marked for women. Across 10 European countries, Hammer *et al.* (2015, p.95) find that the "inclusion of unpaid work increases the LCS of women in all countries [ranging] from 13% of labour income in the UK to 30% in Slovenia"; in contrast, in seven of the ten countries the impact on the LCS for men is negligible. In Spain, incorporating household production and consumption to estimate a total lifecycle deficit (market and non-market production combined) extends the duration of women's surplus period: the age at which women transition from surplus to deficit rises from 54 years to 58 years, while there is no impact observed for men (Rentería *et al.* 2016a, p.695). In Mauritius, females go from having substantial deficits even during the prime working ages, to generating a surplus of over 10 percent of peak labour income from their late twenties to their late forties (Oosthuizen and Lilenstein 2018, p.22).

Chapter 3

Methodology and Data

3.1 National Transfer Accounts

This dissertation employs the National Transfer Accounts (NTA) methodology to construct estimates of and analyse the generational economy in South Africa. The generational economy is defined as "(1) the social institutions and economic mechanisms used by each generation or age group to produce, consume, share, and save resources; (2) the economic flows across generations or age groups that characterize the generational economy; (3) explicit and implicit contracts that govern intergenerational flows; (4) the intergenerational distribution of income or consumption that results from the foregoing" (Mason and Lee 2011b, p.7).

The development of the NTA framework began with the seminal work of Lee (1994a,b), and has its conceptual roots in earlier research by Samuelson (1958), Diamond (1965), Arthur and McNicoll (1978), and Willis (1988). While the formal methodology has been published by the United Nations (2013), this section provides an overview of the some of its key elements.

NTAs are comprised of profiles (or 'age profiles') of economic flows by single-year age cohorts, from age 0 to the very oldest (usually a combined 90+ age cohort). These flows are important in that they "reflect a fundamental feature of all societies: the economic lifecycle" (Mason and Lee 2011a, p.55). For any individual, inflows must equal outflows and the following identity holds:

$$Y_l + Y_A + \tau^+ = C + \tau^- + S \tag{3.1}$$

In other words, individuals can receive resource inflows in the form of labour income (Y_l), asset income (Y_A) and transfer inflows (τ^+); consumption (C), transfers to others (i.e. transfer outflows, τ^-) and savings (S) represent the three ways in which these resources can be used. This identity can be rewritten as:

$$\underbrace{C(x) - Y_l(x)}_{\text{Lifecycle Deficit}} = \underbrace{\underbrace{\tau^+(x) - \tau^-(x)}_{\text{Net Transfers}} + \underbrace{Y_A(x) - S(x)}_{\text{Asset-Based Reallocations}}}_{\text{Age Reallocations}} \tag{3.2}$$

where x represents a given cohort's age. Consumption, transfers and asset-based reallocation are all further disaggregated into public and private flows, while private transfers are disaggregated into interhousehold and intrahousehold flows. Transfers are flows characterised by a lack of an "explicit qui pro quo", while asset-based reallocations "realize inter-age flows through intertemporal exchange" (United Nations 2013).

According to the NTA identity, the lifecycle deficit refers to the difference between consumption and labour income at each age. For the young and the elderly, consumption exceeds labour income resulting in a deficit; prime working-age adults, though, generate lifecycle surpluses, since labour income exceeds consumption. The lifecycle deficit can therefore be financed through a combination of two channels: through net transfers and through asset-based reallocations, which together are referred to as age reallocations. Conversely, cohorts generating lifecycle surpluses may use those surpluses to make net transfers or to asset-based reallocations (e.g. saving).[1]

NTA distinguishes three sectors or types of institutions acting as intermediaries between individuals: the private sector (corporations and households, including household enterprises and non-profit institutions serving households); the public sector (general government); and the rest of the world (United Nations 2013, p.27). This distinction allows for the disaggregation of various flows according to the sector mediating the flow. Consumption, transfers and asset-based reallocations can all be disaggregated into private and public flows. Transfers can be disaggregated into inflows and outflows, the difference between the two being net transfers.

Private transfers consist of transfers between households and transfers within households, respectively inter-household and intra-household transfers, each of which consist of both inflows and outflows. Public transfer outflows typically refer to transfers to government in the form of taxes; public transfer inflows comprise of the inflows from state-funded programmes such as education, health and social grants.

Asset-based reallocations are disaggregated both by mediating sector (private, public), and into inflows (asset income earned, dissaving) and outflows (asset income paid, saving). "[Returns] to capital, dividends, interest, rent, and the imputed return from owner-occupied housing" constitute private asset income; public asset income, on the other hand, includes "income earned from publicly owned assets and interest paid on public debt (a negative value)" (United Nations 2013, p.58). The age profiles of public asset-based reallocations are assigned on the basis of each age cohort's general tax payments. The argument underlying this decision is that the state's asset income and borrowing reduces the need to raise taxes, while interest payments and saving by the state must be financed by taxpayers.

NTAs are compiled using a variety of per capita age profiles that are constructed to reflect particular resource flows at each age over the life course, for example employment earnings, private consumption of primary education, or public transfer inflows in the form of state pensions. In practice, constructing a set of accounts entails the following broad process. First, for a particular flow, a profile is constructed across age using survey or administrative data. The profile is calculated as a mean across the entire population within each single-year age cohort, and its shape is a function of behavioural and institutional factors. Where individual-level data exists, flows for each age cohort are averaged to derive the age profiles. For example, in household surveys wage and salary data are typically available for each individual in the household;

[1]For a visual representation of the lifecycle deficit and the financing of the lifecycle deficit, the reader is referred to Figures 5.1 and 5.2 respectively.

these values are averaged across all members of each age cohort, yielding a 'raw' age profile of employment earnings; if an individual earns no salary or wage income, they are included as a zero within the calculation. Where only household information is available, household-level totals are allocated either econometrically or by convention to individual household members. This intra-household allocation typically incorporates additional data on usage, enrolment or participation rates; alternatively the allocation is made using adult equivalence scales (for example, private consumption of goods and services excluding education and health) or on a per capita basis (for example, public consumption of goods and services excluding education and health).

Second, since the raw age profiles thus constructed are often subject to noise, age profiles are smoothed using a cross-validation smoother, incorporating the unweighted number of observations as weights. Friedman's super smoother (Friedman 1984), implemented in the `supsmooth` command in *Stata*. Education age profiles are not smoothed, due to the real discontinuities in educational participation, while care is taken not to smooth over potential discontinuities in other age profiles. A smoothed profile is sometimes referred to as an 'age shape' as by this stage the shape of the profile is set.

Third, the level of the profile is adjusted multiplicatively using aggregates (referred to as aggregate controls) derived from national accounts, official government financial reports, and other official sources. The reason for this is that, once a profile is multiplied by the population in each age cohort and summed, this total will equal the relevant aggregate originally derived. In essence, this is an adjustment of the level of the profile.

Finally, these detailed aggregate-controlled age profiles are combined as per the NTA flow identity (equation 3.2) to derive the higher-level age profiles. The structure of the NTA flow account can be found in Appendix A.

While a full detailing of the methodology is not possible here, it is worth highlighting certain assumptions within the NTA methodology with regards to households that may influence the final profiles. While NTA profiles are constructed with the individual as the unit of analysis—i.e. all flows are assigned to individuals rather than households—much of the data used to construct profiles is available at the level of the household. In several instances, depending on the exact structure of the available data, flows are recorded at the household-level and therefore need to be allocated to individual household members. A good example of this is the various flows related to private consumption. For education and health, where consumption is not observed at the individual level, allocations to household members are done using regression methods. For education, for example, household-level spending is regressed on the number of enrolled and non-enrolled household members of each age to derive scales of relative consumption by age; these scales are used to assign household-level spending to individual members, with the resulting individual-level allocations used to derive the profile of mean per capita consumption at each age for the population. Other private consumption (i.e. private consumption other than education or health) is allocated using a standard equivalence scale: children under 5 have a weight of 0.4, with weights increasing linearly with age to age 20, from which point it is equal to one (Mason and Lee 2011a, p.62).

Private transfers between individuals are rarely observed in survey data. Inter-household transfers may be recorded at the individual level (in South Africa they are recorded at the level of the household), but intra-household flows are only directly observed in exceptional cases. For inter-household transfers, the assumption is that flows move to and from household heads only. In contrast, intra-household transfers are "estimated indirectly as the balancing item between private consumption and disposable income (labor income plus net private transfers plus public cash transfers inflows less taxes paid) for each household member" (Mason and Lee 2011a, p.72). Where household members have less disposable income than their private consumption, they receive transfers from household members with surpluses. If, at the household level, there is insufficient disposable income to cover private consumption, household heads are assumed to make additional transfers out of asset income or by dissaving. Conversely, where disposable income exceeds private consumption after all deficits have been covered, members with surpluses transfer these surpluses to the household head for saving. This is an important assumption in NTA. In essence, this model of intra-household flows implies that only the household head makes decisions about resources and there is therefore no household bargaining. Further, the assumption means that there is no possibility of an evolution of the sharing rule over time. Household heads are also assumed to own all household assets and, as a result, consumption of durables by household members is funded by intra-household transfers from the household head. Due to data limitations in most countries, including South Africa, this only applies to owner-occupied housing.

The handling of private transfers highlights the importance of the household head: changing the rule according to which household headship is determined may potentially have a significant impact on the patterns of private transfer and asset-based reallocation flows. Hammer (2015, p.7), for example, finds that the impact is minimal in the case of national-level profiles for Austria, but is significant for sub-population profiles. There are numerous ways of defining household headship, including assigning headship to the oldest household member or to the member that generates the most income, although all have limitations. In many surveys, headship is self-reported, and this is the definition used in this paper. One final point to note about private transfers is that they include only current transfers, while excluding transfers such as bequests and dowries (Mason and Lee 2011a, p.71).

In terms of public transfers, inflows consist of in-kind (e.g. education spending) and cash transfers (e.g. welfare grants) from the state to individuals. Age profiles of public transfer inflows are constructed in terms of each programme's intended beneficiaries. For example, old age grants are assigned to elderly recipients, while child grants are assigned to children, even though their parents or caregivers may be the actual recipients of the grant. Public transfer outflows, on the other hand, are taxes paid to the state. Profiles of outflows are constructed using profiles of labour income, asset income, consumption, or combinations of the three, depending on the nature of the tax. For example, taxes on goods and services are allocated using the consumption profile; while payroll taxes are allocated using the labour income profile.

3.2 Demographic Dividends

This section presents the derivation of the first and second demographic dividends within the NTA framework, and follows closely the derivation presented in Mason *et al.* (2017), while drawing from Mason and Lee (2007) and Mason and Lee (2012).

We begin with the relationship between aggregate income, Y, and aggregate consumption, C, in an economy:

$$C(t) = Y(t) \times [1 - s(t)] \tag{3.3}$$

where s is the savings rate. Income (or consumption) per capita is typically viewed as a measure of the general standard of living; employing NTA concepts, we adapt this slightly to account for the fact that consumption varies with age and instead consider income or consumption per effective consumer. The number of effective consumers N and the number of effective producers L in period t are defined as:

$$N(t) = \sum_{x=0}^{\omega} \phi(x) P(x,t) \tag{3.4}$$

and

$$L(t) = \sum_{x=0}^{\omega} \gamma(x) P(x,t) \tag{3.5}$$

where ϕ and γ represent "age-specific, time-invariant vectors of coefficients measuring age variation in consumption and productivity" (Mason and Lee 2007, p.4), $P(x,t)$ is the population of age x in time t. In terms of the NTA framework, $N(t)$ is the population-weighted sum over ages 0 through ω (the oldest age) of the consumption profile and $L(t)$ is the population-weighted sum of the labour income profile; alternatively, these aggregates are respectively total consumption and total labour income in time t.

From equation 3.3, it is possible to express consumption per effective consumer as the product of three factors:

$$\frac{C(t)}{N(t)} = \frac{L(t)}{N(t)} \times \frac{Y(t)}{L(t)} \times [1 - s(t)] \tag{3.6}$$

Thus, consumption per effective consumer is determined by the savings rate, income per effective producer $Y(t)/L(t)$, and the ratio of effective producers to effective consumers $L(t)/N(t)$, also referred to as the support ratio or the "NTA support ratio" (Prskawetz and Sambt 2014, p.978). Assuming a constant ratio of labour income to total income over time, equation 3.6 can be restated in growth terms as:

$$gr\left[\frac{C(t)}{N(t)}\right] = gr\left[\frac{L(t)}{N(t)}\right] + gr\left[\frac{Y(t)}{L(t)}\right] + gr\Big[1 - s(t)\Big] \tag{3.7}$$

where $gr[z]$ denotes the growth rate of z. The first term on the righthand side of equation 3.7, the rate of change of the support ratio, represents the first demographic dividend. If the support ratio is rising—i.e. if the number of effective producers is rising relative to the number of effective consumers—consumption per effective consumer rises; a falling support ratio constrains economic growth and puts downward pressure on living standards.

The second demographic dividend operates through the second term, namely the rate of change of output per effective producer or, simply, workers' productivity. While demographic change may raise productivity through various channels, the focus here is on the role of capital. The general idea as described by Mason *et al.* (2017, p.8) is as follows: "[As] populations age they rely less on work and more on assets and transfers to fund their consumption. An increase in old-age transfers will have no favourable effects on labour productivity, but an increase in assets (capital) leads to higher productivity. Thus, changing demography generates the potential for more rapid economic growth."

In order to estimate the second demographic dividend, we reframe $N(t)$ and $L(t)$ (equation 3.4) as the number of effective years of consumption and the number of effective years of labour for all individuals aged x in time t:

$$\begin{aligned} N(x,t) &= \tilde{c}(x)P(x,t) & L(x,t) &= \tilde{y_l}(x)P(x,t) \\ \tilde{c}(x) &= c(x,b)/c(30-49,b) & \tilde{y_l}(x) &= y_l(x,b)/y_l(30-49,b) \end{aligned} \tag{3.8}$$

Here, $\tilde{c}(x)$ is an index of consumption calculated as per capita consumption at age x divided by mean per capita consumption amongst 30-49 year olds in the base period b; similarly, $\tilde{y_l}(x)$ is an index of labour income with the denominator being mean per capita labour income amongst 30-49 year olds in the base period.

From the above, it is possible to calculate the number of effective years of labour (WL) and consuming (WN) over the remaining life for a cohort aged z at the end of year t as:

$$\begin{aligned} WL(z,t) &= \sum_{x=z+1}^{\omega} \left(\frac{1+\rho}{1+r}\right)^{x-z} L(x,t+x-z) \\ WN(z,t) &= \sum_{x=z+1}^{\omega} \left(\frac{1+\rho}{1+r}\right)^{x-z} N(x,t+x-z) \end{aligned} \tag{3.9}$$

where $(\frac{1+\rho}{1+r})^{x-z}$ is a discount factor accounting for productivity growth ρ and the discount rate r.

Summing over z yields the aggregate value of lifetime effective labour and consumption for all cohorts:

$$\begin{aligned} WL(t) &= \sum_z WL(z,t) \\ WN(t) &= \sum_z WN(z,t) \end{aligned} \tag{3.10}$$

Using these aggregates, an age-specific longitudinal support ratio is defined as:

$$LSR(z,t) = \frac{WL(z,t)}{WN(z,t)} \tag{3.11}$$

As Mason *et al.* (2017, p.10) note, the longitudinal support ratio is interpreted in a similar way to the conventional support ratio although "this is a measure as of year t of prospective lifetime years working relative to prospective lifetime years consuming".

For a given population of age x in year t and where labour income per effective worker and consumption per effective consumer grow at rate ρ from base year b, total labour income $Y_l(x,t)$ and total consumption $C(x,t)$ are:

$$\begin{aligned} Y_l(x,t) &= y_l(30-49,b)(1+\rho)^{t-b}L(x,t) \\ C(x,t) &= c(30-49,b)(1+\rho)^{t-b}N(x,t) \end{aligned} \tag{3.12}$$

Thus, the present value of prospective labour income for the population aged z in year t is:

$$PVY_l(z,t) = \sum_{x=z+1}^{\omega} (1+r)^{-(x-z)} Y_l(x, t+x-z) \tag{3.13}$$

Substituting for Y_l from equation 3.12

$$\begin{aligned} PVY_l(z,t) &= \sum_{x=z+1}^{\omega} (1+r)^{-(x-z)} y_l(30-49,b)(1+\rho)^{t+x-z-b} L(x,t+x-z) \\ &= \sum_{x=z+1}^{\omega} (1+r)^{-(x-z)} y_l(30-49,b)(1+\rho)^{t-b}(1+\rho)^{x-z} L(x,t+x-z) \\ &= y_l(30-49,b)(1+\rho)^{t-b} \sum_{x=z+1}^{\omega} \left(\frac{1+\rho}{1+r}\right)^{x-z} L(x,t+x-z) \\ &= y_l(30-49,t) WL(z,t) \end{aligned} \tag{3.14}$$

Similarly, the present value of prospective consumption for the population aged z in year t can be expressed as:

$$PVC(z,t) = c(30-49,t)WN(z,t) \tag{3.15}$$

The difference between the present values of consumption and labour income for the population aged z in year t is termed lifecycle wealth $W(z,t)$. In other words, this is the present value of consumption that must be financed through transfers or asset-based reallocations. In this respect, for example, claims on future transfers from households or the state form part of lifecycle wealth. From equations 3.14 and 3.15:

$$W(z,t) = c(30-49,t)WN(z,t) - y_l(30-49,t)WL(z,t) \tag{3.16}$$

We are, however, interested in older cohorts and the demand for assets to meet their consumption needs, and so we define lifecycle pension wealth $W45(t)$ (or simply pension wealth) as the gap between consumption and labour income for the population aged 45 years and above over their remaining lifetime:

$$
\begin{aligned}
W45(t) &= \sum_{z=45}^{\omega} W(z,t) \\
\frac{W45(t)}{Y_l(t)} &= \frac{\sum_{z=45}^{\omega} W(z,t)}{y_l(30-49,t)L(t)} \\
&= \frac{\sum_{z=45}^{\omega} c(30-49,t)WN(z,t) - y_l(30-49,t)WL(z,t)}{y_l(30-49,t)L(t)} \\
&= \frac{c(30-49,b)}{y_l(30-49,b)} \frac{\sum_{z=45}^{\omega} WN(z,t)}{L(t)} - \frac{\sum_{z=45}^{\omega} WL(z,t)}{L(t)} \qquad (3.17)
\end{aligned}
$$

In order to estimate the second demographic dividend, the link between pension wealth and growth in output per worker must be established. This is done via relationships between these two variables and the intermediary variable of capital K.

If the motivation for saving is to smooth consumption over the lifecycle, pension wealth is a good proxy for the demand for wealth. However, how well pension wealth proxies the demand for wealth depends on the extent to which other motivations are involved. Where individuals save in order to leave assets for their children when they die (the bequest motive) or where they save for precautionary reasons, the total demand for wealth will be underestimated by pension wealth; in contrast, where the goal of saving is not to smooth consumption the demand for wealth will be overestimated by pension wealth. This is discussed in more detail in Mason and Lee (2007) and Mason and Kinugasa (2008).

Two kinds of wealth are distinguished: assets, $A45(t)$, and transfer wealth, $WT45(t)$, which are claims on future transfers. Thus, pension wealth is:

$$W45(t) = A45(t) + WT45(t) \qquad (3.18)$$

Depending on the exact institutional and policy contexts, the distribution of pension wealth across these two types of wealth may vary substantially. For our purposes, the precise distribution is not important; however, it is assumed that the distribution is constant over time. This helps to ensure that the effect of demographic change can be isolated. By this assumption, all three aggregates must grow at the same rate over time: $gr[W45(t)] = gr[A45(t)] = gr[WT45(t)]$.

Under the assumption of no international capital flows, capital used in the domestic economy is equivalent to assets owned by residents. Assuming that the growth rates of total assets and assets held by the population aged 45 years and above are similar,

$$gr[K(t)] \approx gr[W45(t)] \qquad (3.19)$$

Output is assumed to be the result of the combination of two factors of production, namely capital and effective labour, through a standard Cobb-Douglas production function:

$$Y = K^{\beta} L^{1-\beta}$$

Dividing by Y^{β} and rearranging:

$$\left(\frac{Y}{L}\right)^{1-\beta} = \left(\frac{K}{Y}\right)^{\beta}$$

$$(1-\beta)gr\left[\frac{Y}{L}\right] = \beta gr\left[\frac{K}{Y}\right]$$

$$gr\left[\frac{Y}{L}\right] = \left(\frac{\beta}{1-\beta}\right)gr\left[\frac{K}{Y}\right] \tag{3.20}$$

where β can be shown to be capital's share of total income. Substituting $W45$ for K:

$$gr\left[\frac{Y(t)}{L(t)}\right] = \left(\frac{\beta}{1-\beta}\right)gr\left[\frac{W45(t)}{Y(t)}\right] \tag{3.21}$$

From equation 3.7, the growth rate of consumption per effective consumer can be expressed as:

$$\begin{aligned} gr\left[\frac{C(t)}{N(t)}\right] &= gr\left[\frac{L(t)}{N(t)}\right] + gr\left[\frac{Y(t)}{L(t)}\right] + gr\Big[1-s(t)\Big] \\ &= \underbrace{gr\left[\frac{L(t)}{N(t)}\right]}_{\text{First dividend}} + \underbrace{\left(\frac{\beta}{1-\beta}\right)gr\left[\frac{W45(t)}{Y(t)}\right]}_{\text{Second dividend}} + gr\Big[1-s(t)\Big] \end{aligned} \tag{3.22}$$

In other words, demographic change can impact the general standard of living through two channels, representing the two dividends. As relatively large cohorts pass into the prime working ages, demographic change results in a rise in the ratio of the effective number of producers relative to the effective number of consumers (i.e. the support ratio). The result is a relative decline in the 'demands' placed by households on workers' labour income, releasing resources for consumption, saving or investment in human capital. This is the first demographic dividend. Over time, as the population ages, an increasing proportion of the population will need to accumulate capital to support consumption at older ages, leading to a rise in the capital-to-labour ratio and consequently raising the productivity of labour. This process represents the second demographic dividend.

As should be clear from the discussion in section 2.1, there are a number of potential channels through which demographic change can impact on living standards and economic growth. The simple model presented here focuses simply on the impact on productivity via capital accumulation and does not attempt to address other mechanisms. As Mason *et al.* (2017, p.13) note, "this is a simple characterization of very complex processes and should only be taken as indicative of the magnitude of the effects of age structure on income growth".

3.3 National Transfer Accounts for Sub-Populations

As the name suggests, National Transfer Accounts were originally conceived to be constructed at the national level. As a result, a few methodological innovations and assumptions were required to enable the estimation of NTAs for sub-populations. Assuming that sub-populations are mutually exclusive and exhaustive, following Mejía-Guevara (2015, p.25) it is possible to rewrite the NTA flow identity in equation 3.2 as:

$$C(x,s) - Y_l(x,s) = \tau^+(x,s) - \tau^-(x,s) + Y_A(x,s) - S(x,s) \tag{3.23}$$

where the subscript s denotes the particular sub-population. Since the identity holds for each individual, it must also hold for each age cohort and for the population as a whole; it must also hold for any group of individuals.

The construction of sub-population NTAs presents two specific challenges: first, the sample size is significantly reduced and, second, in most instances it is not possible to construct sub-national aggregate controls. A small sample size has implications for the extent to which age profiles can be relied on and it is not inconceivable that sub-population age profiles, once aggregated, may differ substantially from the original national-level profile. To address this, sub-population age profiles are adjusted at each age using an age-specific factor to ensure consistency with the national-level profile. These age-specific factors are unique for each age, but are identical for each of the sub-populations. This adjustment to ensure consistency with the national profile has the added advantage that previously constructed national profiles can be disaggregated at a later date into relevant sub-populations without requiring adjustment of the original profiles. Some authors (for example, Mejía-Guevara 2015; Turra and Queiroz 2005) go further and choose to use age groups rather than single-year age cohorts, although this results in a loss of detail in the age profiles.

Relatedly, it is possible that the process of smoothing profiles may have an impact on the relative levels of the sub-population profiles. This is of particular concern for smaller sub-populations, where even relatively minor smoothing may have a non-negligible impact. To deal with this, I include an additional step prior to the adjustment to the national-level profiles described above: the smoothed sub-population age profiles are individually adjusted so that the mean per capita level of each profile is unchanged from the raw sub-population profile. This entails a unique multiplicative adjustment to each sub-population profile, depending on the extent to which the mean level of the profile changed during smoothing.

Depending on the sub-populations being analysed, it may or may not be possible to construct sub-national aggregate controls. For example, some countries may publish detail of national accounts at the provincial- or state-level. However, in cases where sub-populations are defined according to individual characteristics such as gender, race or socioeconomic status, disaggregated national accounts do not exist. In this case, the assumption is that the adjustments required at the national level are constant across the sub-populations. While this approach is common in studies of this nature, it is not without its problems. Specifically, constant adjustments across sub-populations assume that there is no variation in under- or over-reporting between sub-populations. Given that income may be correlated with both membership of a particular sub-population and the likelihood of misreporting, this assumption may not be entirely appropriate. At the same time, though, it could be argued that this is true of conventional aggregate controlling, where age, income and the likelihood of misreporting may also be linked.

3.4 National Time Transfer Accounts

3.4.1 Estimating the Value of Household Production

Given the exclusion of household production from the SNA production boundary, a methodology is required to construct non-market production and consumption profiles that are analogous to the NTA labour income and consumption profiles. As in the construction of household satellite accounts, the key challenge is the valuation of household production. There are two basic approaches to valuing work: the first values work on the basis of the outputs produced (the output approach), while the second values work from the perspective of the inputs used (the input approach). The valuation of market work is relatively easy in that the output is traded in the market and therefore has a price (Abraham and Mackie 2005); it is also relatively straightforward to cost the inputs used and determine the value of the same market work using the input approach. However, for non-market work, this is not the case.

In terms of non-market work, Ironmonger (1996, p.50) notes that the output approach substantially addresses "the issue of the joint production of services through simultaneous or parallel uses of time" and can accommodate the contribution to the production process of household capital. That said, few household surveys exist that quantify outputs of non-market work (Hammer *et al.* 2015, p.91). Although the output approach is the preferred approach (Ironmonger 1996; Landefeld and McCulla 2000), it presents significant challenges for the valuation of non-market work: there are no market prices for the services produced through non-market work, and it is difficult, if not impossible, to find market equivalents of many non-market services (Van De Ven *et al.* 2018). Consequently, most analyses rely on the input approach. The input approach requires that values are attached to the inputs used in producing the output; these inputs include capital, intermediate goods and services, and labour.

For many activities, household production is dependent on the use of capital goods and equipment. Consequently, the value of the services arising from the stock of household capital should be included in estimates of the value of household production. Landefeld and McCulla (2000, p.296) argue that actual rentals or market-based proxies should be used. While a perpetual inventory method can be used to estimate the services from household durables, Poissonnier and Roy (2015, p.355) identifies this as "highly conventional" and needing improvement. Relatedly, the value of intermediate goods and services should ideally be accounted for. Here too, significant data constraints limit the extent to which either capital or intermediate goods and services can be incorporated. Fortunately, the evidence suggests that the contributions of capital and intermediate goods and services to the total value of household production are relatively small, leaving labour as the dominant input. Ironmonger (1996, p.51), for example, finds that value added by labour accounts for 83.0 percent of total value added in household production.

The quantum of the input of labour is estimated on the basis of time-use surveys. The quantity of time allocated to household production derived from these surveys must then be valued using an appropriate wage rate. This wage rate can be determined in one of two basic ways: as a replacement wage or as an opportunity cost wage (Abraham and Mackie 2005). According to the first approach, called the replacement cost approach or "market-replacement cost" (Goldschmidt-Clermont 1993, p.421), a wage is estimated on the basis of what it would cost to purchase the service in the market. The second approach, namely the opportunity cost approach, provides an estimate of the wage foregone due to spending time in non-market work rather than in market work. Chadeau (1985, p.242) describes the approaches as respectively representing a "*foregone expense*" and a "*foregone wage*" (emphasis in original). Van De Ven *et al.* (2018, p.15) highlight the difference by describing the replacement wage as "representative of the broad range of activities covered in the production of unpaid household services" and the opportunity cost wage as representative of "the whole economy".

Replacement wages are the answer to the question of what it would cost to hire someone in the market to perform the activity. In determining a replacement wage, the choice lies between a generalist replacement wage and a specialist replacement wage. These correspond to Chadeau's (1985, p.242) "overall substitute" and "specialised substitutes". An example of a generalist replacement wage is the wage of a housekeeper or domestic worker, an occupation that typically performs a wide range of activities closely resembling household production. A domestic worker may spend time cooking, cleaning, caring for children, and running errands, but is not a specialist in any particular area. The specialist replacement approach uses the wage of workers engaged in market activities equivalent to the particular household production activity being valued. Thus, for example, one might use the mean wage of workers in a variety of cooking-related occupations (e.g. cooks, chefs, caterers) to value time spent cooking for the household.

The opportunity cost approach differs from the replacement approach in that it asks what an individual might otherwise have earned in the market instead of spending time in household production activities. Within the opportunity cost approach, there are also two options. The first option is to estimate the foregone income by valuing time spent in household production using the individual's hourly wage. For those who are employed in market work, this is straightforward and their actual hourly market wage can be used. However, for those who do not earn wages, an hourly wage must be imputed. The second option is to use the average wage in the economy to value time, in what Budlender (2008, p.35) terms the "average earnings approach".

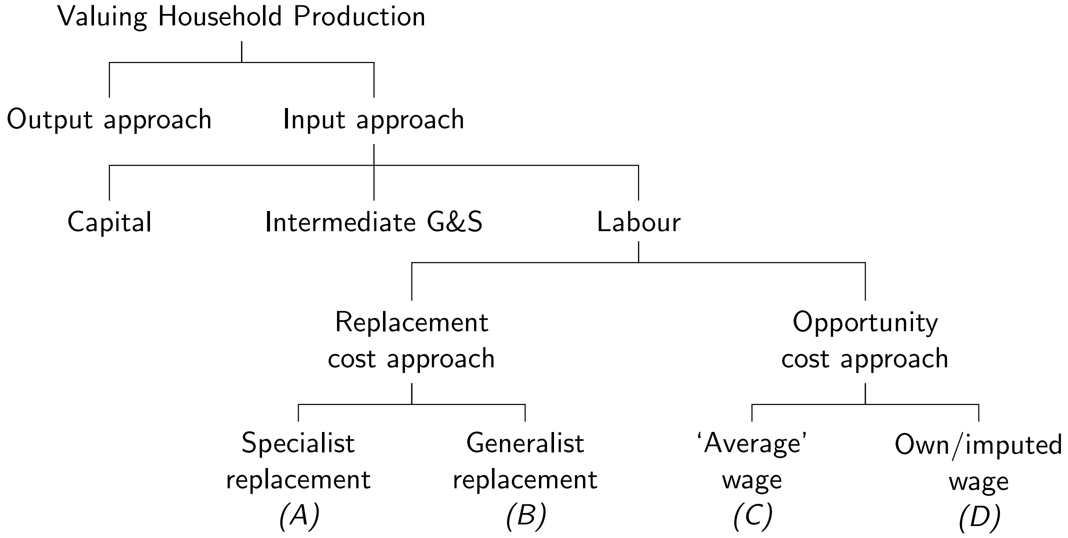
None of the approaches to valuing time is without its disadvantages. The opportunity cost method assumes that "each hour devoted to domestic or caring activities could be productively employed in the labour market" (Giannelli *et al.* 2011, p.2115), an assumption that is particularly problematic in high unemployment countries such as South Africa. At the same time, the approach requires the imputation of wages for individuals not in the labour market, many of whom—such as the elderly—are not even potentially labour market participants. Further, using the opportunity cost method, the same task might be valued differently depending on which household member performs it (Giannelli *et al.* 2011, p.2118). Finally, the opportunity cost method implies value judgements that may reinforce and exaggerate inequalities since the time spent in household production by groups with higher wages is valued more highly than time spent by groups with lower wages (e.g. males relative to females, highly educated individuals relative to those with low levels of education). When using a mean economy-wide wage as an opportunity cost wage, the level of the mean wage may be upwardly biased in high-inequality settings, while the use of a single wage rate for all individuals and across all activities may not be appropriate when analysing particular sub-groups.

The generalist replacement wage is likely to be a very low wage in most, if not all, countries and at least part of the reason for this is that, in the market, these jobs tend to be filled by women. In many countries, 'housekeepers' or similar occupations are likely to be relatively rare within the labour market and employed only by wealthy households, meaning that the wage may no longer be a true reflection of cost faced by the average household to replace the activity in the market (Donehower 2018, p.23). In turn, the specialist replacement method assumes that productivity is similar between the specialist worker and the person performing the non-market work, which is certainly not the case (Giannelli *et al.* 2011, p.2118).

There is strong criticism of the use of wage rates to value household production due to the fact that the types of work corresponding to household production are "socially undervalued" (Carrasco and Serrano 2011, p.75) and, as a result, are characterised by some of the lowest market wage rates. At the same time, hourly rates derived from the market can be tainted by gender-linked wage discrimination (Carrasco and Serrano 2011, p.75).

An overview of the approaches to valuing household production is provided in Figure 3.1.

Figure 3.1. Approaches to Valuing Household Production



Further considerations that ought to be addressed in the valuation of non-market work include productivity differentials and the quality of the output (Van De Ven *et al.* 2018). At this point, the NTTA framework acknowledges these issues but does not make any adjustments in this regard. Nor does the methodology account for economies of scale. The key constraint in making appropriate adjustments is a lack of clear evidence that suggests specific adjustments, as well as evidence that suggests that such adjustments are equally valid across country contexts.

3.4.2 Constructing Profiles of Household Production

The objective of NTTA is to estimate patterns of time allocations to productive activities across the lifecycle and by gender. With estimated age profiles of production and consumption of non-market services (i.e. household production), it is then possible to estimate flows of 'time' (and the value of that time) across the lifecycle in a way that is analogous to the flows of resources within the standard NTA framework. Full details of the NTTA methodology can be found in

Donehower (2018).

Comprehensive time-use surveys contain data on a wide variety of activities, both productive and non-productive. The first task is to identify activities that would have been included within GDP had they not been performed within the household. Unpaid productive activities are identified as those meeting the "third party criterion". Originally articulated by Reid (1934), the third party criterion defines as 'work' any unpaid activity performed by a household member that a third person could be paid to perform. Hawrylyshyn (1977, p.89) uses the third person criterion to define "economic household services" by arguing that they produce indirect utility and that indirect utility can be "produced by a *third person* (e.g. purchased on the market)" (emphasis in original). Hill (1979, p.34) broadens the scope of activities by simply requiring that the service "be capable of being performed by another economic unit than the consumer of the service".

Within the International Classification of Activities for Time Use Statistics (ICATUS), categories of productive activities that are not included in national income are major groups 4 through 6, namely: household maintenance, management and shopping for own household; care for children, the sick, elderly and disabled for own household; community services and help to other households. Statistics South Africa (2013b) also uses the ICATUS classification and refers to these three major groups as "Non-SNA production".

Time-use surveys typically allow respondents to report doing more than one activity within a given time slot. Depending on the survey, these activities might be performed sequentially within a time slot, or they might be performed simultaneously (i.e. multitasking). Further, in the case of simultaneous activities, surveys may allow respondents to identify which is the primary activity and which are secondary activities. There is, however, substantial variation in the approach taken in different surveys and, as a result, the NTTA approach is to ignore multitasking and to consider only the primary activity. In the case of the South African data, this is not possible. The South African surveys do not distinguish between primary and secondary activities; instead, they allow respondents to list up to three activities performed either simultaneously or sequentially within a 30-minute slot. The result is that it is not possible to select the 'primary' activity. The approach taken in the estimations is to split the 30 minutes between the reported activities: two activities within a given slot are each allocated half of the time (i.e. 15 minutes each in a 30-minute slot), while three activities within a single slot are each allocated one-third of the time (i.e. 10 minutes each). Simultaneous activities within a given slot share the time equally.

Four sets of age profiles are constructed: production, consumption and transfer inflows and transfer outflows. The production profile for a given activity is calculated as the time spent on that activity averaged across *all* members of each age cohort. Individuals who do not spend any time in that activity are allocated a zero for the purposes of calculating the mean. For example, the average time spent cleaning by 20 year olds is the value of the cleaning production profile at age 20. This is identical to the way in which NTA profiles are constructed.

By definition, the time spent in non-market work is productive, yielding outputs for consumption. While household satellite accounts help quantify and value the output of non-market work and time-use studies reveal varying time allocations to productive activities over the life course, NTTA goes a step further by developing a framework for allocating the consumption of the outputs of non-market work, providing detail by age and gender. Consumption of household production is not directly observed in the surveys, and is therefore estimated indirectly. In the case of activities of which all household members are beneficiaries, such as cooking, cleaning and household management, production is allocated equally as consumption to all household members including the producer. In contrast, in the case of activities for which only specific household members are beneficiaries, the approach is to allocate consumption using a regression where the dependent variable is the time spent by respondents in the activity and the independent variables are the number of individuals in the household of relevant ages. For example, in the case of childcare, the independent variables would be the number of household members aged zero, the number aged one and so on. This approach is similar to that used in the allocation of certain types of consumption in NTA.

Since household production is typically only observed for a subset of household members, a matrix is constructed where each cell represents the average time consumed by individuals of a particular age and gender (the columns) of a given activity produced by individuals of a particular age and gender (the rows). By multiplying the rows by the corresponding population estimates, a matrix of aggregate production and consumption is constructed. Dividing the columns by the corresponding population estimates generates a matrix of average consumption by individuals of a particular age and gender of activities produced by individuals of a particular age and gender. Summing each column (i.e. across producer characteristics) yields the total consumption of a given activity by individuals by age and gender.

Transfer inflows and outflows are calculated differently depending on the activity in question. For intra-household transfers—where all production and consumption occurs within the household—there are two procedures. In the case of targeted care, such as care of children within the household, the production of the activity is recorded as an outflow, while the consumption is recorded as an inflow. In the case of activities that benefit all members of the household, the time consumed by the producer him- or herself must be excluded from the transfers. Thus, if an individual cleans for one hour in a household of four, she is deemed to consume one-quarter of that production and to transfer three-quarters to the other three household members. In this case, at the household level, production is one hour, consumption is one hour, there is a transfer outflow of 45 minutes and a matching transfer inflow of 45 minutes.

For activities where beneficiaries of the household production are not members of the household (e.g. care of non-household members), the production-consumption matrix described above is used. All production of these activities is designated as transfer outflows and all consumption is designated as transfer inflows.

As in NTA, calculated profiles are smoothed to deal with some of the noise in the data. The key exception is for the consumption and transfer inflows of care time for infants, since smoothing is likely to substantially underestimate their consumption. Once the profiles are smoothed, various checks are implemented to ensure consistency across profiles. Specifically, the checks ensure that total production equals total consumption, that total inter-household inflows equal total inter-household outflows, and that total intra-household inflows equal total intra-household outflows.

There are two areas in which the NTTA methodology currently makes no adjustments. The first is the issue of potential differences in efficiency or quality between production in the market and production in the home. It is quite possible that market production may be systematically more (or less) efficient or of higher (or lower) quality than home production, but we lack the data that would allow us to address these differences. The second issue is the relationship between age and efficiency in home production. For example, an hour spent cleaning by a 10 year old may not be equivalent to an hour spent cleaning by a 30 year old, or to an hour spent cleaning by an 80 year old; however, replacement wage approaches will value each of these hours identically.

Once the time-denominated age profiles of production, consumption and transfers have been estimated, these need to be valued using an appropriate wage. Valuing time spent in household production is useful in assessing its magnitude relative to, say, GDP; it is also important if these estimates are to be combined with NTA estimates of market production. The NTTA approach uses the labour input as a basis for valuing household production; it does, however, ignore the value of the capital inputs and intermediate goods and services, potentially resulting in an underestimate of the total value of household production. While valuing labour inputs rather than the outputs of household production may result in a downward bias in the NTTA estimates, it helps avoid issues such as double-counting production that includes purchased and non-purchased inputs (Donehower 2013, p.23).

Within NTTA, the preferred methodology is the specialist replacement approach, since the opportunity cost wage rates in most countries tend to be very high—the method imputes skilled inputs not required to complete the task—while the generalist replacement approach is avoided due to the relatively small number of households in most countries that can afford to employ housekeepers (the typical generalist) (Donehower 2018, p.23). Opportunity cost wages are also controversial in that they imply that, for example, an hour of childcare performed by a highly educated parent is more valuable than an hour of childcare performed by a parent with no education. Poissonnier and Roy (2015, p.362) further argue that the opportunity cost approach is more appropriate for welfare economics analyses than for national accounts. Given widespread employment of domestic workers in South Africa, both replacement approaches are viable from a data perspective. Data on wages are typically obtained from either the time-use survey itself if it has sufficient detail on wages and employment, or a labour market survey preferably conducted at a similar point in time to the time-use survey.

3.5 Data

3.5.1 Data for National Transfer Accounts

The analysis presented in the coming chapters relies on five sets of NTA estimates. Chapter 5 is based on estimates for 2015, Chapter 6 details results for 2010, while Chapter 4 incorporates estimates for 1995, 2000 and 2005 in addition to the 2010 and 2015 estimates. The key data source in each case is a survey, or module of a survey, that provides detailed information on incomes and expenditures. The five primary data sources for the construction of the estimates are the *Income and Expenditure Surveys* of 1995, 2000, 2005/06 and 2010/11 (Statistics South

Africa 1995a, 2000, 2006b, 2011), and the income and expenditure modules of the 2014/15 *Living Conditions Survey* (Statistics South Africa 2015b), all of which are nationally representative household surveys conducted by Statistics South Africa.

Statistics South Africa has implemented a number of changes over time in terms of the methodology of the surveys (see Table 3.1). For example, they switched from a survey period of one month to a period of a year; from one questionnaire to multiple questionnaires; from using the recall method only to using a combination of recall and a weekly diary; and from the Standard Trade Classification (STC) to the Classification of Individual Consumption According to Purpose (COICOP). Two of the surveys—the IES 1995 and the IES 2000—were conducted in conjunction with other surveys so that observations can be linked across surveys, the IES 2005/06 and the IES 2010/11 were standalone surveys, while the LCS 2014/15 was a larger survey that included income and expenditure modules.

Table 3.1. Information on Core Surveys Used

	IES 1995	**IES 2000**	**IES 2005/06**	**IES 2010/11**	**LCS 2014/15**
Survey period	Oct 1995	Oct 2000	Sep 2005 to Aug 2006	Sep 2010 to Aug 2011	Oct 2014 to Oct 2015
Links to other surveys	OHS 1995	LFS 2000:2	-	-	IES module within LCS 2014/15
Sample frame	Census 1991	Census 1996	Census 2001	Census 2001	Census 2001
Sample (households)	29 582	26 263	21 144	25 328	27 527
Response rate (%)	Not reported	Not reported	93.5	91.6	84.9
Questionnaires	One	One	One main; four weekly diaries	One main; two weekly diaries	One main; two weekly diaries
Methodology	Recall	Recall	Recall and diary	Recall and diary	Recall and diary
Visits per household	One	One	Six	Four	Four
Classification system	Standard Trade Classification (STC)	Standard Trade Classification (STC)	Classification of Individual Consumption According to Purpose (COICOP)	Classification of Individual Consumption According to Purpose (COICOP)	Classification of Individual Consumption According to Purpose (COICOP)

Notes: The number of visits per household is unclear from the LCS 2014/15 metadata, but it appears that enumerators visited households at least four times.
Source: Statistics South Africa (2008, 2012a,b); Yu (2008).

The consensus appears to be that these datasets are of reasonably good quality: these datasets have been the basis for arguably most analyses of spending patterns, income distribution and poverty in the post-apartheid era, and have been used by Statistics South Africa to update the consumer price index weights. While there have been some concerns regarding consistency of particular categories of spending (for example, Yu 2008; Finn *et al.* 2014), this is ameliorated in the construction of NTAs through the use of detailed aggregate controls, and by the fact that the only consumption spending that is focussed on separately is that on education and health.

These five datasets were the primary sources of data used in constructing the five sets of NTAs. Other survey data was incorporated where these surveys lacked information specifically pertaining to educational attendance and health utilisation rates. For the 1995 accounts, data from the accompanying *October Household Survey* (Statistics South Africa 1995b) was used for the profiles of private and public consumption of education and health. For the 2000 accounts, which only cover the components of the lifecycle deficit, additional data from the *Post-Apartheid Labour Market Series* (PALMS) (Kerr *et al.* 2016), the 2002 *General Household Survey* (Statistics South Africa 2002), and the 1998 *Demographic and Health Survey* (DHS) (Department of Health and Medical Research Council 1998) was used to inform the construction of the private consumption profiles for education and health, as well as the allocation of consumption of alcohol and tobacco products. The 2005 accounts incorporated information from the 2005 *General Household Survey* (Statistics South Africa 2005a) for the construction of the profiles for public and private consumption of education and the public consumption of health, and from the 2006 *General Household Survey* (Statistics South Africa 2006a) for private consumption of health. For the 2010 accounts, the 2010 *General Household Survey* (Statistics South Africa 2010a) was used to construct attendance and utilisation rates used in the private and public consumption of education profiles, and the private consumption of health profile. The 2014/15 *National Income Dynamics Study* (NIDS, Wave 4) (Saldru 2015) was used to allocate consumption of alcohol and tobacco products for both the 2010 and 2015 accounts.

3.5.2 Data for Aggregate Control Totals

Aggregate control values were compiled from several sources, with official macroeconomic data drawn from the South African Reserve Bank (2018a). In addition, supplementary data was required to construct certain aggregate controls. This included:

- For 1995:
  - Data from the IES 1995 (Statistics South Africa 1995a) for the estimation of gross mixed income;
  - Data on the relative size of the non-profit institutions serving households (NPISH) sector in 2000 Statistics South Africa (2005b), as a proxy for its size in 1995;
  - Data from the 1997 Budget Review (Department of Finance 1997) to estimate the distribution of current expenditure on education by level;
  - Data from the 1998 Budget Review (Department of Finance 1998) on spending on social grants; and
  - Data from the 1999 Budget Review (Department of Finance 1999) on government revenues.
- For 2000:
  - Data from the IES 2000 (Statistics South Africa 2000) for the estimation of gross mixed income; and

  - Data on the relative size of the non-profit institutions serving households (NPISH) sector in 2000 (Statistics South Africa 2005b).

- For 2005:
  - Data from the IES 2005/06 (Statistics South Africa 2006b) for the estimation of gross mixed income;
  - Data on the relative size of the non-profit institutions serving households (NPISH) sector in 2000 (Statistics South Africa 2005b), as a proxy for its size in 2005;
  - Data from the 2008 Estimates of National Expenditure (National Treasury 2008) on spending on social grants and unemployment benefits; and
  - Data from the 2007 Estimates of National Revenue (National Treasury 2007) on government revenues.

- For 2010:
  - Data from the IES 2010/11 (Statistics South Africa 2011) for the estimation of gross mixed income;
  - Data on the relative size of the non-profit institutions serving households (NPISH) sector in 2010 (Statistics South Africa 2013a);
  - UNESCO (2018) data to estimate the distribution of current expenditure on education by level;

- For 2015:
  - Data from the LCS 2014/15 (Statistics South Africa 2015b) for the estimation of gross mixed income;
  - Data on the non-profit sector (Statistics South Africa 2017c) to estimate the relative size of the non-profit institutions serving households (NPISH) sector;
  - World Bank (2018b) data to estimate the distribution of current expenditure on education by level;
  - National budget documentation from National Treasury (2018) for expenditures on social benefits, the Unemployment Insurance Fund and the Compensation Fund; and
  - Data from Statistics South Africa (2017a) and National Treasury (2014) relating to government revenues.

3.5.3 Data for National Time Transfer Accounts

For the NTTA estimates, the key source of data is the *Time Use Survey* (TUS) of 2010, conducted by Statistics South Africa (2010c) and South Africa's second nationally representative time-use survey. Fieldwork took place during the final quarter of 2010 (October to December). Basic data on all members of surveyed households were collected, but only up to two respondents were selected to complete the time-use component of the survey. These respondents were selected from amongst all members aged ten years and older using a grid listing the person identifiers to be selected based on the number of age-eligible household members, and the number of households with this number of eligible household members already encountered by the enumerator (Statistics South Africa 2014b, p.26). In households with only one age-eligible respondent, only that respondent was surveyed.

The survey made use of a 24-hour diary, divided into 30-minute slots, covering the previous day beginning at 4am. Up to three activities within a slot were recorded. Multiple activities within a slot could be identified as being performed simultaneously or sequentially. Activities were classified according the International Classification of Activities for Time Use Statistics (ICATUS).

One unique aspect of the South African TUS questionnaires lies in the fact that it specifically prompts respondents, once they have completed the survey, to check whether they had mentioned all childcare performed. If necessary, respondents went back and filled in any missing childcare; any childcare that was filled in during this process was coded slightly differently so that it is possible to differentiate between spontaneously reported childcare and the childcare that was recorded only after the respondent was prompted. This means that the surveys are likely to have captured more childcare than other surveys without the additional prompt.

A second data source is used to derive the wage rates with which the time spent in household production is valued. Wage rates for 2010 are derived from the *Labour Market Dynamics in South Africa* (LMD) data, published by Statistics South Africa (2010b). This dataset is essentially a pooling of the four *Quarterly Labour Force Surveys* conducted during 2010, with the only difference being that the wage data collected as part of the QLFS is only published in the LMD (and not in the QLFS itself). The QLFSs are nationally representative household surveys, with a sample size of roughly 30 000 dwellings each, and are the key source of survey data on the South African labour market.

3.5.4 Population Data

Estimates and projections of single-year age cohorts of the South African population are obtained from the 2017 Revision of the *World Population Prospects* produced by the United Nations (2017). Unless otherwise stated, the medium fertility variant is used.

For estimates by race for 2015, Statistics South Africa's (2018b) *Mid-Year Population Estimates* were used, which are published in five-year age cohorts. Estimates of the population by race for single-year age cohorts were calculated using Sprague multipliers (Sprague 1880; see also Calot and Sardon (2004) for full details of the multipliers). The mismatch between the two sets of estimates—the United Nations (2017) estimates the 2015 population at 55.291 million, while Statistics South Africa (2018b) puts the figure at 54.957 million—was dealt with by applying the racial composition of each age cohort derived from the *Mid-Year Population Estimates* to the United Nations (2017) estimates for the total population in 2015.

Chapter 4

South Africa's Demographic Dividend

4.1 Introduction

South Africa is currently undergoing a demographic transition. While roughly half the population is under the age of 26, the population is ageing: between 1985 and 2015, the median age rose from 19.6 years to 26.1 years and is projected to increase to 32.9 years over the following three decades (United Nations 2017). This transition—from high fertility and high mortality, to low fertility and low mortality—results in a transitory shift in the composition of the population until a new steady state is achieved. Specifically, since mortality declines before fertility, the demographic transition creates a boom generation: a series of cohorts that are unusually large. As fertility declines and these large cohorts enter the working ages, there is a decline in the extent to which the average worker is relied upon by non-workers (children and the elderly in particular) for the consumption needs. This fall in economic dependency releases resources that can be used to raise living standards, to invest or to save. This is the demographic dividend.

However, a quarter of a century after the system's demise, South Africa still bears the scars of apartheid. South Africa's highly unequal society is reflected in its economy, in which a sophisticated modern sector with high incomes exists alongside a low-income informal sector and mass unemployment. Although economic growth in the post-apartheid period has generally been significantly higher—and more stable—than growth in the preceding two decades, it has been insufficient to draw the unemployed in significant numbers in to productive employment in a sustainable way. As a result, unemployment, poverty, and inequality remain three of the most pressing socioeconomic challenges facing the country.

The process of population ageing and the associated demographic dividend therefore represent an important opportunity for South Africa. However, the demographic dividend is not a guaranteed benefit and, given its social and economic challenges, South Africa risks failing to capitalise on this opportunity. Indeed, many of the socioeconomic problems facing the country actively work against the realisation of the dividend.

The focus of this chapter is on South Africa's demographic dividend. Pulling together five sets of South African NTA estimates covering a period of 20 years from 1995, the chapter addresses three specific questions. First, what are the estimated magnitudes of South Africa's first and second demographic dividends? Second, to what extent are the projected dividends robust to updated estimates of the generational economy? Third, what types of policy options are available to maximise the demographic dividend that is eventually realised?

While there is a relatively large literature on the demographic dividend, the phenomenon has received relatively little attention in South Africa. This chapter contributes to the South African literature by providing detailed estimates of both the first and the second demographic dividends, and models the impact on both dividends of changes in the shapes of the labour income and consumption profiles. This is also the first detailed analysis of South Africa's second demographic dividend; previous estimates have only been published as part of global or regional overviews of the demographic dividends. Further, the chapter presents a first look at how the broad structure of the generational economy has been changing during the post-apartheid period.

4.2 Population Change in South Africa

Before analysing the impact of demographic change on the South African economy, this section outlines some of the key changes that have occurred and that are predicted to occur in the coming decades. All of the data presented here comes from the 2017 Revision of the United Nations' *World Population Prospects* (United Nations 2017).

Figure 4.1 presents population pyramids for the South African population for five years, ranging from 1965 to 2095, based on the UN's medium fertility projections. Age groups are presented on the vertical axis, with the share of the population on the horizontal axis; the male population is presented on the left of the figure, while the female population is on the right. The figure clearly illustrates how the structure of the population has changed since 1965 and is expected to change over the next eight decades. In general, the narrowing of the pyramid's base observed over the past five decades is expected to continue, while there will be a significant broadening of the upper end of the pyramid. Together, these changes imply substantial ageing of the South African population.

The base of the pyramid has narrowed significantly over the past five decades. In 1965, the youngest male and female cohorts each accounted for between 1.6 percent and 1.8 percent of the total population; by 2015, however, these cohorts each accounted for around one percent of the total population. Over the coming decades, this narrowing is projected to continue so that child cohorts will be less than half their present size as a proportion of the total population by the end of the century. This narrowing of the base implies growth in the size of older cohorts. Between 1965 and 2015, this growth was somewhat muted and largely confined to cohorts between the ages of 20 and 50 years. However, the coming decades are projected to see a strong expansion in the relative sizes of older cohorts, with cohorts over the age of 50 expected to see particularly strong growth relative to the total population.

Table 4.1 quantifies some of these and other projected population changes. The total fertility rate fell by almost half between 1965-70 and 1995-00, from 5.80 live births per woman to 2.95 births. Over the subsequent 20 years, it fell by a further 0.54 births. According to the medium

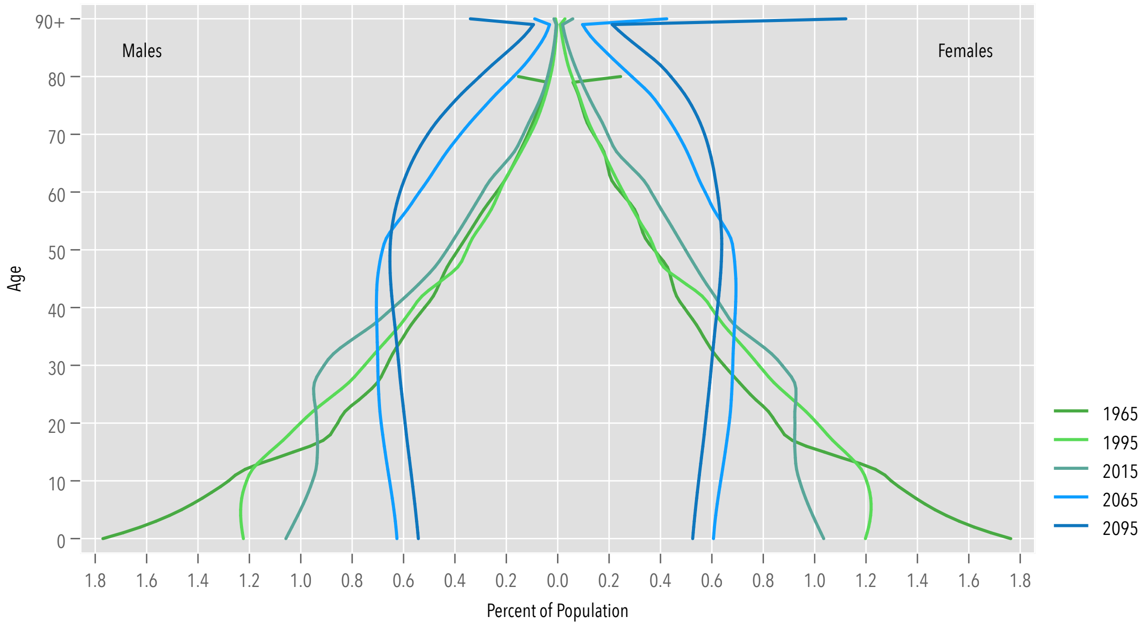


Figure 4.1. Demographic Change in South Africa, 1965-2095

Notes: Projections are the medium fertility variant. Prior to 1990, the top age bracket was 80+.
Source: Own calculations, United Nations (2017).

fertility projection, the total fertility rate is expected to fall further to 1.82 births per woman in 2065-70 and 1.80 birth per woman in 2095-00. The low and high fertility projections set fertility at respectively 0.5 births per woman lower and 0.5 births per woman higher than the medium fertility projection. Irrespective of the projection, however, fertility is expected to decline over the next half century.

At the same time, life expectancy is projected to rise during the 21^{st} century. Life expectancy at birth rose by less than five years between 1965-70 and 1995-00, while that at age 30 declined by one year to 36.5 years over the same period. The next half century is expected to see further increases, by 11.5 years at birth, by 8.6 years at age 30 and by 4.1 years at age 60.

The ageing of the population is clearly evident in the rising median age of the population. In 1965, half of the population was under the age of 19.1 years; 30 years later this had not changed by much (21.6 years). However, the twenty years between 1995 and 2015 saw the median age increase by 4.5 years to 26.1 years. By 2065, it is expected that the median age will rise to 37.6 years and to 42.7 years by 2095, based on the medium fertility projections. The low fertility variant implies more rapid ageing, with the median age reaching 51.0 years by 2095, while the high fertility variant implies less rapid ageing.

The total population is projected to continue growing, reaching 76.3 million in 2065 and 77.0 million in 2095. Within the total, however, the population under the age of 20 is projected to fall over the 2015-2065 and 2065-2095 periods, while the population aged 20-64 years is projected to rise to 45.3 million by 2065 and to fall to 43.0 million by 2095. In contrast, the population aged 65+ is projected to grow rapidly from 2.8 million in 2015 to 11.3 million in 2065 and 16.8 million in 2095. Indeed, for the periods shown here except 1965-1970, the 65+ population has experienced or is projected to experience the highest population growth rate.

Table 4.1. Selected Population Indicators for South Africa, 1965-2100

	Unit	1965-1970	1995-2000	2015-2020	2065-2070	2095-2100	Change ('15-'65)
Total fertility rate							
Medium variant	births	5.80	2.95	2.41	1.82	1.80	-0.59
Low variant	births			2.16	1.32	1.30	-0.84
High variant	births			2.66	2.32	2.30	-0.34
Life expectancy							
At birth	years	54.8	59.2	63.7	75.2	80.0	11.5
At age 30	years	37.5	36.5	38.3	46.9	51.2	8.6
At age 60	years	15.0	15.4	16.9	20.9	23.7	4.1
Median age (in first year of period)							
Medium variant	years	19.1	21.6	26.1	37.6	42.7	11.5
Low variant	years			26.1	43.8	51.0	17.7
High variant	years			26.1	32.7	36.1	6.6
Medium variant projections							
Population (in first year of period)							
Total	'000s	19 942	42 088	55 291	76 287	77 008	20 996
0-19 years	'000s	10 297	19 751	21 363	19 635	17 157	-1 728
20-64 years	'000s	8 900	20 764	31 119	45 340	43 033	14 221
65+ years	'000s	745	1 573	2 809	11 312	16 819	8 503
Population growth							
Total	% p.a.	2.75	1.67	1.21	0.18	-0.14	-1.03
0-19 years	% p.a.	2.92	0.58	0.43	-0.48	-0.45	-0.91
20-64 years	% p.a.	2.58	2.56	1.50	0.10	-0.33	-1.40
65+ years	% p.a.	2.40	3.19	3.70	1.57	0.66	-2.13
Dependency ratios							
Total		1.26	0.98	0.76	0.69	0.80	-0.08
Child (0-19)		1.17	0.91	0.67	0.43	0.40	-0.24
Old age (65+)		0.08	0.08	0.10	0.26	0.40	0.16

Notes: Low and high fertility projections of the total population, population growth rates and dependency ratios can be found in Table B.1 in the Appendix.
Source: Own calculations, United Nations (2017).

The result of these trends is a fall in the dependency ratio from 1.26 in 1965-70 to 0.69 in 2065-70, with a subsequent increase to 0.80 during the remainder of the century. The decline is driven entirely by the child dependency ratio, which falls throughout the period from 1.17 in 1965-70 to 0.40 in 2095-00, and which dominates the gradually rising old age dependency ratio for most of the period under review. It is only during the latter 30 years of the period that the rise in the old age dependency ratio outweighs the fall in the child dependency ratio. By the end of the 21^{st} century, the old age dependency ratio will equal the child dependency ratio.

Low and high fertility projections of the total population, population growth rates and dependency ratios can be found in Table B.1 in the Appendix. In essence, though, the low fertility variant sees a peak and subsequent decline in the total population so that the population at the end of the century will be lower than the current population. The result is a more sharply rising old age dependency ratio and a more rapidly falling child dependency ratio. In contrast, the high fertility assumption sees the population more than doubling between 2015 and 2095. The child dependency ratio falls by one-half of the fall under the medium fertility variant, while the rise in the old age dependency ratio is also slower. By 2095-00, though, the total dependency ratio under both the low and high fertility variants is the same, at 0.83.

4.3 The Changing Economic Lifecycle in South Africa 1995-2015

4.3.1 The Lifecycle Deficit

Currently, there are five sets of estimates of the lifecycle deficit available for South Africa: 1995, 2000, 2005, 2010 and 2015. The normalised labour income and consumption profiles for each year are presented in Figure 4.2. In the cases of both labour income and consumption, the profiles are broadly similar across time. Nevertheless, there are important changes.

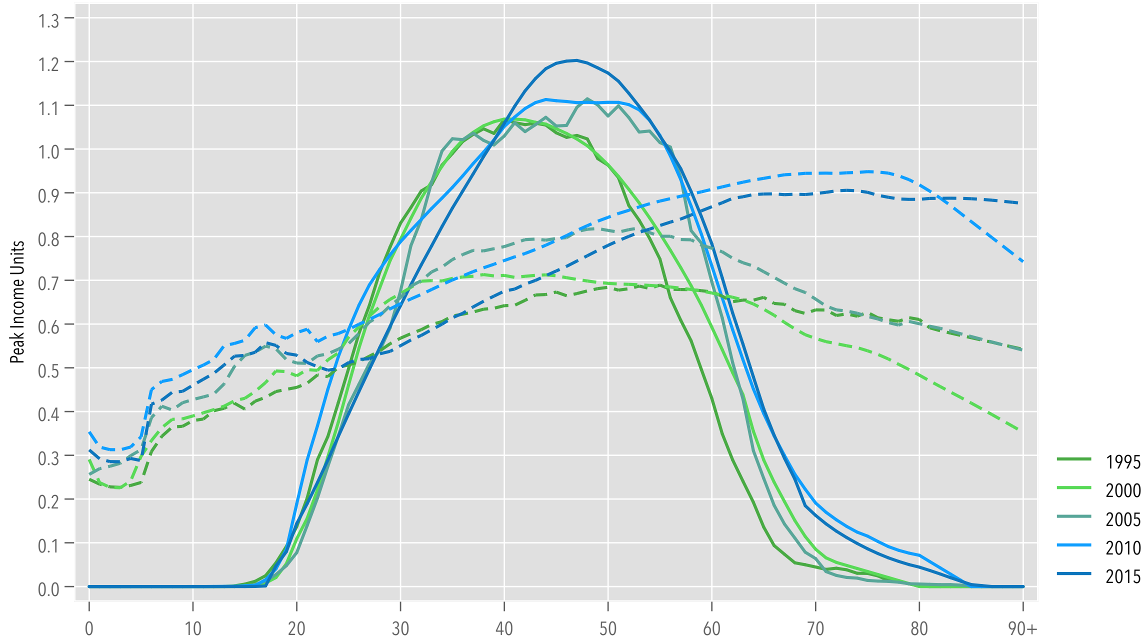


FIGURE 4.2. SOUTH AFRICAN LABOUR INCOME AND CONSUMPTION PROFILES, 1995-2015

Notes: Profiles are normalised by dividing through by the average labour income for 30 to 49 year olds ('peak labour income') for each year; this average equals one peak income unit. Nominal profiles can be found in Figure B.1 in Appendix B.

Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c); UNESCO (2018); United Nations (2017); World Bank (2018b).

The five labour income profiles all follow the conventional bell-shape: labour income is zero or negligible amongst the youngest cohorts, rises as cohorts enter the labour force, peaks and then declines as cohorts approach retirement age, with elderly cohorts again having little labour income. Over time, however, the labour income profile appears to have leaned further towards the right, towards older ages: successive estimates generally show lower per capita labour income amongst cohorts in their twenties and thirties and higher per capita labour income amongst older cohorts. The 2010 labour income profile is, though, something of an outlier from the perspective of younger cohorts, for whom it is the highest of the five profiles.

While the profiles have increasingly leaned towards older ages, the age at which labour income peaks has increased over time. Further, these two processes have seen normalised labour income peak at a higher level relative to the average for 30-49 year olds in each year. In 1995, labour income peaked at age 40 at 107 percent of peak labour income. In 2005, the labour income profile plateaued between the mid-thirties and mid-fifties, with a peak at age 48 at 111 percent of peak labour income. By 2015, the peak occurred at age 47 at 120 percent of peak labour income.

Per capita consumption is low for young children, and rises rapidly once children start school. In all five years, per capita consumption continues to rise until the mid-thirties; thereafter, however, there are some important differences between the estimates. In 1995, 2000 and 2005, per capita consumption peaks at some point between the mid-thirties and the mid-fifties and falls thereafter; in 2010 and 2015, per capita consumption continues to rise until the early seventies.

Once labour income is subtracted from consumption, it is possible to plot the lifecycle deficit in each year (Figure 4.3). As per NTA convention, lifecycle deficits are plotted as positive, while surpluses are negative. Given that they have little if any labour income, children and the elderly experience lifecycle deficits. Prime working-age cohorts, in contrast, produce lifecycle surpluses.

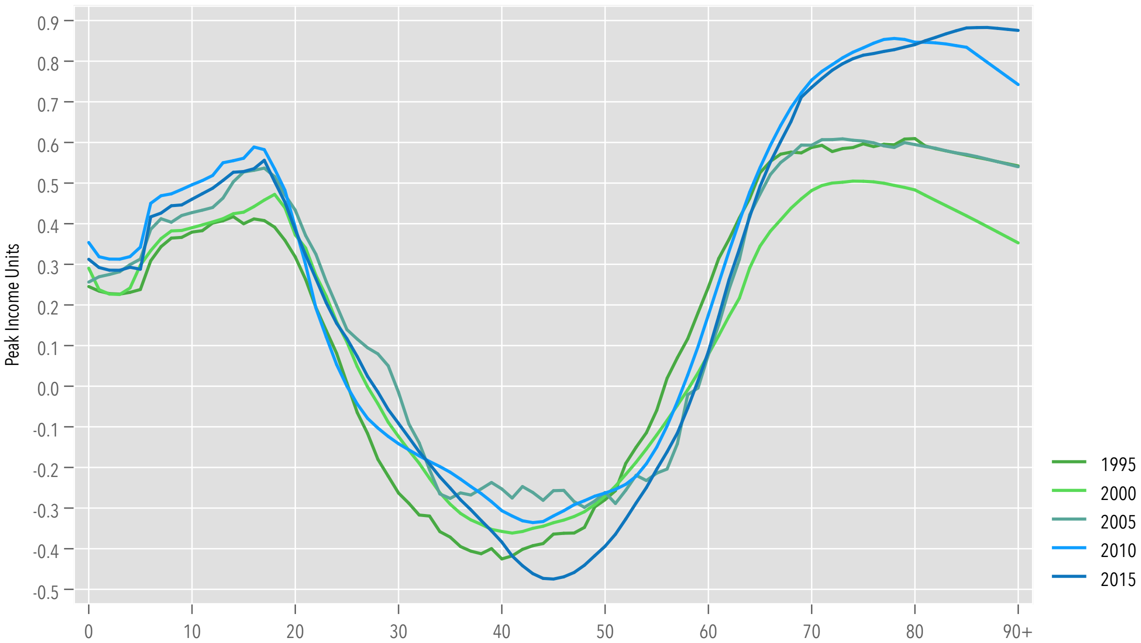


FIGURE 4.3. SOUTH AFRICAN LIFECYCLE DEFICIT, 1995-2015

Notes: Profiles are normalised by dividing through by the average labour income for 30 to 49 year olds ('peak labour income') for each year; this average equals one peak income unit. Lifecycle deficits are positive in this figure; lifecycle surpluses are negative. Nominal profiles can be found in Figure B.2 in Appendix B.
Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c); UNESCO (2018); United Nations (2017); World Bank (2018b).

There are a few points to note above the five profiles. In general, per capita lifecycle deficits for children are slightly higher in later years than in earlier years. This difference is more strikingly evident when the profiles are expressed in constant Rands, as in Figure B.2. Taking 15 year olds as an example, the per capita lifecycle deficit increased from R28 900 in 1995 to R43 900 in 2005 and to R52 700 in 2015, using constant 2015 Rands. Most of this increase occurred between the 2000 and 2010 estimates. This trend is consistent with rising levels of public spending on education and health that accrues to children, the expansion of child grants, and generally rising per capita incomes over the post-apartheid period.

Similarly, per capita lifecycle deficits have generally increased over time amongst elderly cohorts. In 1995 and 2005, the lifecycle deficit amongst elderly cohorts peaked at 61 percent of peak labour income (the 2000 peak was at 50 percent of peak labour income). This increased to 68 percent of peak labour income in 2010, and to 88 percent of peak labour income in 2015. Thus, in general, per capita lifecycle deficits tend to be higher amongst elderly cohorts than amongst young cohorts, and the gap has increased over time.

In terms of the magnitude of lifecycle surpluses, there does not seem to be a discernible trend over time. In constant Rand terms, though, 2015 stands out as having an unusually large surplus for cohorts in their fifties in particular (see Figure B.2). Nevertheless, the number of surplus years is between 30 and 32 years across the five years, with transitions from deficit to surplus and from surplus to deficit occurring within a four-year range in the late twenties and late fifties respectively.

4.3.2 Transfers and Asset-based Reallocations

The financing of the lifecycle deficit, through public transfers, private transfers and asset-based reallocations, is illustrated in Figure 4.4. For these profiles that comprise the righthand side of the NTA flow identity, estimates are provided for 1995, 2005 and 2015.

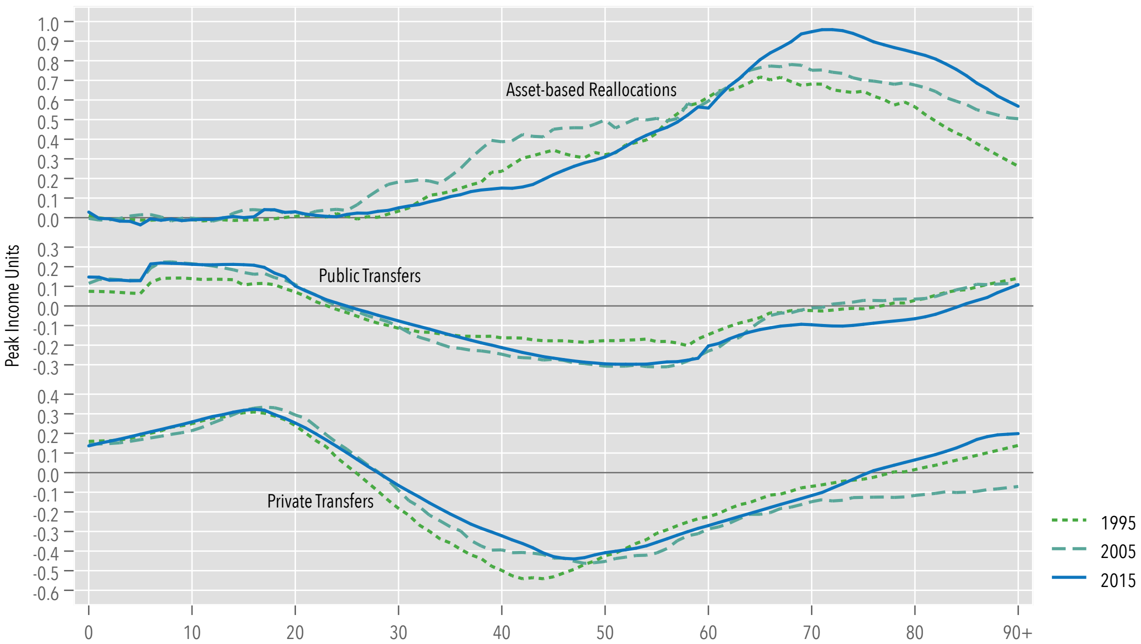


Figure 4.4. South African Lifecycle Deficit, 1995-2015

Notes: Profiles are standardised by dividing through by the average labour income for 30 to 49 year olds ('peak labour income') for each year; this average equals one peak income unit.
Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c); UNESCO (2018); United Nations (2017); World Bank (2018b).

Young cohorts receive net private transfer inflows from older cohorts, which peak in the late teens before falling towards zero. During the late twenties net private transfers turn negative indicating net private transfer outflows, which reach their peak during the forties. Net transfer outflows gradually decline thereafter and, in two of the three years, return to net inflows by the mid-seventies. In 2005, however, even the oldest cohorts are making larger private transfers to younger cohorts than they receive from these cohorts. Between 1995 and 2015, the switch from net inflows to net outflows shifted slightly later (from age 26 to 29), while peak net outflows also shifted to slightly older ages. This pattern suggests an increase in the reliance on private transfer inflows amongst younger adults over the period.

A similar pattern—net inflows amongst the young and the old, net outflows amongst prime working age cohorts—is observed for public transfers. The transition from net inflows to net outflows occurs slightly earlier than for private transfers, around age 25, while there is wide variation in the age of transition back to net inflows amongst older cohorts as the profiles are very flat at that point. The 20-year period has seen an increase in per capita net public transfer inflows amongst children, and an increase in per capita net public transfer outflows amongst prime working-age and elderly cohorts.

Asset-based reallocations—the difference between asset income and saving—are negligible for the young, and only really start to increase in the late twenties. Inflows from this source peak during the late sixties in the case of the 1995 and 2005 profiles, and in the early seventies in the case of the 2015 profile, before tapering off in old age. Per capita asset-based reallocations are slightly higher for working-age cohorts in 1995 and 2005 than in 2015, but slightly lower for post-retirement cohorts.

4.3.3 South Africa in an International Context

While the preceding sections provide a sense of how particular South African age profiles have changed over time, it is not possible to discern whether they exhibit any particularly unique features. One of the strengths of the global NTA research effort is the fact that it covers a large number of countries, which is useful for providing the context required to identify these potential features. The NTA database (National Transfer Accounts Project 2019) contains at least one set of consumption and labour income profiles for 45 countries globally, excluding South Africa, although not all of these profiles have been published.

Figure 4.5 presents the 1995 and 2015 South African labour income and consumption profiles, along with the median labour income and consumption profiles constructed from the 45 countries in the NTA database for which there are complete estimates. In addition to the median profiles, the interquartile range for each set of profiles is plotted in order to give a sense of the dispersion of values.

It is clear from the figure that the South African profiles, while following the broad conventional patterns, are unusual in a number of aspects. First, relative to other country profiles, the South African labour income profile is shifted to the right, towards older ages, and it appears that it has shifted further right over the 20-year period. At younger ages, normalised per capita labour income in South Africa is relatively low, a feature that is consistent with the extremely high rates of unemployment, particularly amongst young people, that are characteristic of the

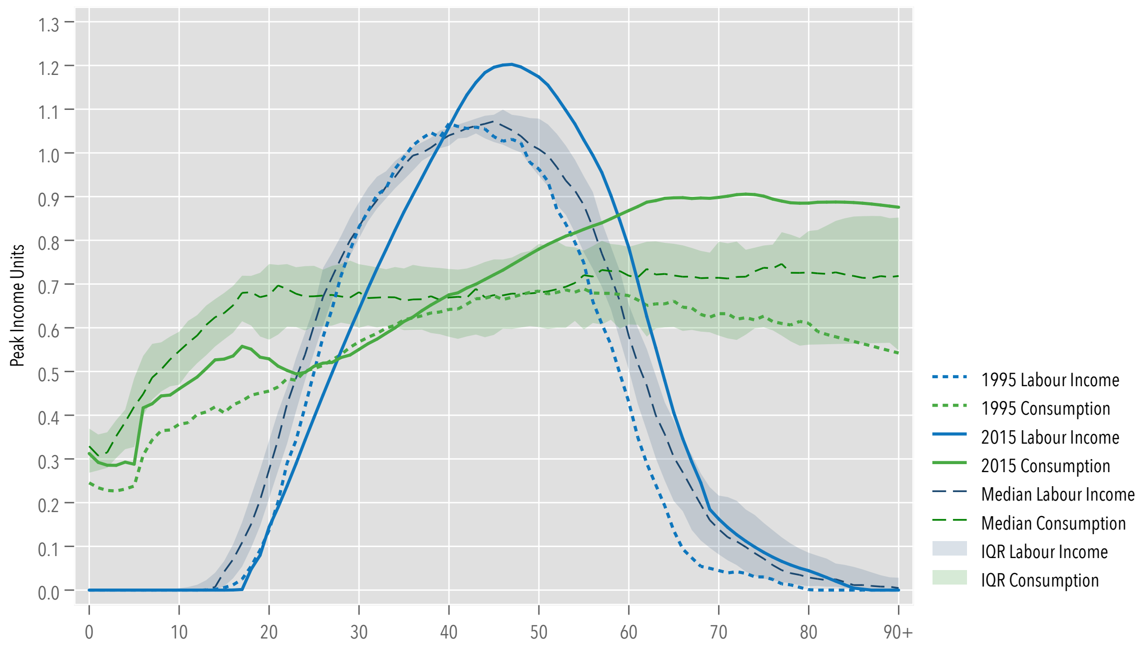


Figure 4.5. Labour Income and Consumption Profiles in an International Context

Notes: Profiles are standardised by dividing through by the average labour income for 30 to 49 year olds ('peak labour income') for each country; this average equals one peak income unit. Country profiles are from Argentina (1997); Australia (2010); Austria (2010); Botswana (2011); Brazil (2002); Cambodia (2009); Canada (2011); Chile (1997); China (2002); Colombia (2008); Costa Rica (2013); El Salvador (2010); Ethiopia (2005); Finland (2006); France (2001); Germany (2003); Ghana (2005); Hungary (2005); India (2004); Indonesia (2005); Italy (2008); Jamaica (2002); Japan (2004); Kenya (2005); Mauritius (2003); Mexico (2004); Moldova (2014); Mozambique (2008); Namibia (2012); Nigeria (2009); Peru (2007); Philippines (1999); Senegal (2011); Singapore (2013); Slovenia (2010); Spain (2000); Swaziland (2011); Sweden (2003); Taiwan (2015); Thailand (2004); Turkey (2006); United Kingdom (2012); United States of America (2011); Uruguay (2006); and Viet Nam (2008).
Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Transfer Accounts Project (2019); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c); UNESCO (2018); United Nations (2017); World Bank (2018b).

economy. In 2015, the expanded unemployment rate is estimated to have been 62.8 percent for 15 to 24 year olds and 39.4 percent for 25 to 34 year olds (own calculations, Statistics South Africa 2017b). At age 25, for example, per capita labour income was 39 percent of peak labour income in 2015, compared with 50 percent in 1995 and the median value of 61 percent.

The rightward shift over time means that at older ages per capita labour income in 2015 is relatively high as a proportion of peak labour income. Per capita labour income in 2015 is in the top quartile for cohorts aged 40 to 66 years; in 1995, in contrast, per capita labour income was below the median value for cohorts in their mid-forties onwards. For cohorts aged 70 years and above, the 2015 labour income profile is very close to the median profile.

In terms of consumption, South Africa's profile is unusual. Per capita consumption in South Africa is relatively low as a proportion of peak labour income for children, despite it having increased over the 20-year period. The 1995 profile remains below the inter-quartile range until the early thirties; the same is true of the 2015 profile except for a few years in early childhood. By around age 40, both the 1995 and 2015 profiles are close to the median profile and, while the former gradually drifts towards the lower bound of the inter-quartile range with age, the latter rises above the upper bound in the early fifties where it remains until age 90+. In stark contrast, the median consumption profile indicates more or less constant per capita consumption from age 20 onwards; this is also true of the upper and lower bounds of the interquartile range.

4.4 The First Demographic Dividend

4.4.1 South Africa's First Demographic Dividend

As was demonstrated in equation 3.7, the magnitude of the first demographic dividend is measured by the rate of change of the support ratio, defined as the ratio of effective producers to effective consumers:

$$SR(t) = \frac{L(t)}{N(t)} = \frac{\sum_{x=0}^{\omega} \gamma(x)P(x,t)}{\sum_{x=0}^{\omega} \phi(x)P(x,t)} \tag{4.1}$$

Using the NTA age profiles for labour income and consumption, and combining them with population projections by age, it is possible to calculate the support ratio and the first demographic dividend. There is one important caveat to note: since the support ratio is calculated on the basis of a single labour income and a single consumption age profile, the demographic dividends estimated here are based on the assumption that the prevailing patterns of labour income and consumption across the lifecycle remain constant over time. This means, in the context of labour income for example, that the structure of remuneration in the economy does not change systematically over time, that labour force participation rates by age do not change and that unemployment rates do not change—or, at least, that they do not change in ways that would impact on mean labour income for any given age cohort. Insofar as this is not the case, the estimates presented here will be impacted.

Figure 4.6 presents estimates of South Africa's first demographic dividend, using the five existing sets of NTA profiles for South Africa and the medium fertility variant population projections. The estimates based on the 2015 profiles are considered the baseline estimates. South Africa is currently experiencing its first demographic dividend: in 2015, for example, the effect of demographic change in South Africa is estimated to have raised consumption per effective consumer by 0.5 percent. However, while the country is experiencing the first dividend, estimated to have begun during the mid-1970s, the magnitude of the dividend has been falling since 1993. The most recent estimates suggest that the dividend will turn negative in 2041, meaning that the country has just two decades remaining before changes in the population structure begin to act as a drag on the economy.

Over the roughly six decades of positive first demographic dividend between 1977 and 2040, the country's changing population structure is projected to raise consumption per effective consumer by 29.2 percent. The dividend is thus estimated to average 0.41 percent per annum over the period. While this may not seem particularly large, it should be noted that the magnitude of the first dividend for South Africa is in line with the experiences of many other middle-income countries. For the 2005-2010 period, the average annual growth rate of the South

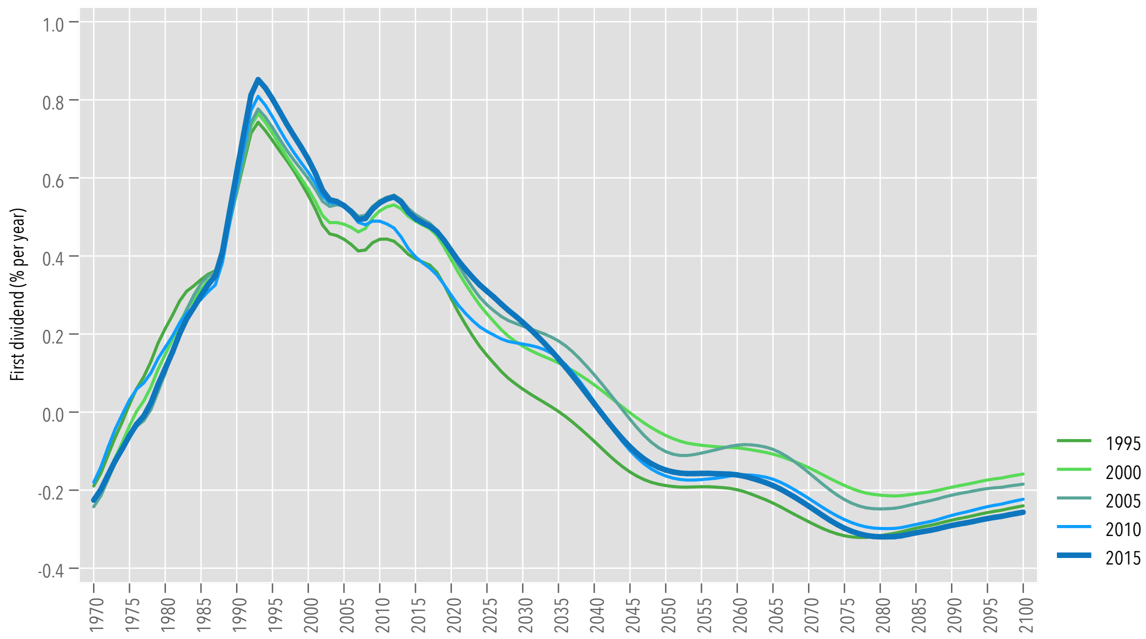


FIGURE 4.6. FIRST DEMOGRAPHIC DIVIDEND USING VARIOUS NTA ESTIMATES, 1970-2100

Notes: Estimates using the 2015 NTA profiles are the baseline estimates.
Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c); UNESCO (2018); United Nations (2017); World Bank (2018b).

African support ratio is estimated at 0.51 percent; this compares favourably to an average for the same period of under 0.4 percent for 11 upper-middle income countries calculated by Mason and Lee (2012, p.14).[1] Individual estimates for these 12 countries ranged between 0.13 percent (Thailand) and 0.59 percent (Costa Rica).

What is clear from the figure is that the differences in the labour income and consumption profiles over time illustrated in Figure 4.2 have typically had a relatively small impact on the projections of the first demographic dividend. Over the full 1970-2100 period, the five estimates have remained within 0.18 percentage points of each other, the range being widest in the 2030s as the 1995 estimate drifts away from the other four estimates. Focusing on the projected end of the first demographic dividend period, the five estimates range between 2035 as the last year of positive first dividend using the 1995 estimates, and 2044 using the 2000 and 2005 estimates. The 2010 and 2015 estimates suggest the final year will be 2040. The positive dividend is projected to have begun between 1975 and 1978. Aggregated over the full period of positive first dividend, the estimates are 23.1 percent (1995), 27.1 percent (2000), 28.8 percent (2005), 26.3 percent (2010) and 29.2 percent (2015).

The data therefore suggests that estimates of the first demographic dividend are relatively consistent across datasets. This is perhaps not entirely surprising given that the underlying population projections are identical. What it does seem to indicate is that only relatively large changes in the labour income or consumption profiles may be able to generate significant changes

[1] Mason and Lee (2012) include a previous estimate for South Africa as one of the original 12 country estimates; this estimate is omitted in the calculation of the average here.

to the estimated first dividend, which has important implications for policy aimed at boosting the magnitude or duration of the first dividend via changes to the NTA profiles.

In terms of the formulation of the support ratio (equation 5.2), there are three channels through which the first dividend may be impacted: through demography, through labour income and through consumption. These three channels are investigated in further detail below.

4.4.2 Fertility and the First Demographic Dividend

Demography is central to the demographic dividend—without demographic change, the dividend would not arise—and changes in our assumptions regarding demographic change may affect the estimated magnitude and duration of the dividend. These effects are important in terms of informing possible policy interventions that may affect fertility.

In addition to the medium fertility variant, Figure 4.7 presents estimates based on four other variants: the low and high fertility variants, the constant fertility variant, and the no change variant. Each of the variants makes particular assumptions regarding fertility, mortality and migration (United Nations, Department of Economic and Social Affairs, Population Division 2017, p.31). As already noted, the low and high fertility variants differ from the medium fertility variant only in that the fertility rate is 0.5 births per woman lower and higher respectively than the medium fertility variant. All three variants assume normal mortality and migration. The constant fertility variant assumes the fertility remains constant at the 2010-2015 levels, while mortality and migration are assumed to be normal. The no change variant assumes constant fertility and mortality as of 2010-2015 and normal migration.

The first observation to make is that none of the fertility assumptions presented here do not see the magnitude of the first demographic dividend decline over the coming decades. In fact, the high fertility, constant fertility and no change variants see the first demographic dividend fall rapidly from 0.5 percent in 2015 to below zero by the mid-2030s; this is roughly a decade sooner than is the case under the medium fertility projections. These three variants see a slight recovery in the demographic dividend by the early-2060s, but none see a recovery of the dividend above zero that is significant in either magnitude or duration. Although the dividend in 2065 is in each case above that of the medium fertility projection, for the 2015-2065 period as a whole the cumulative dividends are somewhat smaller. Indeed, in the case of the constant fertility and no change variants, the cumulative first dividend over that period is negative, while in the case of the high fertility variant it is essentially zero.

The low fertility variant sees the first dividend remain around its 2015 level until around 2030, after which it drops sharply. It turns negative in 2045, four years after the medium fertility projection in 2041. The effect is that by 2041, the cumulative dividend under the low fertility assumption is almost twice that under the medium fertility assumption (13.2 percent compared to 7.3 percent). However, the dividend continues to fall rapidly under the low fertility assumption and dips below -0.6 percent during the 2070s, and by the mid-2070s the low fertility cumulative dividend falls below the medium fertility dividend.

Lower fertility, therefore, extends the period of positive first demographic dividend and, during this period, increases the magnitude of the dividend in each year. However, the low fertility projections are associated with a more strongly negative first dividend from the 2050s

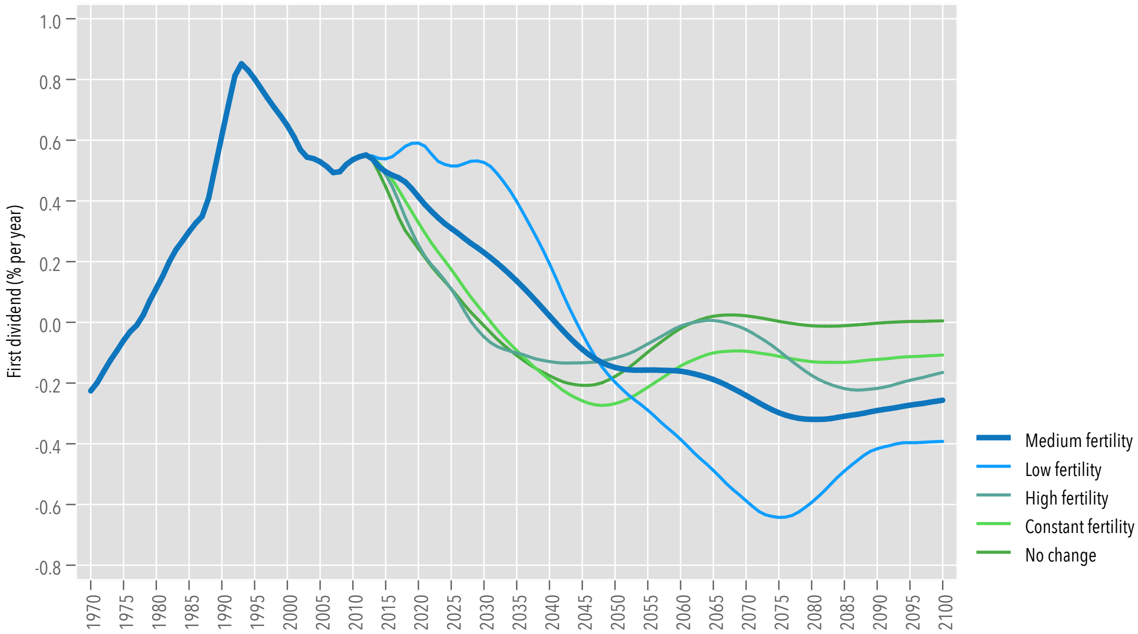


Figure 4.7. First Demographic Dividend using Different Fertility Assumptions, 1970-2100

Notes: The first demographic dividend is estimated based on the 2015 labour income and consumption profiles for South Africa. The constant fertility variant differs from the low, medium and high fertility variants only in that fertility is assumed to be constant as of 2010-2015. The no change variant assumes both constant fertility and constant mortality as of 2010-2015. All five of these variants assume normal migration. The medium fertility estimates are the baseline estimates.

Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c); UNESCO (2018); United Nations (2017); World Bank (2018b).

onwards, which remains significantly lower than the estimated dividends for the other variants by the end of the 21st century. This is true of the low fertility projection relative to the medium fertility projection, but it is also true of the medium fertility projection when compared to the high fertility projection.

4.4.3 Labour Income, Consumption and the First Demographic Dividend

The labour income and consumption profiles are the other two important inputs in the calculation of the first demographic dividend. As was demonstrated in Figure 4.6, changing the shape of these profiles without changing the population projections can impact the estimated first dividend. Further, since the estimated dividends assume constant labour income and consumption profiles over time, it may be possible to impact the dividend by allowing the profiles to change over time.

Before doing so, a few points are worth noting. First, the particular shapes of the labour income and consumption profiles are the result of the combination of numerous factors. For example, differences in mean per capita labour income over the lifecycle are the result of the combination of variations in labour force participation rates, unemployment rates, educational attainment, occupational and industrial distribution of employment, wage rates, and hours of work, amongst other factors. A change in the labour income profile may therefore be the outcome of any number of these factors. Second, although labour income and consumption are related to each other and form the lefthand side of the NTA flow identity (equation 3.2), they are balanced in the identity by transfers and asset-based reallocations. Since the focus in terms of the first dividend is only on labour income and consumption, it is assumed that transfers and/or asset-based reallocations adjust to ensure the identity holds.

The results of three simulations are presented in Figure 4.8. Two of these simulations relate to the labour income profile, while the third relates to the consumption profile. The labour income simulations assume convergence between the South African labour income profile and that of the median NTA country, presented in Figure 4.5 over a 20-year period beginning in 2020. The whole labour market simulation assumes that this convergence takes place for all cohorts, while the youth labour market simulation confines this convergence to cohorts under the age of 35 years. It is further assumed that convergence takes place at a constant rate over the convergence period (i.e. the rate of change of mean labour income at each age is constant). The consumption simulation assumes a 50 percent convergence between the South African and median NTA country consumption profiles for all cohorts. In all other respects, the simulation makes the same assumptions as the labour income simulations.

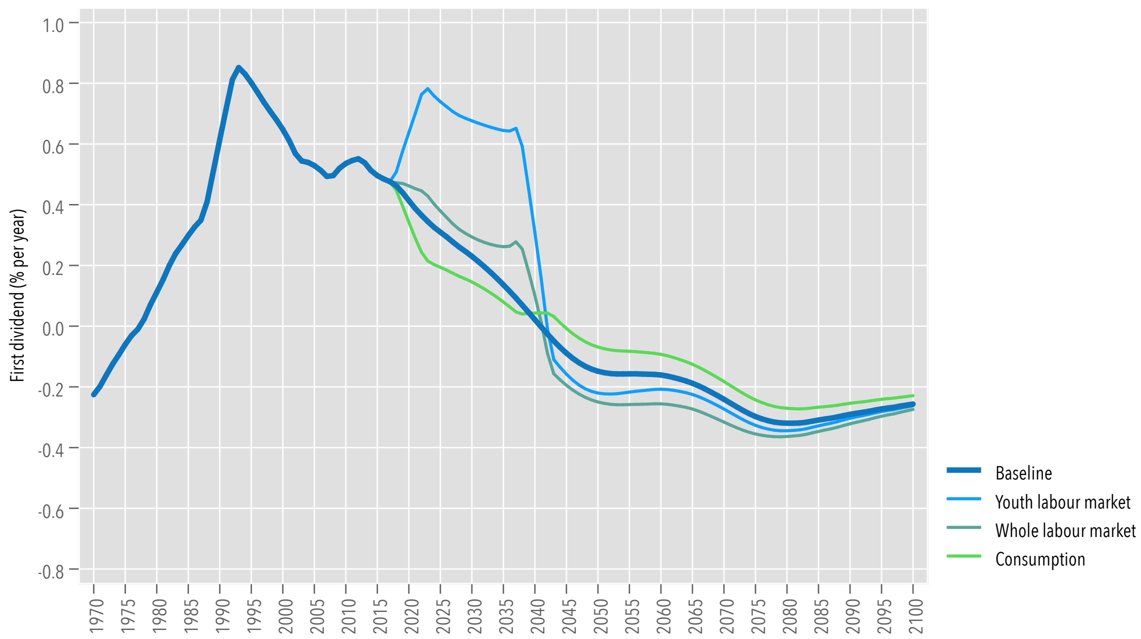


Figure 4.8. Simulated First Demographic Dividend assuming Changes in Labour Income, 1970-2100

Notes: The baseline dividend is estimated based on the 2015 labour income and consumption profiles for South Africa. The youth labour market simulation assumes convergence between the South African and median profiles for cohorts under the age of 35, while the whole labour market simulation assumes convergence for all cohorts. The consumption simulation assumes convergence by 50 percent between the South African and median consumption profiles for all cohorts. Convergence begins in 2020 and is complete by 2040, and is calculated assuming a constant growth rate of per capita labour income/consumption at each age over the convergence period.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c); United Nations (2017); World Bank (2018b).

Both labour market simulations suggest that convergence between the South African and median NTA country labour income profiles would be beneficial in terms of increasing the magnitude of the first demographic dividend in a given year during the period of convergence. Inspection of the South African and median NTA country labour income profiles reveals that convergence implies large increases in per capita labour income amongst cohorts under the age of 40, and decreases amongst cohorts over the age of 40. It is therefore not surprising that convergence across all cohorts yields only a small boost to the dividend. Instead, where convergence is limited to younger cohorts, the first dividend is substantially increased, almost doubling to almost 0.8 percent by 2023, and remaining above 0.6 percent until the late 2030s. Once the convergence process is over, however, the dividend falls rapidly: by 2043, both simulated dividends have fallen below the baseline dividend and into negative territory.

The consumption simulation yields a marginally reduced first dividend in terms of magnitude, while the duration is slightly increased. Once it turns negative, however, it remains above the baseline estimate for the remainder of the century. This is an interesting result given the significant changes in the consumption profile implied by convergence, and is a function of the stage in the demographic transition in which South Africa currently finds itself. A simulation of convergence beginning a couple of decades earlier, when a larger proportion of the population was located in cohorts experiencing rising consumption, would yield a lower first dividend; conversely, convergence that begins a couple decades later, when a larger proportion of the population would see falling per capita consumption, would yield a higher dividend.

The NTA framework is not prescriptive in terms of policies to achieve these shifts in the labour income and consumption profiles. On the consumption side, boosting the first dividend would require the South African consumption profile to move even further from the median profile by lowering consumption amongst cohorts under 40. Alternatively, consumption amongst older cohorts would need to be reduced, moving the consumption profile closer to the median profile. However, it is not clear that governments in democratic societies possess the policy levers to affect a shift in consumption of the order envisaged in the consumption simulation; nor does it seem worth the effort that would be required, given the magnitude of the required change in consumption. On the labour income side, however, any policy that raises per capita labour income amongst the youth would boost the first dividend.

To what degree is it realistic to impose a particular labour income or consumption profile on the data for South Africa? In some sense, this is a simulation of a very different reality. It seems improbable that a different labour income profile, for example, would be consistent with the estimated consumption profile, given the structure of transfers and asset-based reallocations. However, the simulations are only concerned with the lefthand side of the NTA flow identity, meaning that it is possible to assume that the righthand side of the identity adjusts in response to the changed profiles. As long as the aggregate labour income and consumption flows are unaffected, the new labour income profile is consistent with the original consumption profile, or vice versa. Nevertheless, this could potentially entail significantly different flows to finance the lifecycle deficit than is estimated using the actual country data; flows that may not be feasible given individual and societal preferences, local customs and norms, and institutional arrangements. What is important to note is that these simulations do not take into account potential impacts on household formation. Even though the various profiles are constructed on the basis of household survey information, they are abstracted from the household data and the effects on household formation are not possible to predict within this framework.

4.5 The Second Demographic Dividend

4.5.1 South Africa's Second Demographic Dividend

The first demographic dividend arises as the population in the most productive ages grows relative to the total population. The second dividend, however, is linked to older populations as the increased stock of savings that accumulates as large cohorts approach retirement age. The derivation of the second demographic dividend in such a way that it can be estimated using NTA profiles is detailed in Section 3.2. In order to estimate the second dividend, there are three key parameters that require specification, namely productivity growth (ρ), the discount rate (r), and capital's share of total income (β). Here, I follow Mason *et al.* (2017), who estimated the second dividend for 60 NTA countries and modelled results for a further 106 countries: productivity growth is assumed to be 1.5 percent per annum, the discount rate is set at 3.0 percent, and capital's share of total income is assumed to be $\frac{1}{3}$. In order to get full estimates over this century, the 2100 population is assumed to be static beyond that year. The 2015 NTA profiles are used.

Two key variables are of particular interest, namely the lifetime support ratio for the population aged 45 years and above ($LSR45$) and the ratio of pension wealth to labour income ($W45$). These are presented along with estimates of the second demographic dividend in Figure 4.9.

The longitudinal support ratio for the population aged 45 years and above is estimated at 0.51 in 2015. This means that, for older adults, every 100 years of effective consumption was financed through 51 years of effective labour, with the balance needing to be financed through transfers and asset-based reallocations. This ratio has gradually drifted lower over time since 1970 and is projected to fall below 0.50 in 2024 and below 0.40 by 2066. The implication is that, over time, older adults will increasingly come to rely on net transfers from younger cohorts either indirectly through the state or directly through private transfers, as the importance of labour income declines.

The result is increasing demand for pension wealth over time, which is clearly illustrated in the figure. In 1970, pension wealth was equivalent to 47 percent of labour income and, by 2015, had more than doubled to 96 percent. This rise is projected to continue, reachings 1.3 times labour income in the early 2030s. Over the following half century, demand for pension wealth generally increases more rapidly and, as a proportion of labour income, reaches 2.0 by 2047, 3.0 by 2067 and 4.0 by 2089. In response to rising demand for pension wealth, individuals accumulate assets, a process that underpins the second demographic dividend. The second dividend is projected to remain above 0.8 percentage points for almost seven decades beginning in 2001 and ending in 2071, with a five-year interruption during the mid-2020s. At its peak between 2036 and 2046, the second dividend is estimated to contribute between 1.5 and 1.7 percentage points per annum to growth, an effect that is in addition to the assumed rate of productivity growth of 1.5 percent per annum. Importantly, the second demographic dividend

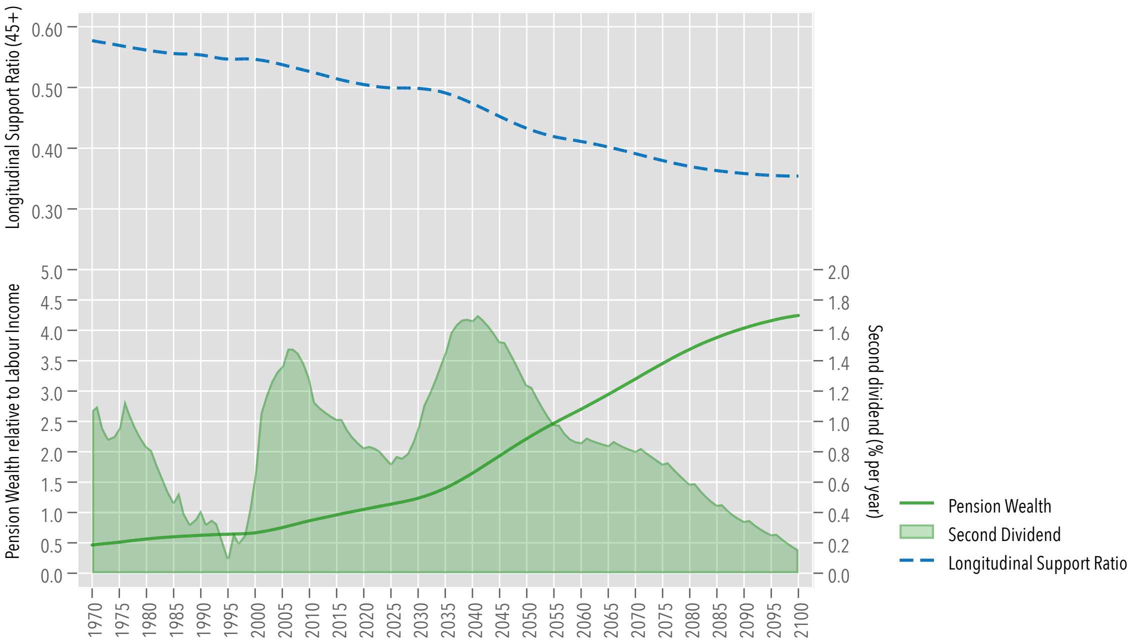


Figure 4.9. Second Demographic Dividend, 1990-2100

Notes: Estimates based on 2015 NTA profiles. Estimates assume medium fertility projections, productivity growth (ρ) of 1.5 percent, a discount rate (r) of 3.0 percent, and static population post-2100.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c); United Nations (2017); World Bank (2018b).

is consistently positive throughout the period.

In general, the projected second demographic dividend is relatively robust to the different sets of NTA estimates for South Africa. As illustrated in Figure B.3 in Appendix B, projections of the dividend follow the same trends over time irrespective of the estimates used, with a peak in the early 2000s and a later and higher peak centred around 2040. The projected dividend based on the 1995, 2005 and 2010 NTA estimates are all very similar, with those based on the 2000 and 2015 estimates providing slightly higher dividends, particularly at the two peaks. Further, as is the case with the first demographic dividend, lower fertility is associated with a larger second demographic dividend. By 2100 when the baseline second dividend is under 0.2 percentage points, it is still above 0.6 percentage points under the low fertility assumption. In contrast, the high fertility second dividend is lower than the baseline dividend from the late 2030s onwards and actually turns negative by the final decade of the 21^{st} century.

The total demographic dividend, which is comprised of the first and second dividends, is presented in Figure 4.10. What is immediately clear from the figure is that the second demographic dividend is generally larger than the first dividend in a given five-year period. Indeed, it is only during the latter half of the 1980s and the 1990s where the first dividend was larger than the second demographic dividend. The result is that the period during which the changing structure of the population impacts favourably on incomes and living standards is extended significantly. While the first demographic dividend turns negative in the early 2040s, the total dividend remains positive into the final decade of the 21^{st} century.

Table 4.2 presents estimates of the first and second demographic dividends over a number

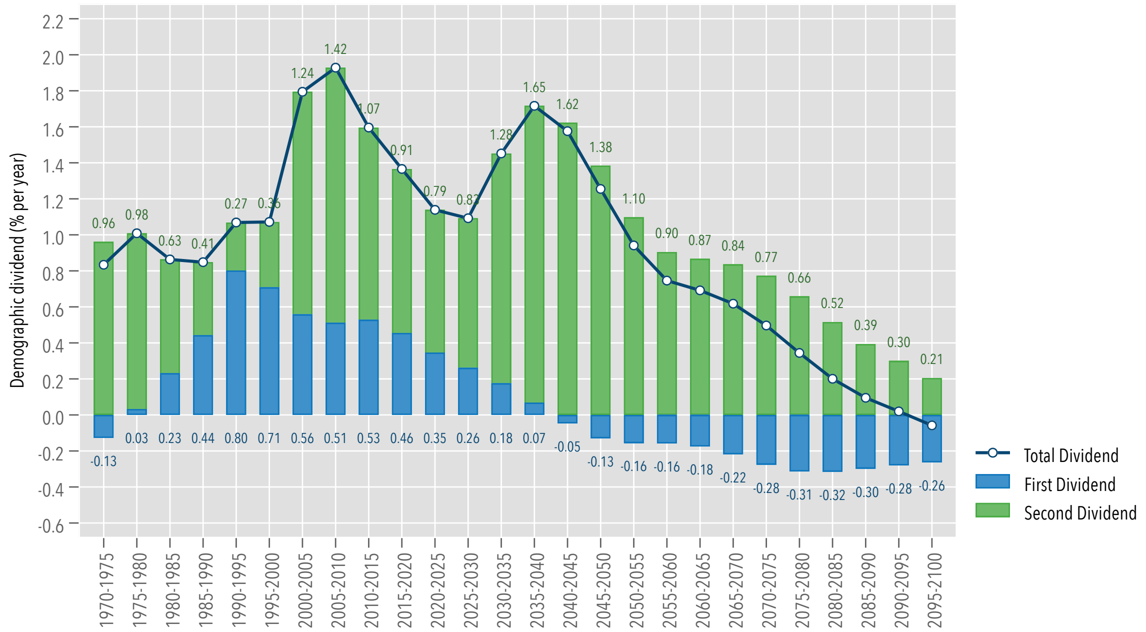


Figure 4.10. South Africa's Total Demographic Dividend, 1970-2100

Notes: Estimates based on 2015 NTA profiles. Estimates assume medium fertility projections, productivity growth (ρ) of 1.5 percent, a discount rate (r) of 3.0 percent, and static population post-2100.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c); United Nations (2017); World Bank (2018b).

of time periods between 1975 and 2100 for six different projections introduced earlier. All dividends are estimated using the 2015 NTA profiles. Estimates are presented over four time periods roughly corresponding to: the period since the start of the positive first dividend, 1975-2020; the future period of positive first dividend, 2020-2040 (a period that corresponds to that of the labour income and consumption simulations); the period covering the rest of the century, 2040-2100; and the full future period, 2020-2100.

The estimates of the first dividend reveal the strong positive influence of lower fertility during the 2020-2040 period, followed by a larger negative dividend in the 2040-2100 period, when compared with the baseline estimate. Under the assumption of high fertility, the first dividend is zero over the 2020-2040 period and, while still negative, is smaller than baseline during the final 60 years of the century. This comparison is overly favourable for the high fertility estimates, however; the second dividend is substantially smaller than baseline under the assumption of high fertility and by a much larger margin than its advantage in terms of the first dividend.

The labour income and consumption simulations yield interesting results. The estimates of the first dividend are as described above. convergence to the median labour income profile for youth cohorts has the most positive impact on the first dividend during the 2020-2040 period, while convergence to the median consumption profile has the least favourable impact over this period. Over the full future period, the youth labour income simulation yields the strongest outcome in terms of the first dividend across all six projections (-1.3 percent total growth, compared with -8.3 percent for the baseline), followed by the consumption convergence simulation

Table 4.2. Magnitude of the Demographic Dividends, 1975-2100

	Average Annual Growth Rate (%)				**Total Growth (%)**			
	1975-2020	2020-2040	2040-2100	2020-2100	1975-2020	2020-2040	2040-2100	2020-2100
First Dividend								
Baseline	0.47	0.22	-0.22	-0.11	23.4	4.5	-12.3	-8.3
Low fertility	0.48	0.46	-0.39	-0.18	24.0	9.6	-20.9	-13.3
High fertility	0.46	0.00	-0.12	-0.09	22.8	0.0	-6.8	-6.9
Youth labour income	0.47	0.70	-0.26	-0.02	23.4	15.0	-14.2	-1.3
All labour income	0.47	0.33	-0.29	-0.13	23.4	6.9	-15.8	-10.0
Consumption	0.47	0.14	-0.16	-0.09	23.4	2.8	-9.2	-6.7
Second Dividend								
Baseline	0.81	1.14	0.80	0.88	43.6	25.4	60.9	101.7
Low fertility	0.78	1.17	1.15	1.15	42.0	26.1	98.5	150.2
High fertility	0.78	1.14	0.54	0.69	42.0	25.5	37.8	73.0
Youth labour income	0.81	0.63	0.86	0.80	43.6	13.3	67.5	89.9
All labour income	1.06	1.52	0.67	0.88	60.4	35.3	49.1	101.7
Consumption	0.54	0.90	0.92	0.91	27.2	19.5	72.9	106.7

Notes: Estimates based on 2015 NTA profiles. Second dividend estimates assume productivity growth (ρ) of 1.5 percent, a discount rate (r) of 3.0 percent, and static population post-2100.

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c); United Nations (2017); World Bank (2018b).

(-6.7 percent total growth). However, in terms of the second dividend, the consumption convergence simulation is the only one of the three simulations to outperform the baseline projection (106.7 percent total growth over the 2020-2100 period, compared with 101.7 percent for the baseline), while the youth labour income simulation yields a weaker second dividend than the baseline (89.9 percent total growth, which is better than only the high fertility projection). The difference between the two labour income simulations is in the timing of the gains: the second dividend for the youth simulation is shifted further into the future compared with the baseline and overall labour income simulation, given that the changed per capita labour income only impacts the young. As a result, the time horizon is likely too short and extending it further into the future may change the rankings.

4.5.2 Savings and the Second Demographic Dividend

The first demographic dividend arises almost mechanically as the support ratio rises while the boom generations born during the initial stages of the demographic transition enter the working-age population and come to dominate the overall population structure. However, once a new steady state is achieved at low fertility and low mortality, the boost to per capita incomes provided by the first dividend dissipates and it is quite possible that per capita incomes may return to pre-transition levels. While the first demographic dividend is a transitory phenomenon, the second dividend has the potential to permanently raise incomes and consumption (Mason and Lee 2007, p.128). This occurs through the accumulation of capital—financial and physical on the one hand, and human on the other—driven by the fact that "a longer horizon for the individual makes investing in education more worthwhile and makes saving for retirement essential" (Bloom and Canning 1999, p.1). This section will focus on savings, while the following section will discuss human capital accumulation.

Bloom *et al.* (2003, p.39) identify savings as one of the mechanisms through which the demographic dividend arises, although they do not differentiate between the two dividends. As populations age and the support ratio begins to decline, asset accumulation represents the only way through which elderly cohorts are able to maintain their levels of consumption without compromising the consumption of younger generations. The alternative is to rely on future generations to transfer resources to the elderly in order to support their consumption, either through the familial transfer system or through public systems such as unfunded pension schemes or, using a South African example, the non-contributory state old age grant. The process of generating a claim against future generations is referred to as transfer wealth accumulation (Mason and Lee 2006, p.14), which is matched by transfer debt held by future generations.

While both allow the elderly to maintain consumption levels, these two processes are substantively different in terms of their implications for the second dividend. Accumulating assets requires saving during the working ages and, as a result, consumption is lowered during these ages. These accumulated financial assets, under appropriate institutional arrangements, can be used in two ways: they may either be invested in the domestic economy, leading to capital deepening and an increase in productivity, or they can be used to accumulate foreign assets, giving rise to asset income flows from the rest of the world, but not impacting on productivity domestically. Accumulating transfer wealth, on the other hand, requires no immediate sacrifice of consumption, but may compromise the future consumption of all generations if the burden on the working population becomes too large. Critically, though, without any savings, no assets are accumulated and no second dividend is realised.

A country's chances of enjoying the second dividend are, therefore, linked to the institutional context that governs the support of the elderly. Countries that rely more on transfers—public or private—to finance the consumption of the elderly will find themselves in a weaker position to benefit from a second demographic dividend than those that rely more on assets. This distinction is possible to make using NTA estimates, relying on the righthand side of the NTA flow identity.

In South Africa, post-retirement cohorts are heavily reliant on asset-based reallocations to fund the lifecycle deficit (Table 4.3). For the population aged 65 years and older, asset-based reallocations (including asset income and asset disposals) more than full fund the deficit, with the rest—equivalent to 21.1 percent of the aggregate lifecycle deficit for this age group being transferred to younger cohorts. This result, although contrary to the common view of the elderly as dependent on their children for support, is not inconsistent with evidence and general perceptions around flows between generations. Klasen and Woolard (2009), for example, provide evidence that amongst poorer communities households often form around recipients of the old age grant in response to high unemployment, particularly amongst youth. At the upper end of the distribution, which has a large weight in the calculation of these proportions, there is a general view that there are often significant transfers taking place between older cohorts and their adult children. Reliance on asset-based reallocations is observed for both younger and older cohorts within the post-retirement population. For the population aged 65-74 years, asset-based reallocations account for an even larger share of the lifecycle deficit (135.1 percent), compared to 97.8 percent amongst the population aged 75 years and above.

Table 4.3. Financing the Lifecycle Deficit, 2015

	65+ years	65-74 years	75+ years
Financing of the age group's aggregate lifecycle deficit (percent share)			
Age reallocations	78.9	64.9	102.2
Transfers	-21.1	-35.1	2.2
Public transfers	-11.9	-15.6	-5.7
Private transfers	-9.3	-19.5	7.9
Asset-based reallocations	121.1	135.1	97.8
Share of the population (percent)			
2015	5.1	3.5	1.6
2035	7.8	5.0	2.8
2065	14.8	8.6	6.3

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c); United Nations (2017); World Bank (2018b).

Transfers to younger cohorts are almost evenly split between public transfers and private transfers, respectively equivalent to 11.9 percent and 9.3 percent of the lifecycle deficit amongst the population aged 65 and above. Amongst those aged 65 to 74 years, private transfers are somewhat larger than public transfers and both flow downward to younger cohorts. In contrast, though, while public transfers continue to flow downwards for those aged 75 years and above, private transfers are positive (i.e. private transfers flow upwards from younger cohorts).

This relatively favourable pattern of support for the consumption of the elderly is important, given the rapid growth in the elderly population that is expected over the half-century to 2065. Under the medium fertility assumptions, the population aged 65 years and older is expected to almost triple as a proportion of the total population from 5.1 percent to 14.8 percent. Growth amongst the oldest cohorts is expected to be even more rapid, with those aged 75 years and older almost quadrupling as a proportion of the population between 2015 and 2065. These growth rates are important because, apart from behavioural changes that raise aggregate savings (increased life expectancy stimulates higher saving to finance more years of retirement), there is also the compositional effect of a growing proportion of the population falling within the ages with the greatest savings levels (i.e. those near or just past retirement). Hence, as was shown in Figure 4.9, demand for lifecycle wealth in South Africa is expected to grow relatively quickly over this period, particularly once greater longevity and the need to make provision for longer periods of retirement is internalised by working age cohorts.

From the perspective of a strong reliance on assets to fund the consumption of the elderly, South Africa seems well placed to enjoy the second dividend. The country possesses a sophisticated and highly regarded financial system—South Africa is currently ranked 18^{th} globally in terms of the depth and stability of its financial system (World Economic Forum 2018)—that should be able to facilitate and encourage saving and efficient allocation of capital. Further, the current move towards the introduction of mandated retirement savings for the employed is likely, over time, to strengthen the reliance of the elderly on accumulated assets, by both encouraging asset accumulation and preserving accumulated assets as workers change jobs. An added benefit may also be a reduced reliance by the elderly on the social grant system. However, the ability of the population to accumulate assets in preparation for retirement is entirely dependent on the functioning of the labour market.

The South African labour market, though, remains distorted by the effects of apartheid. Inequalities in the provision of education by race group—in terms of both quality and quantity—has resulted in a skewed distribution of skills in favour of Whites in particular. At the same time, the economy's growth path for the past four decades at least has been capital- and skills-intensive, depressing the demand for less-skilled workers while maintaining shortages in high-skilled occupations (Bhorat and Hodge 1999; Rodrik 2008). This mismatch between labour supply and demand is most starkly illustrated in unemployment rates by educational attainment: in the fourth quarter 2018, the expanded unemployment rate for those with an incomplete secondary education is more than five times that of those with university degrees (45.5 percent compared with 8.6 percent) (own calculations, Statistics South Africa 2019b).

The skills mismatch exists alongside significant youth and long-term unemployment, with these high rates of unemployment amongst younger cohorts explaining the late rise in labour income in South Africa and the late transition to surplus. An extended period of economic dependence among young people is an immediate concern in terms to the additional burden placed on older cohorts, directly as the source of private transfers and indirectly as an ultimate source of public transfers. It also represents the longer-term concern through the 'wage scar' (lower wages post-unemployment) or 'employment scar' (lowered probability of finding work post-unemployment) that youth unemployment may cause (Gregg and Tominey 2004; Cockx and Picchio 2013; Petreski *et al.* 2017). Youth unemployment, therefore, negatively impacts future earnings potential, constraining the ability of prime working cohorts to generate sufficient surpluses now and in the future, and limiting the scope for saving and making transfers to other cohorts.

4.5.3 Human Capital and the Second Demographic Dividend

Human capital accumulation is the second channel through which the demographic dividend may arise. The extent of country's investment in its younger generations is often judged by measures such as the proportion of GDP allocated to education or health. However, these measures are affected by countries' population age structures, making accurate cross-country comparisons difficult. For example, in 2017, total government spending on education in South Africa was equivalent to 6.1 percent of GDP (World Bank 2018b). This places it among the top 30 countries for which there is recent (2014-2017) data, just ahead of countries such as the United Kingdom (5.5 percent in 2016) and Honduras (6.0 percent in 2017), and just behind countries like Senegal (6.2 percent in 2017) and Brazil (6.2 percent in 2015). However, each country has a different population age structure, making these figures almost meaningless on their own when trying to assess the level of resources allocated per child.

The mechanism through which human capital accumulation may give rise to a second demographic dividend is through the trade-off between the quantity and quality of children within a budget constraint (Becker and Lewis 1973; Willis 1973; Becker and Barro 1988). As fertility declines, parents are able to devote greater resources to the human capital accumulation of their children. This relationship is confirmed by Lee and Mason (2010) using synthetic cohort estimates of human capital spending—public and private spending on education from age 0 to age 26, and public and private spending on health from age 0 to age 17—relative to peak labour income derived from NTA data for 19 countries. They find a significant negative relationship between human capital spending and fertility and an elasticity of -1, implying a trade-off between the number of children and spending on human capital that keeps total spending roughly constant (Lee and Mason 2010, p.167).

Updated estimates expanding the number of countries to 46 and adjusting the age range over which education spending is aggregated to three to 26 years reconfirm a significant negative relationship between the total fertility rate and human capital spending, indicated by the dashed line in Figure 4.11. The figure shows countries in Europe and North America clustered at lower fertility rates, Asian and Latin American and Caribbean countries generally located at low, but above replacement, fertility, and African countries spanning a range from below replacement fertility (Mauritius) to fertility rates above five births per woman. Spending on human capital accumulation in South Africa is consistent with the cross-country pattern, given its level of fertility. This is true cross-sectionally, using only one of the estimates available for South Africa, but it is also when considering the trend for South Africa over time as fertility has fallen. South African lifetime human capital spending per child in 2015 is estimated to be equivalent to 317 percent of peak labour income, with its total fertility rate of 2.55 births per woman. In 1995, spending per child was equivalent to 203 percent of peak labour income while the total fertility rate was 3.34 births per woman. The level of spending in 2015 in South Africa is broadly on par with spending in countries with similar fertility levels in Latin America and the Caribbean, but is somewhat higher than spending in Asian countries at the same level of fertility.

The data therefore indicates that South Africa is investing in human capital at a level that is in line with international experience—at least as far as the group of NTA countries is concerned—suggesting that this prerequisite for reaping the second demographic dividend is being met. Despite this, the evidence suggests that this investment may fail to unlock the second dividend. The chief reason for this is the persistence of deep inequalities in the quality of service provision in the areas of education and health during the post-apartheid period. Social services were characterised by a fractured delivery system under apartheid, with separate government departments overseeing education and health services depending on race and location. Thus, for example, by the early 1990s, there were 19 departments responsible for education in South Africa (Jansen and Taylor 2003, p.9). Combined with racially differentiated fiscal allocations to education and health (Van der Berg 2001), this resulted in wide disparities in the quality of these services that have persisted into the post-apartheid era (Van der Berg 2007). This persistence is at least partly related to the widely varying initial conditions faced by the new provincial departments, with some provinces particularly burdened by the incorporation of dysfunctional departments inherited from the previous political system, while at the same time often having to provide services to some of the country's poorest, most deprived and least urbanised areas.

In terms of education, the result is the existence of a bimodal distribution of schools in terms of performance (see, for example, Van der Berg 2007; Spaull 2012). Spaull (2012, p.4) notes that this bimodality "can be seen as early as Grade 3 . . . and remains unabated until the national school leaving exam", and is visible when dividing schools by wealth quartiles, school language and apartheid-era education department. Van der Berg *et al.* (2007, p.859) estimate that, while Africans accounted for 83 percent of the Grade 12 cohort in 2003, they accounted

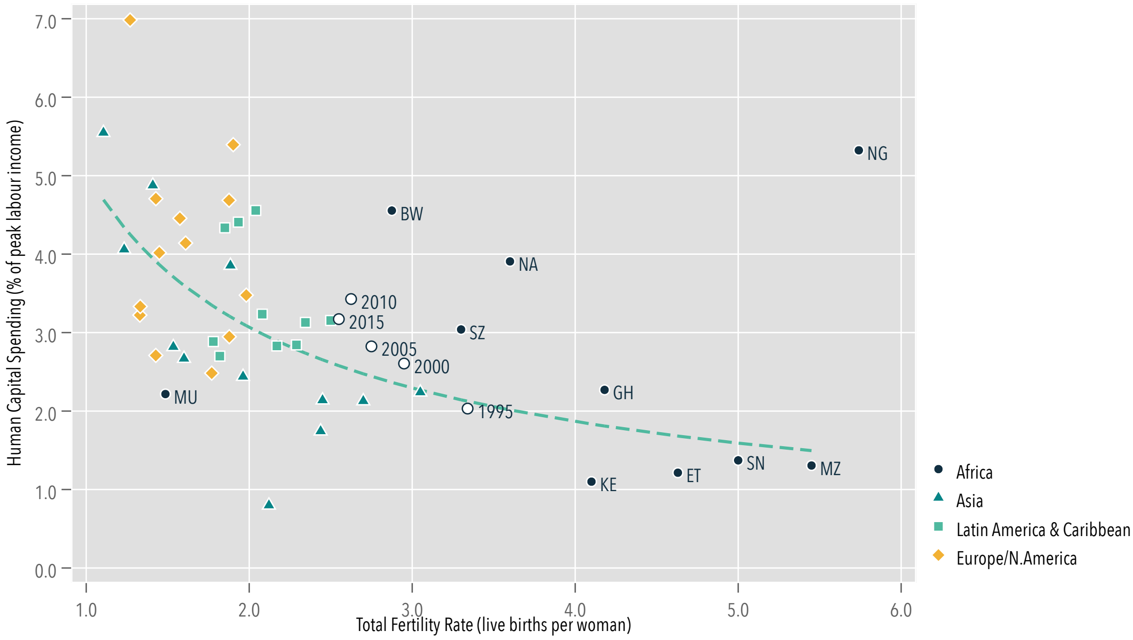


Figure 4.11. Lifetime Human Capital Spending and Fertility

Notes: Lifetime human capital spending is the sum of all per capita spending (both public and private) on education between the ages of three and 26 years and all per capita spending on health between the ages of zero and 17 years, using synthetic cohorts. All values are expressed as proportions of peak labour income. Where countries have estimates for multiple years, only the most recent estimate is used. The curve represents the predicted relationship between TFR and human capital spending based on a log-log regression on the sample of countries, excluding Nigeria (the high TFR, high human capital spending outlier). African countries are labelled with their official country alpha-codes, while the five South African estimates are labelled with the year of the estimate.

Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Transfer Accounts Project (2019); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c); UNESCO (2018); United Nations (2017); World Bank (2018b).

for only 71 percent of passes, 22 percent of higher grade mathematics passes (i.e. with a 50 percent mark or better), and just eight percent of passes with an A-aggregate mark (average over all subjects of at least 80 percent). Such inequalities in education reproduce inequality in the labour market and raising quality in former black schools, in particular, must be an urgent policy priority.

Not only are a large number of schools unable to achieve satisfactory results relative to the national curriculum, South African schools also perform poorly when compared internationally: "South African schools generally perform at an even lower level than most of their African counterparts, despite greater South African resources, less acute poverty and more educated parents (Van der Berg 2007, p.854). Mlachila and Moeletsi (2019, p.13)highlight the fact that since it began participating in TIMSS (Trends in International Mathematics and Science Study) and PIRLS (Progress in International Reading Literacy Study) in 1995 and 2006 respectively, the country has remained amongst the worst performers globally in terms of quality of primary education. Even within the region, South Africa performs poorly as results of the Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) tests show: in

2013, South Africa ranked seventh and sixth amongst 13 countries in the region in terms of reading and mathematics (Mlachila and Moeletsi 2019, p.14). Again, this demonstrates some of the inequalities within the system, but also points to systemic failures within education that do not bode well in an era of globalisation, international trade and competition for foreign direct investment.

The process of equalisation of spending across race groups—or, rather, the delinking of per capita fiscal allocations from race—has been accompanied by perceptions of falling quality in the public health and education systems. Those who can afford to move to private sector provision of healthcare, in particular, have tended to do so. In education, while this trend exists, it has been dampened by provisions that allow schools, through school fees and fund-raising, to finance the hiring of additional teachers, for example. The private healthcare system is well resourced, but covers only a fraction of the country's population. It is estimated that 16.8 percent of South Africans were covered by medical aid in 2017 (own calculations, Statistics South Africa 2018a). Blecher *et al.* (2011, p.32) report a similar coverage rate in 2010, but note that at the time almost 30 percent of South Africans reported using private healthcare services at the time of their last visit. However, higher per capita spending in the private sector means that just over half of total health spending was accounted for by private financing in 2015 (Day *et al.* 2018, p.229). Thus, while South Africa's spending on human capital accumulation is in line with expectations given its fertility rate, inequalities in outcomes are pervasive and undermine the country's ability to harness the second dividend.

4.6 Discussion and Conclusion

On the basis of South Africa's NTA estimates, the evidence suggests that the country has already passed through a significant proportion of its first demographic dividend. Demographic change is estimated to have contributed positively to per capita income growth since 1978 and this is expected to continue until at least 2040 under the assumption of medium or low fertility. For much of the period, however, the South African policy context was largely hostile to the demographic dividends: large sections of the population were denied access to quality education and health services, and were actively excluded from employment opportunities in line with apartheid's race-based policies. Further, apartheid's spatial policies forced large proportions of the African working-age population into remote rural areas that lacked the economic basis to provide sufficient employment. While these policies were abandoned by the time of the democratic transition, their effects continue to be felt.

The demographic dividends represent potential benefits that may accrue to societies undergoing changes in the age structure of their populations, rather than automatic windfalls. With barely two decades in which South Africa can still potentially experience a positive first demographic dividend, has the opportunity been lost? More importantly, given its much larger magnitude, has South Africa squandered its chance to benefit from the second demographic dividend? The need for appropriate policy interventions is clear: "[the] benefits of the 'demographic dividend' require that desired changes in labor supply, savings, and educational attainment actually come about in practice" (Bloom and Canning 1999, p.33). This point is reiterated by

Mason and Lee (2006, p.15), who note that both the first and second demographic dividends "depend on effective complementary economic policy".

Is a policy environment conducive to the realisation of the demographic dividend in place in South Africa? It would seem the answer is not yet. The weakness in the labour market and continued problems in the provision of quality education to the broader population highlighted above point to the fact that South Africa will be hard pressed to harness the dividend as current inequalities are reproduced in younger generations. Moreover, the economy continues to grow in such a way as to suppress demand for South Africa's abundant supply of relatively low-skilled labour, while skills shortages persist, with negative consequences for wage inequality (Bhorat *et al.* 2014).

Inequalities in terms of quality of education are particularly problematic and have far-reaching consequences. As noted by the World Bank (2012, p.xi), "the disadvantages conferred by unequal opportunities in education earlier in life are an increasingly consequential stumbling block to the social and economic mobility of individuals, for whom having a job is crucial". These effects are compounded by inequalities in quality of health service provision and the burden of disease, as well as in access to housing, sanitation and water supplies, which all play a role in determining well-being.

From a policy perspective, the key constraint is one of time. The policy priorities for maximising the benefit from the demographic dividends should be formulated in terms of South Africa already having transitioned through two-thirds of its first dividend period. In this respect, policy should prioritise economic growth and should fundamentally shift the structure of production towards greater labour intensity, particularly in relation to low-skilled workers. Without such a focus, significant proportions of working-age cohorts will remain effectively 'unemployable'. The pursuit of a more labour-intensive growth path represents a critical shift in South Africa's economic trajectory and is fundamental to the creation of employment on the required scale. Without this shift, the economy will remain unable, even at relatively high rates of growth, to absorb new labour market entrants into employment in sufficient numbers, representing a binding constraint on both demographic dividends.

Broad educational and health policies may suffer from long lead times, but there may be scope for targeted interventions particularly relating to post-secondary non-university education, as well as artisan training and apprenticeships that would have shorter lags. Health policy should continue to address the prevention and treatment of diseases such as HIV/Aids and tuberculosis, which will help reduce the effective dependency ratio by reducing morbidity amongst working age cohorts.

The short timespan within which South African can still benefit from the first dividend should not, however, shift efforts away from the systemic improvement of education and health service quality and the efficiency of resource use in these sectors.The benefits associated with such policies may take time to materialise but, even in the case of a steady state population, could help raise incomes in the longer term.

The projections of the demographic dividends are based on labour income and consumption profiles constructed at a particular point in time and that are determined by a range of factors, including prevailing economic conditions, social and cultural norms, and institutional arrangements. In that sense, the projected dividends are not deterministic and changed circumstances may positively (or negatively) affect the eventual dividend that is realised. Thus, for example, it was demonstrated in Figure 4.7 that fertility rates below that of the medium fertility projections would boost the magnitude of the first dividend. Similarly, improvements in the labour market that would result in higher per capita labour incomes would have the same type of effect and would improve the prospects for the second dividend. Indeed, improvements in labour income among younger cohorts within the working-age population would have additional benefits in reducing the need for elderly cohorts to make the kind of downward transfers that they currently do.

This chapter set out to answer three specific questions regarding the magnitude of the dividends, the robustness of the projections to NTA estimates from different years, and the policy options available to maximise the dividend.

Based on labour income and consumption profiles for 2015, the first demographic dividend is projected to be 0.41 percent per annum between 1978 and 2040. The dividend was largest during the early 1990s, ranging between 0.80 percent and 0.95 percent per annum, and after a slight uptick around 2010 it is projected to fall almost continuously until 2080. In all, then, South Africa is projected to experience 62 years of positive first demographic dividend. The second demographic dividend is projected to be even more substantial than the first. Between 2020 and 2100, the second dividend is projected to average 0.88 percent per annum: cumulatively over this period, the second dividend will raise consumption per effective consumer by 101.7 percent.

In combination, the two dividends have the potential to contribute materially to economic growth and living standards in South Africa over a period of more than a century. From 2015 to the end of the 21^{st} century, the demographic dividend is projected to raise consumption per effective consumer from R89 127 to R182 646 in constant 2015 Rands; this increase represents an average annual growth of just over one percent. In per capita terms, consumption is projected to rise from R51 012 per person in 2015 to R124 476 in 2100.

The projections of the first dividend presented in Figure 4.6 and of the second dividend presented in Figure B.3 reveal that the estimates of the demographic dividends are relatively robust to using NTA estimates from different years. This is not to say that the estimates do not, at times, fall within a relatively large range. This is particularly true for the second dividend. Nevertheless, the trends in the demographic dividends remain consistent across datasets, despite changes in the NTA profiles across datasets, alluding to the importance of the demographic data in driving the dividend projections.

Suggestions of policy options aimed at harnessing or magnifying the demographic dividends do not necessarily flow directly from the NTA estimates or dividend projections themselves. In many respects, NTA is non-prescriptive in terms of specific policy interventions, presenting instead implications in terms of how specific profiles, for example, may need to change and leaving the choice of specific policy to policymakers. However, one clear policy suggestion that emerges from the analysis here—and one which is consistent with existing evidence on the demographic dividends—relates to fertility.

Consistent with the literature, lower fertility is associated with a larger, although less long-lived, first demographic dividend in South Africa. Under the assumption of low fertility, the first dividend is larger in any given year than the baseline projection until the late 2040s, by which time both are projected to have turned negative. Compared with higher fertility projections—the high fertility, constant fertility and no change variants—the low fertility projects see a difference of around 15 years in the duration of the period of positive first demographic dividend. Cumulatively, between 2014 and 2040, the first dividend assuming low fertility is almost twice the magnitude of that assuming medium fertility, and between four and seven times those of the higher fertility projections. The benefits of lower fertility are applicable to the second demographic dividend too, although these materialise around a quarter of a century after the beginning of the simulation.

While lower fertility has the benefit of boosting the size of the demographic dividend, it also increases the size of the negative first dividend from the 2050s onwards. This increases the stakes involved in terms of the country needing to effectively harness the first demographic dividend in order to be able to compensate for the large negative dividend later on. Projections of the second dividend reveal a markedly larger dividend under the assumption of low fertility but, as already noted, this dividend is dependent on society's ability to harness the first. All things equal, the clear policy recommendation emerging from the projections is that population policy emphasising lower fertility should be pursued. Indeed, assuming no deterioration in the factors influencing the labour income and consumption profiles going forward, this is still a valid objective for policy.

The second clear policy recommendation that emerges from the simulations of the first dividend relates to the labour market and, in particular, the improvement of labour market outcomes for young people. Figure 4.5 clearly illustrates the impact of high rates of youth unemployment on the per capita labour income of these young working-age cohorts. Raising per capita labour incomes amongst cohorts under the age of 35 years to the median level observed across all countries with NTA estimates boosts the first demographic dividend substantially during the period of convergence. From a policy perspective, this convergence may be achieved in numerous ways, including raising the employment-to-population ratio, improving the skills profile of employment, enhancing productivity or raising wages amongst these cohorts. In practice, these types of outcomes have proven difficult to achieve within the South African context. Indeed, it seems unlikely that such outcomes can be achieved at scale without a qualitative shift in the country's economic growth path and in its education and training systems. It is clear that in order to raise the employment-to-population ratio would require a shift towards more labour-intensive activities, and could be facilitated through effective support for small and medium enterprises. At the same time, addressing quality concerns within the education and training system and facilitating lifelong learning amongst the working-age population could contribute towards raising the skills profile and improving the flexibility of the workforce.

The conclusion based on the projections of the demographic dividend presented here is relatively pessimistic, with the majority of the first demographic dividend in the past and the existence of a number of weaknesses in South Africa's preparedness to harness the dividend. This stands in stark contrast to the much more optimistic picture painted by the window of opportunity, which is identified purely on the basis of dependency ratios. According to this approach, South Africa's window of opportunity has only recently opened, and is expected to remain open until 2065, putting the dividend very much in the future (see Figure B.7). Accepting the argument that NTA-based estimates of the dividend are able to more accurately measure dependence and non-dependence, policymakers in South Africa and in the rest of Sub-Saharan Africa should be aware that they likely have significantly less time to prepare for the dividend than dependency ratio-based estimates would suggest.

Chapter 5

Inequality and the Generational Economy

5.1 Introduction

Since its inception, National Transfer Accounts (NTA) research has demonstrated the differences between countries in the patterns of resource flows across generations. Despite these differences, there are broad similarities in the patterns of flows across all countries; further, there are often important similarities between countries at similar levels of development, or that are culturally or geographically proximate. This has become particularly evident as the NTA network grows to include an increasingly diverse set of countries.

The existence of differences between countries at different levels of development suggests that such differences may also manifest themselves within countries when comparing sub-populations with different levels of income. This has led to various efforts aimed at constructing accounts for key sub-populations within countries. These sub-populations have been defined in a variety of ways, including position within the income or consumption distribution (for example, unpublished work by Abrigo 2011; Angulo 2011; Bucheli and González 2011); geographic location and rural-urban status in particular (Maliki 2011; Li *et al.* 2011, for example); socio-economic status (Turra and Queiroz 2005, and Mejía-Guevara 2015, using educational attainment of the household head; or Tovar and Urdinola 2014, using a quality of life index); or gender (for example, Zagheni and Zannella 2013). In a static or cross-sectional sense, these types of categorisations of the population are useful, but they can become problematic for analysis over time as individuals or households may switch groups from one period to the next.

South Africa remains a deeply unequal country. Indeed, according to the World Bank (2018b), amongst 104 countries with estimates between 2013 and 2017, South Africa has the highest Gini coefficient at 63.0 in 2014. The extent of these inequalities suggests that understanding differences in the generational economy across sub-populations may be particularly important for South Africa. However, instead of using a measure of socio-economic status or position within the income distribution to define sub-populations, this chapter constructs separate accounts by race using data for 2015. Within the South African context, race continues to be closely intertwined with socio-economic status and racial disaggregations remain useful from a policy perspective in monitoring progress towards a more equitable non-racial society. Race is also less likely to suffer from problems of individuals switching between groups over time.

This chapter focuses on analysing the generational economy in South Africa in 2015, constructing separate profiles for the country's four main race groups. Based on the accounts constructed, this chapter aims to answer three key questions. Firstly, how and to what extent does the economic lifecycle differ across race groups within South Africa? Secondly, how do the systems of intergenerational flows differ across groups and, in particular, what are the implications for the demographic dividend? Thirdly, based on the findings for South Africa, what are the implications for the construction of NTAs in high-inequality countries?

From the perspective of National Transfer Accounts, the paper contributes to the relatively sparse literature on sub-population NTAs and, excluding work on gender, represents the first known attempt at constructing full NTA profiles for sub-populations in Africa. In assigning individuals to sub-populations based on their individual characteristics, rather than on the basis of the characteristics of the household head, the approach here is more closely to aligned to the current research on European countries. However, in terms of the extent of inequality, South Africa is more closely comparable to Latin American countries. The results presented here are, therefore, the first for a high inequality country where classification of individuals is done on the basis of individual characteristics. Finally, this chapter includes the first effort at demonstrating the impact that inequality can have on the results from projections of NTA profiles.

5.2 Poverty, Inequality and Race in South Africa

South Africa has a long and painful history of colonial and White-minority rule, dispossession and discriminatory policy, the effects of which—directly or indirectly—undermined the economic position of the country's Coloured, Asian and, in particular, its African population. A key outcome of this history is stark inequality between the four race groups across a range of variables that has persisted over a long period of time. According to Leibbrandt *et al.* (2010, p.13), real per capita incomes for Coloureds, Asians and Africans were respectively 22.0 percent, 22.1 percent and 9.1 percent of those of Whites in 1917; by 1980, these proportions were virtually unchanged. Even in 2008, per capita income amongst Coloureds was still 22.0 percent of that of Whites, while those of Asians and Africans had risen to respectively 60.0 percent and 13.0 percent. Thus, despite the passage of two and a half decades since the end of apartheid, race remains a key covariate of socioeconomic status in South Africa.

One of the key areas impacted has been the labour market. Job reservation and spatial segregation policies, combined with limited access for the majority of the population to quality education, have had enduring effects on the labour market, while economic policy has tended to favour large-scale capital intensive industries, such as mining. Under apartheid, Whites were given a head start in accumulating human capital, while lower-skilled White workers were, to a large extent, protected from direct competition with other race groups for employment. Less educated workers, who are primarily African, have also found themselves on the wrong side of technological change that has favoured the employment of higher skilled workers over the last half-century.

The fall of apartheid brought with it the removal of restrictions on access to education and employment, along with policies aimed at redress. However, gaps in the labour market have been slow to narrow, with their initial advantage in terms of education enabling Whites and Asians to capitalise on opportunities presented by the post-sanctions economy. The post-apartheid period has therefore seen high and rising unemployment rates, particularly amongst less educated workers, with skills shortages driving wage growth at the upper end of the skills distribution. Race differentials in educational attainment have meant that unemployment Africans, and to a lesser extent Coloureds, suffer particularly high unemployment rates. Further, when they are able to find employment, Africans dominate in less skilled occupations.

Table 5.1. Selected Economic and Social Indicators for South Africa, by Race

Indicator	**Year**	**Overall**	**Afr**	**Col**	**Asi**	**Whi**
Economic Indicators						
Employment-to-population (15-64, %)	2018Q3	43.1	40.1	49.2	53.1	63.2
Unemployment rate, narrow (15-64, %)	2018Q3	27.5	31.1	21.8	10.1	7.1
Unemployment rate, broad (15-64, %)	2018Q3	37.3	41.8	27.6	17.5	9.3
Poverty rate (UBPL, %)	2015	55.5	64.2	41.3	5.9	1.0
Multidimensional poverty rate (%)	2011	8.0	9.9	2.2	0.4	0.1
Gini coefficient	2008	0.70	0.62	0.54	0.61	0.50
Social Indicators						
Adults (25+) with degrees (%)	2018Q3	5.8	3.7	3.5	11.1	22.1
Adults (25+) with post-secondary (%)	2018Q3	13.6	10.4	9.0	20.5	40.1
Adults (25+) with secondary only (%)	2018Q3	65.0	65.3	69.2	71.7	57.5
Medical aid coverage (%)	2017	16.8	10.0	20.1	48.6	71.7
Mean household size	2018Q3	3.3	3.3	3.8	3.5	2.7
Demographic Indicators						
Population share (%)	2015	100.0	80.3	8.9	2.5	8.3
Population under 20 (%)	2015	38.3	40.6	36.2	26.3	22.0
Population 20-39 years (%)	2015	35.2	36.5	31.8	34.8	25.9
Population 40-59 years (%)	2015	18.4	16.7	22.9	26.1	28.3
Population aged 60+ (%)	2015	8.1	6.2	9.1	12.9	23.7
Population growth rate (ave. ann., %)	2007-17	1.60	1.84	1.34	1.55	-0.22

Source: Own calculations, Leibbrandt *et al.* (2012); Statistics South Africa (2014a, 2015a, 2018a,b,c).

The result is a clear pattern of racial disadvantage in terms of labour market earnings and household income, which is echoed across a variety of other measures: Africans are worse off than Coloureds, who are worse off than Asians, who are worse off than Whites. This pattern is clearly observed in terms of poverty rates. Indeed, Gradin (2012, p.188) notes that "the differential in poverty levels across racial groups stands out as one of the most important" features documented in the South African poverty literature. Poverty rates, using a lower-bound poverty line, are estimated to be 47 percent for African-headed households, compared to 23 percent for Coloured-headed households, just over one percent for Asian-headed households and less than one percent for White-headed households (World Bank 2018a, p.13). The same ranking—and substantial inter-race differences—is observed for money-metric poverty throughout the post-apartheid period (see, for example, Leibbrandt *et al.* 2010, p.37), and in terms of asset-based (Bhorat and Van der Westhuizen 2013) and multidimensional measures of welfare (Finn *et al.* 2013; Fransman and Yu 2018).

The end result of these patterns is extreme inequality. South Africa has consistently ranked as one of the most unequal countries in the world in terms of Gini coefficients. According to the World Bank (2018b), amongst 104 countries with estimates between 2013 and 2017, South Africa has the highest Gini coefficient at 0.63 in 2014 (the same value is observed in 2015 (World Bank 2018a, p.xv)). Various authors have confirmed that the income source responsible for the largest share of the Gini coefficient is income from work (Hundenborn *et al.* 2016; Leibbrandt *et al.* 2010, 2012)—estimated to contribute around 80-90 percent to the Gini—with "at least one-third [of this share] attributable to the large percentage of households with zero wage income" (Leibbrandt *et al.* 2010, p.19). Income is highly concentrated at the upper end of the income distribution, with the richest 10 percent accounting for 58 percent of total income in 2008 (Leibbrandt *et al.* 2010, p.26). Asset income is particularly unequally distributed: Hundenborn *et al.* (2016, p.3) report Gini coefficients of investment income 0.97 and 0.98 in 2008 and 2014. Inequalities in assets and asset income are a function of, amongst other things, long-term inequalities in labour income, and are particularly important in the context of the intergenerational transmission of inequality.

Within this context, successive post-apartheid governments have pursued various policy interventions aimed at reducing poverty and inequality. A key component of this effort has been social grants. Building on a pre-existing system of social assistance, government has removed race-based discrimination within the system and has expanded the system to cover additional vulnerable groups. It is estimated that a total of 10.91 million grants—equivalent to 18.9 percent of the population—were paid out in July 2018; by December 2018, this had risen to 11.03 million (own calculations, SASSA 2019; Statistics South Africa 2018b). Thus, it is estimated that the proportion of households receiving any form of transfer from the state more than doubled from 21.9 percent in 1993 to 47.8 percent in 2008 (Leibbrandt *et al.* 2010, pp.34-35). Van der Berg (2011, p.134) further reports that not only did real per capita social spending by government increase by 21 percent between 1995 and 2000, and by another 40 percent between 2000 and 2006, but the targeting of this spending to the poor also improved.

Assessments of the social grant system reveal a significant impact on poverty, particularly at lower poverty lines, but with an ambiguous or weakly positive effect on inequality. Hundenborn *et al.* (2016, p.20) though show that the increase in grants "limited the increase in inequality over [the 1993-2008] period immensely". However, considering fiscal policy beyond merely the grants system, Inchauste *et al.* (2015) have found South Africa to be particularly effective in reducing inequality. Nevertheless, they find that "consumable income"[1] inequality in South Africa—i.e. inequality post fiscal policy—is still higher than "market income" inequality in other highly unequal countries such as Brazil (Inchauste *et al.* 2015, p.15). Further, improvements in municipal infrastructure have helped significantly reduce asset inequality (Wittenberg and Leibbrandt 2017, p.727) and multidimensional poverty (Finn *et al.* 2013).

The extent of inequality in South Africa means that averages mask the true situation for the vast majority of the population. As Van der Berg (2011, p.120) notes, "[for] an upper middle income country..., South African social indicators (e.g., life expectancy, infant mor-

[1]'Consumable income' is defined as market income less direct and indirect taxes plus direct cash transfers, social security contributions, and consumption subsidies and taxes. 'Market income' consists of "pretax wages, salaries, and income earned from capital assets (rent, interest, or dividends) and private transfers" and includes contributory pensions and imputed rent for owner-occupied housing (Inchauste *et al.* 2015, p.15).

tality or quality of education) are closer to those of lower middle income or even low income countries. . . [reflecting] the unequal distribution of resources and opportunities".

5.3 Overview of the South African Generational Economy in 2015

Race-based differences in the generational economy are usefully analysed within the context of patterns at the national level. The focus here is on the high-level profiles corresponding with the NTA identity outlined in equation 3.2. Figure 5.1 presents the lifecycle deficit and its components, consumption and labour income. To facilitate comparison, all profiles are normalised by dividing through by the unweighted average labour income amongst cohorts aged 30 to 49 year.

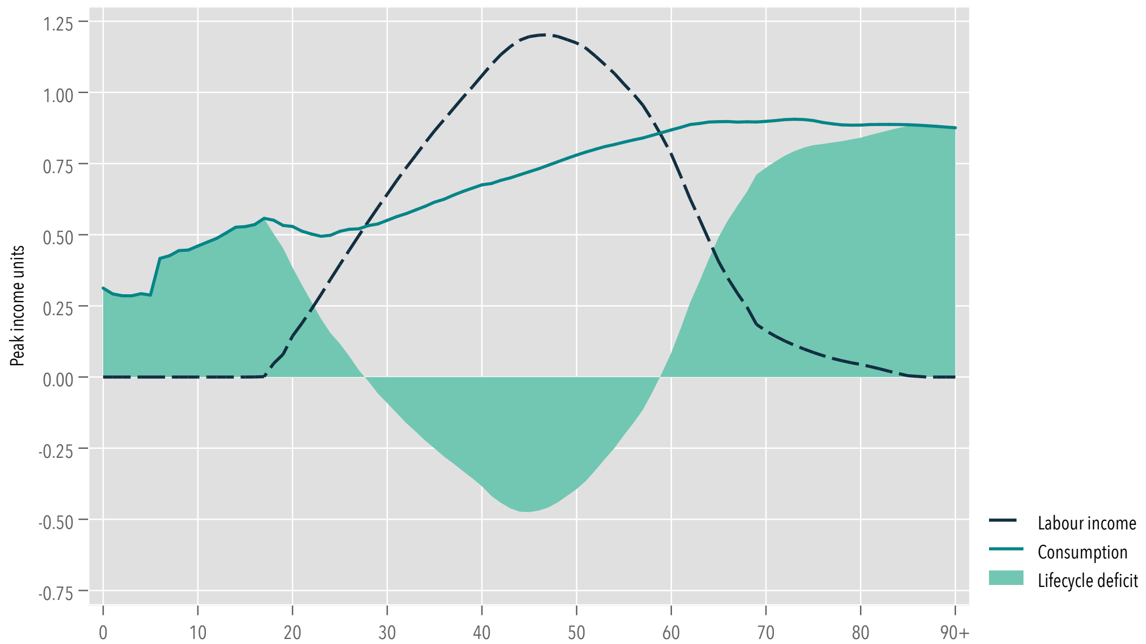


FIGURE 5.1. LABOUR INCOME, CONSUMPTION AND THE LIFECYCLE DEFICIT, 2015

Notes: Profiles are standardised by dividing through by the average labour income for 30 to 49 year olds ('peak labour income'); this average value is referred to as a 'peak income unit'.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

The labour income profile is bell-shaped, rising from zero for young children to a peak of 1.2 in the mid- to late-forties. It falls rapidly during the late fifties and sixties, but much more slowly from age 70 onwards. Interestingly, the notion that underlies the normalisation of the profiles, namely that cohorts between the ages of 30 and 49 years are the peak income earners, is clearly inaccurate in the case of South Africa in 2015. Instead, the 20 cohorts with the highest per capita labour incomes are those between the ages of 38 and 57 years.

Consumption shows less variation across age than labour income. For the youngest cohorts, consumption is equivalent to approximately 30 percent of peak labour income—at least partially driven by the equivalence scale—but jumps sharply as children start attending school from age six onwards. During the school-going years, consumption gradually increases, peaking at over 0.55 peak income units at ages 17 and 18, and falls slightly in early adulthood. From age 23, however, consumption begins to rise again and is over 0.90 peak income units during the early seventies; for older cohorts, per capita consumption is only marginally lower than this peak. This considerable rise in per capita consumption across age—it increases by 70 percent between the ages of 20 and 70—stands in contrast to the general cross-country pattern of relatively stable consumption after age 20. Oosthuizen (2015, p.16), for example, illustrates this stability using the interquartile range of normalised estimates from 33 countries and shows that per capita consumption in South Africa in 2005 is below the 25th percentile amongst children and close to the 25th percentile amongst the oldest cohorts, but was above the 75th percentile for cohorts between the ages of 30 and 60 years.

Together, the consumption and labour income profiles determine the lifecycle deficit—$C(x)$ *minus* $Y^l(x)$—which follows the consumption profile at young ages where there is no labour income. The deficit peaks at age 17 (0.56 peak income units) and falls rapidly as cohorts enter the labour market and begin to earn labour income. The deficit turns negative (i.e. a lifecycle surplus) at age 28, reaching 0.47 peak income units during the mid-forties. Averaged across cohorts, per capita surpluses are generated between the ages of 28 and 58 years, with older cohorts experiencing per capita deficits that are substantially larger than those observed amongst children.

The lifecycle deficit profile is reproduced in Figure 5.2, along with the three source of LCD financing. The importance of these sources—net public transfers, net private transfers and asset-based reallocations—varies substantially over the life course in terms of both magnitude and sign. Amongst younger cohorts, the LCD is almost entirely financed through transfers. Within total transfers, private transfers are dominant and represent between 50 percent and 65 percent of the total amongst cohorts all but two cohorts under 20 years. Public transfers are largest relative to total transfers for infants (52 percent) and for the youngest school-going cohorts (46-51 percent amongst six- to nine-year-olds). At the peak of the LCD at age 17, per capita public transfers are equivalent to 0.20 peak income units, compared to 0.32 units for private transfers and 0.04 units for asset-based reallocations.

Both public and private transfers turn negative (i.e. net outflows) in the late twenties, at around the age that cohorts start producing lifecycle surpluses. For public transfers, this is driven by increases in public transfer outflows linked to rising per capita labour income, combined with reduced public transfer inflows, which include in-kind transfers such as spending on education and health. Private transfer outflows are, again, larger than public transfer outflows. In contrast, asset-based reallocations rise at an increasing rate from the early twenties onwards. The result is that the substantial transfer outflows during the prime working ages are offset by increasing inflows associated with asset income, which includes inflows related to owner-occupied housing. Peak per capita lifecycle surplus equivalent to 0.47 income units is generated at age 45; at this age, net transfer outflows total 0.69 peak income units (of which 0.43 units are private transfer outflows), while inflows from asset-based reallocations total 0.22 income units. In other words, at age 45, net public transfer outflows are almost completely balanced by inflows from asset-based reallocations.

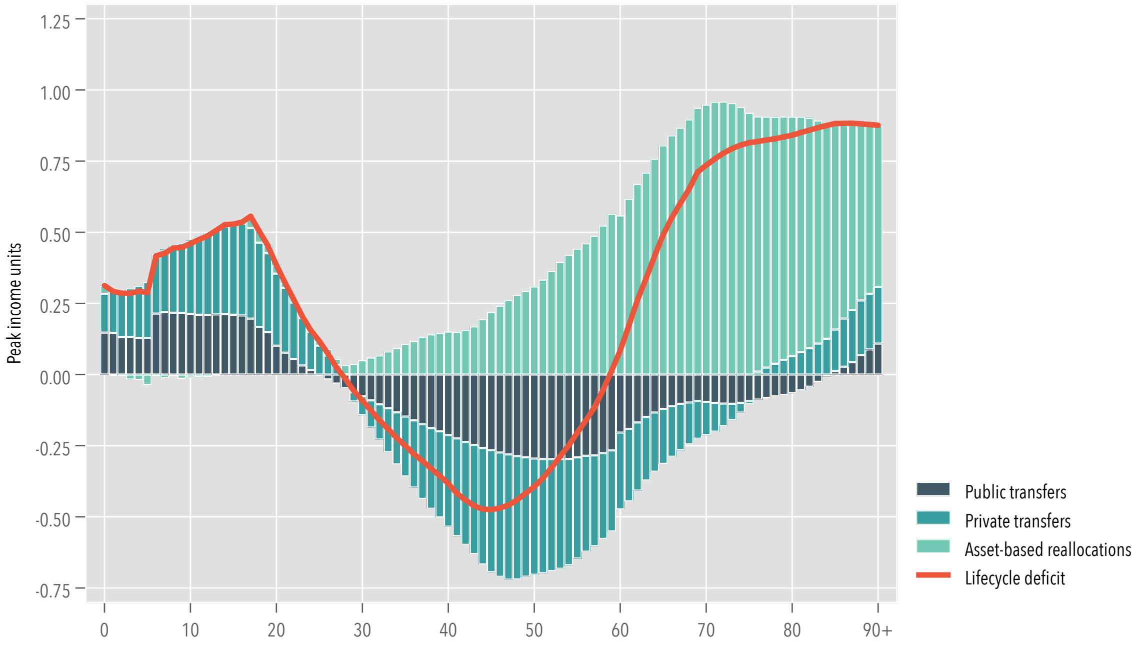


Figure 5.2. Financing the Lifecycle Deficit, 2015

Notes: Profiles are standardised by dividing through by the average labour income for 30 to 49 year olds ('peak labour income'); this average value is referred to as a 'peak income unit'.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

Amongst post-retirement cohorts, inflows from asset-based reallocations peak at 0.96 income units in the early seventies, but fall by two-fifths to 0.57 units for the 90+ cohort. During the post-retirement years, net private transfers turn positive at age 76 and net public transfers at age 85. Thus, for the oldest cohort, the LCD of 0.88 income units is financed through net public transfer inflows of 0.11 income units, net private transfer inflows of 0.20 income units, and asset-based reallocations of 0.57 income units.

The overall picture then is one of lifecycle deficits for children and elders, with deficits particularly large for the latter. Surpluses are produced by the 31 cohorts between the ages of 28 and 58 years. The deficits generated by children are financed almost exclusively through transfers, with private transfers accounting for one-half to two-thirds of the total, while deficits for elders are primarily financed through asset-based reallocations. However, transfers are increasingly important to the financing of the deficit amongst the elderly and finance more than one-third of the deficit for the oldest cohort.

These per capita profiles, though, obscure some of the effects of the population age structure. Table 5.2 provides a better sense of the interaction between the profiles and the population age structure by presenting the aggregate flows (i.e. the aggregate control values) and their distribution across four age groups.[2]

There are a number of key points that emerge from the table. First, the aggregate lifecycle deficit amongst young people is substantially larger than that amongst elders, despite the per capita deficits being smaller. The aggregate deficit amongst those under the age of 19 years

[2]For Rand values, see Table C.1 in Appendix C.

TABLE 5.2. AGGREGATE CONTROLS AND DISTRIBUTION ACROSS AGE, 2015

Flow		**Overall**	**Proportion (%) attributable to...**			
		R bil	0-18 yrs	19-39 yrs	40-59 yrs	60+ yrs
Labour income	**YL**	**2 166.5**	**0.2**	**45.2**	**48.3**	**6.3**
Employment earnings	YLE	1 945.8	0.1	44.8	49.4	5.7
Self-employment earnings	YLS	220.7	1.6	48.2	38.8	11.4
Consumption	**C**	**2 820.5**	**27.2**	**34.9**	**25.4**	**12.5**
Private consumption	CF	1 991.6	19.9	36.7	29.0	14.4
- Education	*CFE*	*69.9*	*61.0*	*35.3*	*3.3*	*0.5*
- Health	*CFH*	*135.0*	*19.2*	*22.7*	*36.7*	*21.4*
- Other	*CFX*	*1 786.7*	*18.3*	*37.8*	*29.4*	*14.4*
Public consumption	CG	828.9	44.8	30.6	16.6	8.0
- Education	*CGE*	*204.6*	*77.1*	*20.7*	*2.2*	*0.0*
- Health	*CGH*	*120.8*	*23.8*	*24.4*	*30.3*	*21.5*
- Other	*CGX*	*503.5*	*36.8*	*36.0*	*19.1*	*8.0*
LIFECYCLE DEFICIT	**LCD**	**654.0**	**116.6**	**1.0**	**-50.8**	**33.2**
REALLOCATIONS	**R**	**654.0**	**116.6**	**1.0**	**-50.8**	**33.2**
Transfers	**T**	**-33.5**	**-2 284.6**	**264.4**	**1 826.6**	**293.6**
Private transfers	TF	12.8	3 390.8	-76.8	-2 806.8	-407.2
- Inflows	*TFI*	*1 346.5*	*32.6*	*33.4*	*21.2*	*12.9*
- Outflows	*TFO*	*1 333.8*	*0.4*	*34.4*	*48.2*	*16.9*
Public transfers	TG	-46.3	-720.5	170.3	549.7	100.5
- Inflows	*TGI*	*1 034.7*	*43.2*	*28.0*	*16.5*	*12.3*
- Outflows	*TGO*	*1 081.0*	*10.5*	*34.1*	*39.3*	*16.0*
Asset-based reallocations	**RA**	**687.6**	**-0.5**	**13.8**	**40.8**	**45.9**
Private ABR	RAF	746.9	0.4	15.4	40.7	43.5
- Private asset income	*YAF*	*902.2*	*0.2*	*18.0*	*44.7*	*37.0*
- Private saving	*SF*	*155.3*	*-0.6*	*30.6*	*64.1*	*6.0*
Public ABR	RAG	-59.3	10.7	33.9	39.2	16.2
- Public asset income	*YAG*	*-109.9*	*10.7*	*33.9*	*39.2*	*16.2*
- Public saving	*SG*	*-50.6*	*10.7*	*33.9*	*39.2*	*16.2*
Population		**55.3 mil**	**36.8**	**36.0**	**19.1**	**8.0**

Notes: Proportions in rows sum to 100.

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

is equivalent to 116.6 percent of the total deficit, 3.5 times elders' 33.2 percent share. This is the result of this cohort outnumbering elders by a factor of more than four to one. Second, the cohort age 19 to 39 years is virtually in lifecycle balance, accounting for just 1.0 percent of the aggregate deficit. Third, elders receive relatively large shares of both private and public transfer inflows compared with their share of the population (approximately 12 percent compared with their 8.0 percent population share), while children's share of total transfer inflows is simillar to their population shares (although they account for a relatively large share of public transfer inflows). Fourth, elders account for 45.9 percent of aggregate asset-based reallocations, while adults aged 40 to 59 years account for 40.8 percent. The large share for elders is driven by private asset-based reallocations, which in turn is the result of a high share of private asset income and a low share of private saving. The somewhat lower share for 40 to 59 year olds is the result of this cohort accounting for nearly two-thirds (64.1 percent) of private saving.

5.4 Race and the Lifecycle Deficit

5.4.1 Labour Income, Consumption and the Lifecycle Deficit

Having described the broad outlines of the South African generational economy above, the focus here is on the race-specific profiles that comprise the lifecycle deficit. Figure 5.3 presents the labour income, consumption and lifecycle deficit profiles by race in 2015 Rands, and reveals significant differences between the four groups. The overall profiles presented in Figure 5.1 are reproduced here for context.

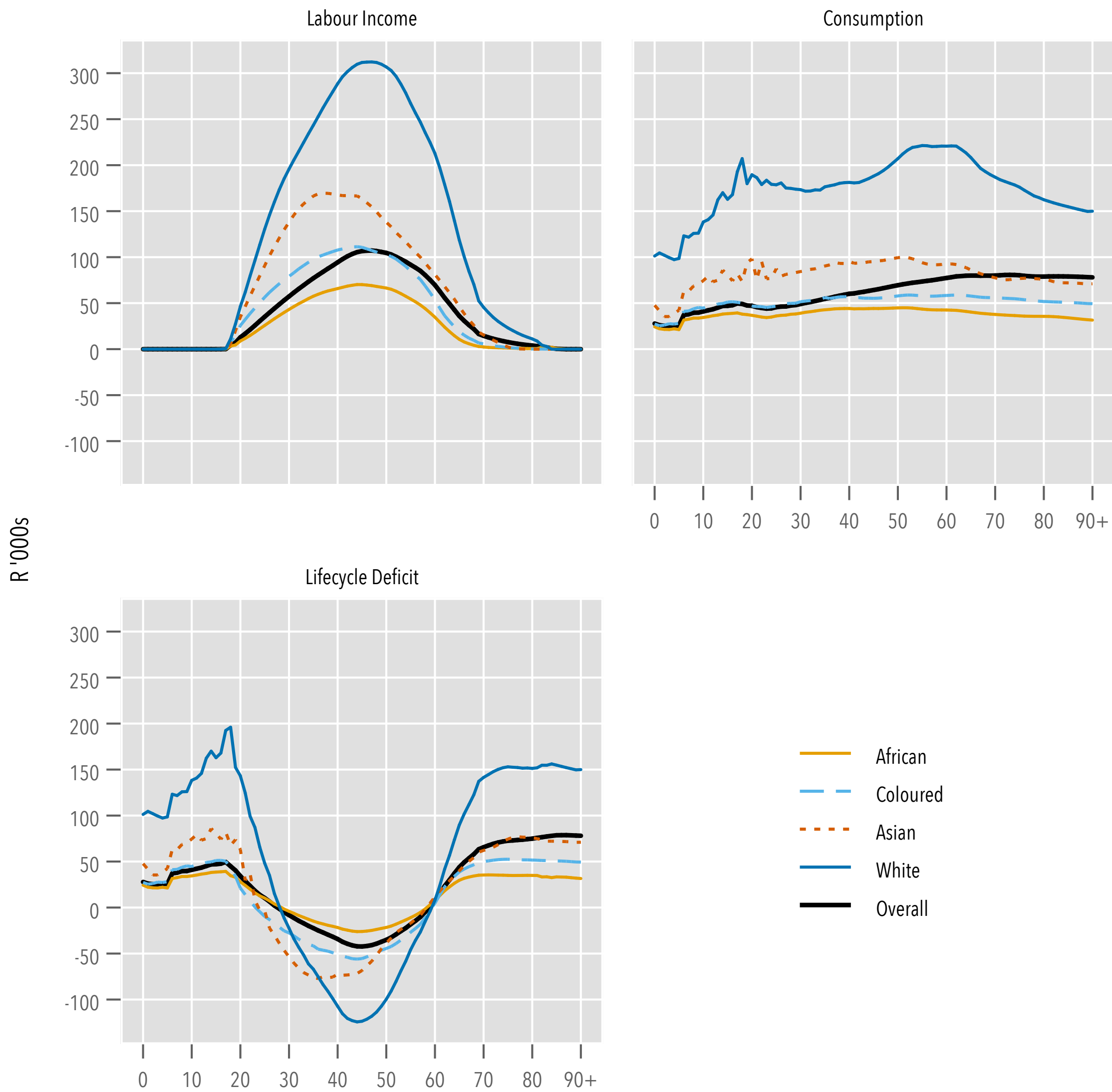


FIGURE 5.3. COMPONENTS OF THE LIFECYCLE DEFICIT BY RACE, 2015

Notes: Profiles are expressed in 2015 Rands. Self-normalised profiles are available in Figure C.1 in Appendix C. Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

While the labour income profiles of each of the four race groups follow the conventional bell-shaped pattern, their levels and timing of the peaks vary substantially. The national profile peaks at R107 000 in the late forties; in contrast, the peak for Africans occurs at R70 000 income units in the mid-forties, compared with R111 000 in the mid-forties for Coloureds, R169 000 in the late-thirties for Asians, and R309 000 in the late-forties for Whites. In other words, peak per capita labour income for Whites is nearly 2.5 times the national peak, while that of Africans is less than four-fifths of the national peak. The profiles therefore also differ in the extent to which they lean towards younger or older ages: the Coloured and Asian profiles lean towards younger ages, while those of Africans and Whites lean towards older ages.

Given the differences in labour income, it should not be surprising that consumption levels differ too. What is perhaps most interesting is the fact that the African, Coloured and Asian profiles are relatively close to the overall profile, while the White profile stands out far above the others. At age 20, per capita consumption amongst Whites is R188 000 and ranges between R165 000 and R222 000 over the rest of the life course. In contrast, consumption at age 20 amongst Africans is just R37 000 (one-fifth that of Whites) and remains within a narrow band during adulthood (R33 000 to R45 000). For Coloureds, consumption ranges between R45 000 and R59 000 over the same age range, while the range is R59 000 to R100 000 for Asians. Importantly, though, each of the race groups broadly exhibit the more conventional stable per capita consumption levels observed in other NTA countries, despite the overall profile gradually rising over much of the life course.

As a result of these differences in labour income and consumption, profiles of the lifecycle deficit are also different by race. In line with the differences observed above, the first point to note is the much larger per capita lifecycle deficits and surpluses for Whites compared with the other races. Amongst younger cohorts, the peak deficit of R194 000 amongst Whites occurs at age 18; this compares to peaks of R39 000 amongst Africans at ages 16 and 17, R51 000 amongst Coloureds aged 15 and 16 years, and R85 000 amongst Asians aged 14 years. The same ordering is observed for deficits in old age and in surpluses in the prime working ages.

There are also differences in the timing of the transitions between lifecycle surplus and deficit and, consequently, in the duration of the surplus-generating period. The transition to surplus amongst young adults occurs earlier for Coloureds and Asians (at age 24) than for Africans and Whites (both at age 29). However, transitions to deficit in later adulthood are almost simultaneous across the four groups, at ages 58 or 59. The result is shorter surplus-generating periods amongst Africans and Whites—30 and 31 years—than amongst Coloureds and Asians (36 and 35 years respectively). For context, on average across 40 countries for which publicly available NTA estimates are available, the age of transition to surplus is 26.6 years and the return to deficit occurs at 58.7 years of age; thus, the average duration of the period surplus is 32.1 years (own calculations, National Transfer Accounts Project 2019). This places Coloureds and Asians within the top quartile of the range of available national estimates in terms of the duration of the period of surplus, and Africans and Whites within the second-lowest quartile.

5.4.2 Private and Public Consumption

National Transfer Accounts distinguish between the private and public sectors within the generational economy, with a number of flows—including consumption—having both private and public components. Within consumption, in addition to the distinction between consumption mediated by the private and public sectors, consumption of education and health are estimated separately given their strong lifecycle dimensions. Within the context of inequality, looking more closely at the components of consumption will provide an indication of the relative importance of the two institutional sectors in mediating consumption.

It should be noted that public consumption is allocated by assuming equal spending per person within a given age cohort, irrespective of their race. This simplifying assumption may, however, not reflect the true situation in all spheres of public spending. For example, public spending on schools is targeted according to the socioeconomic status of the communities in which schools are located: schools in poorer areas receive large per capita subsidies than those in wealthier areas. This means that public spending on education may be higher for African children than for White children. At the same time, teachers' qualifications and experience—and, therefore, pay—may differ systematically, with schools in poorer areas likely averaging lower teacher pay. Where per capita spending does differ between individuals of different races within age cohorts, the assumption will dampen the differences between race-specific profiles. Disentangling these various effects across the full range of public consumption would represent a significant undertaking, which unfortunately falls beyond the scope of this research.

Figure 5.4 plots the per capita profiles of private and public consumption for the four race groups, as well as the share of public consumption within the total. What is immediately evident is the dominance of the public sector within consumption for Africans and, to a slightly lesser extent, Coloureds, particularly amongst the young and the old. Public consumption accounts for between one-half and two-thirds of per capita consumption for Africans under the age of 19 years, and between 45 percent and 54 percent amongst those aged 70 years and older. Amongst Coloureds, these proportions are 36-50 percent and 25-32 percent respectively. In contrast, public consumption represents just 9-17 percent of per capita consumption amongst Whites under the age of 19, and 6-7 percent of consumption for those aged 70 years and above.

In terms of consumption of education, per capita public consumption is relatively similar across the four race groups although a small gap does open up in the early twenties (Figure 5.5). This difference is the result of differences in attendance rates across institutional types, rather than differences in spending per learner within educational levels.[3] The key difference, though, is in the level of private consumption of education. Note, private consumption of education refers to consumption financed by private sector institutions, most notably households. It is not the same as spending on private education; instead, it refers to all private spending related to education, whether such education is provided by the state or not. These profiles are relatively noisy, but what is clear is that public consumption accounts for a significantly larger share of total consumption of education amongst Africans, Coloureds and, to a lesser extent, Asians than for Whites. A key difference is the relatively high per capita levels of private spending on preschool education amongst Whites, compared to virtually nothing for the other three race groups. Across cohorts aged six to 20, the public sector accounts for an (unweighted) average of 90 percent of education consumption amongst Africans, compared with 75 percent for Coloureds, 55 percent for Asians and 38 percent for Whites.

[3] In the construction of the NTA profiles, spending per user/learner is assumed to be constant within the educational phases used.

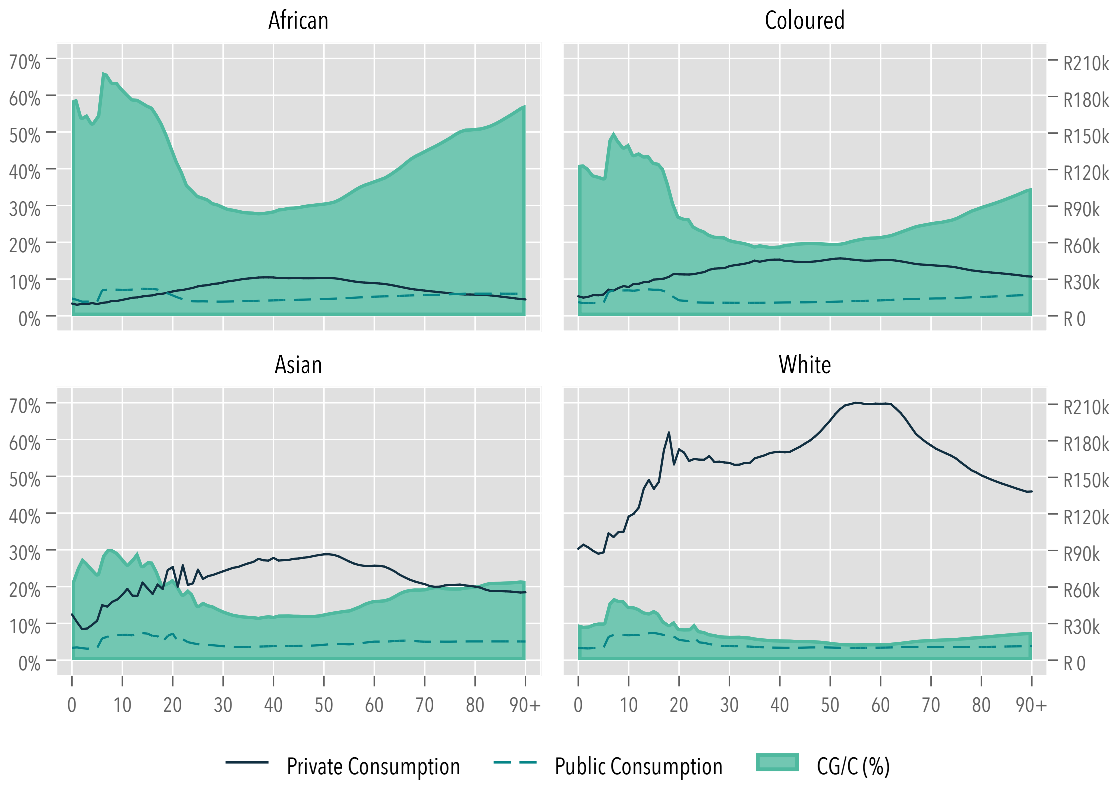


FIGURE 5.4. PUBLIC AND PRIVATE CONSUMPTION BY RACE, 2015

Notes: Profiles are expressed in 2015 Rands.

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

This pattern of the relative importance of public and private consumption across race groups is repeated within health consumption (Figure 5.6). Amongst Africans, the public sector accounts for 60-80 percent of total health consumption for virtually all age cohorts; in contrast, amongst Whites, the public sector never accounts for more than 15 percent of health consumption for any cohort. Per capita public consumption of health rises in absolute and relative terms for all four race groups from the prime working-age cohorts onwards. The profiles suggest significant allocations of resources by households to health consumption for infants and young children. Amongst Whites, private consumption of health is estimated at R32 000 per capita at age zero, compared to R9 000 amongst Asians, R6 000 amongst Coloureds and R3 000 amongst Africans. Despite these differences in the Rand amounts, a common feature across race is that private consumption of health for infants is higher than for most other age cohorts.

These patterns of the relative importance of public and private consumption of health are consistent with differentials in access to medical aid and utilisation of public health services across income. Low rates of utilisation of the public healthcare system amongst high-income groups (Alaba and McIntyre 2012, p.711; Burger *et al.* 2012, p.688) translate into low rates of utilisation amongst Whites and to a lesser extent Asians and Coloureds, and although older cohorts' have amongst the highest rates of medical aid coverage—coverage rates are estimated to be above 25 percent for the population over 70, compared with under 20 percent for the

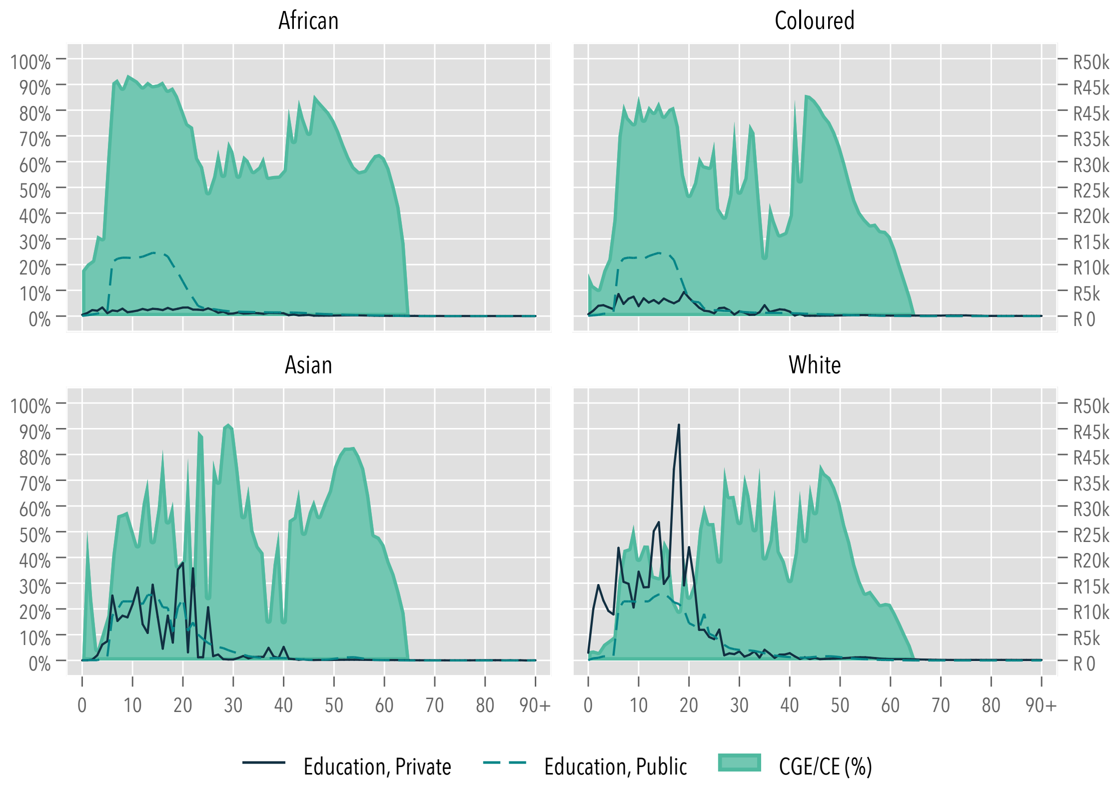


Figure 5.5. Education Consumption by Race, 2015

Notes: Profiles are expressed in 2015 Rands.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

population under 40 (own calculations based on data from Council for Medical Schemes 2018; Statistics South Africa 2018b)—they may be more constrained in terms of the quality of coverage and may increasingly opt for public healthcare at older ages.

The main driver of differences in consumption across race groups, however, is other consumption (i.e. all consumption excluding education and health) as illustrated in Figure 5.7. Other public consumption is, as noted, allocated on a per capita basis and there is therefore no age- or race-related variation in this type of consumption. Other private consumption, however, varies dramatically across both age and race. The variation by age is, to a large extent, by construction given the use of adult equivalence scales. However, a per capita allocation of other private consumption would still yield higher per capita consumption amongst working-age adults (see Figure C.2 in the Appendix), given these cohorts greater access to labour income. At its peak, other private consumption is estimated at R29 000 per capita, compared to R41 000 for Coloureds, R81 000 for Asians and R191 000 for Whites. As a result, the public sector is more important within other consumption for Africans and Coloureds than for Asians and Whites.

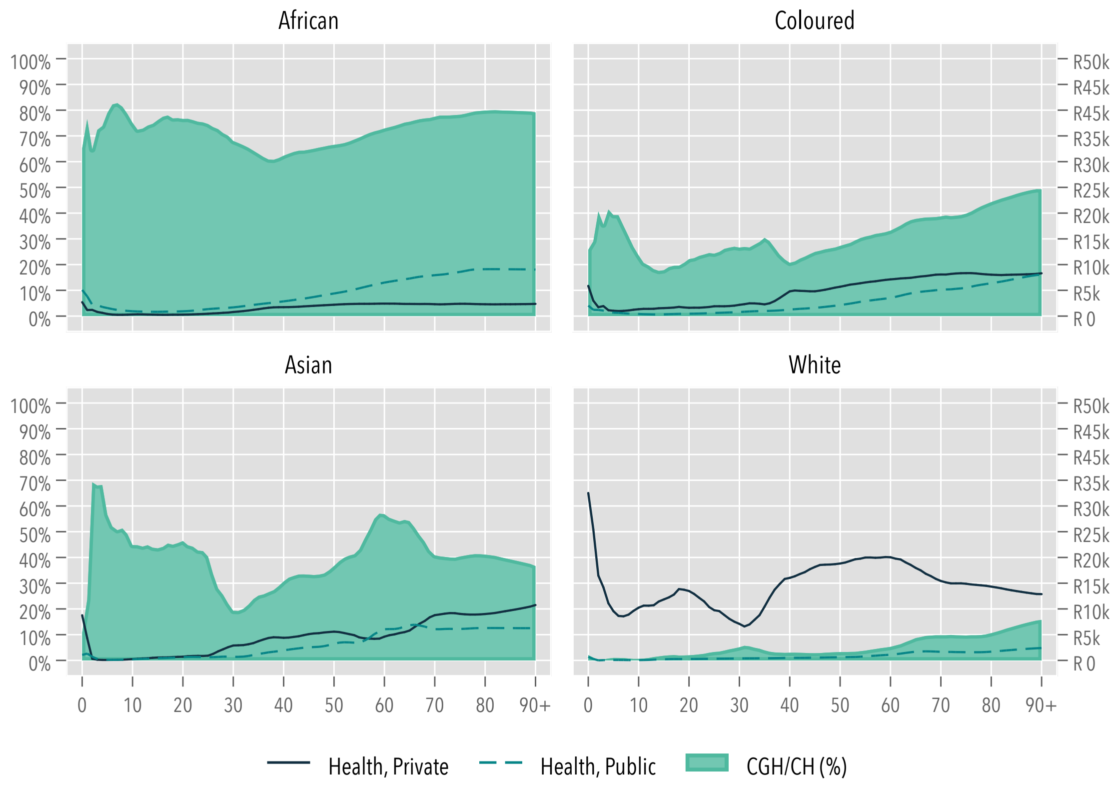


FIGURE 5.6. HEALTH CONSUMPTION BY RACE, 2015

Notes: Profiles are expressed in 2015 Rands.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

5.5 Age Reallocations and Intergenerational Flows

5.5.1 Transfers and Asset-Based Reallocations

Age reallocations consist of two categories of flows, namely transfers and asset-based reallocations (see equation 3.2). Both categories of flows can be further subdivided into public and private flows, depending on whether or not they are mediated by the government. Further, both categories include both inflows and outflows.

Figure 5.8 provides an overview of net public and net private transfers, as well as net asset-based reallocations. The latter is not disaggregated into public and private flows since it is overwhelmingly comprised of private asset-based reallocations. For the population as a whole, net public transfers range from net per capita inflows of R20 000 (amongst young children) and net outflows of R26 000 (in the late forties and fifties). Cohorts up to the age of 25 years and those aged 85 years and above receive net public transfer inflows, while cohorts between these ages experience net public transfer outflows.

The pattern observed for net private transfers is broadly similar: the youngest cohorts (up to the age of 28 years) receive net private transfer inflows, as do their counterparts over the age of 75 years, while private transfers outflows exceed inflows for cohorts between these ages. The key differences between the net public and private transfer profiles are that the latter has

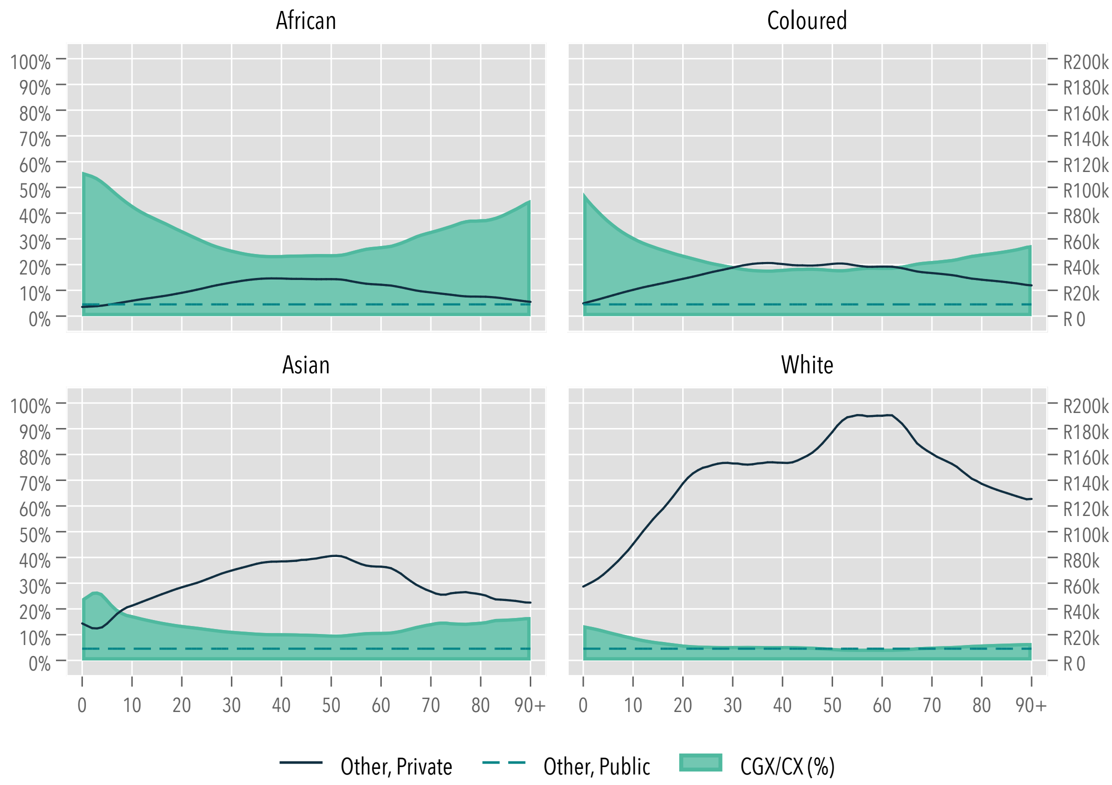


FIGURE 5.7. OTHER CONSUMPTION BY RACE, 2015

Notes: Profiles are expressed in 2015 Rands.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

a wider range of values (ranging from a net outflow of R39 000 per capita to a net inflow of R29 000 per capita), and that more cohorts experience net public outflows than net private outflows, with this difference driven particularly by older cohorts.

For both of these flows, there are marked differences by race. In terms of public transfers, Whites are the outlier with large net outflows across adulthood with net outflows in excess of R22 000 from the age of 21 onwards and a peak of nearly R120 000 during the fifties. Amongst Whites, only primary school-age children receive net public transfer inflows. In contrast, net public transfer inflows are received by African cohorts under the age of 29 and those aged 60 years and older, while net outflows peak at under R10 000 per capita for cohorts around age 50. For Coloureds, net outflows are observed for cohorts aged 23 to 62 with a peak of just over R25 000 around age 50; for Asians, this is true of cohorts aged 21 to 71 with a peak of almost R43 000 in the mid-forties. In other words, the socioeconomic gradient observed across South Africa's four race groups is correlated with the timing and duration of net public transfer outflows as well as their peak values. Importantly, differences between race groups are much less pronounced amongst children than for any other age.

For private transfers, the amplitude of the White profile is substantially greater than those of the other groups. Amongst Whites, net private transfer inflows peak at over R170 000 per capita for White cohorts aged 14 to 17 years, while net outflows peak at over R110 000 during

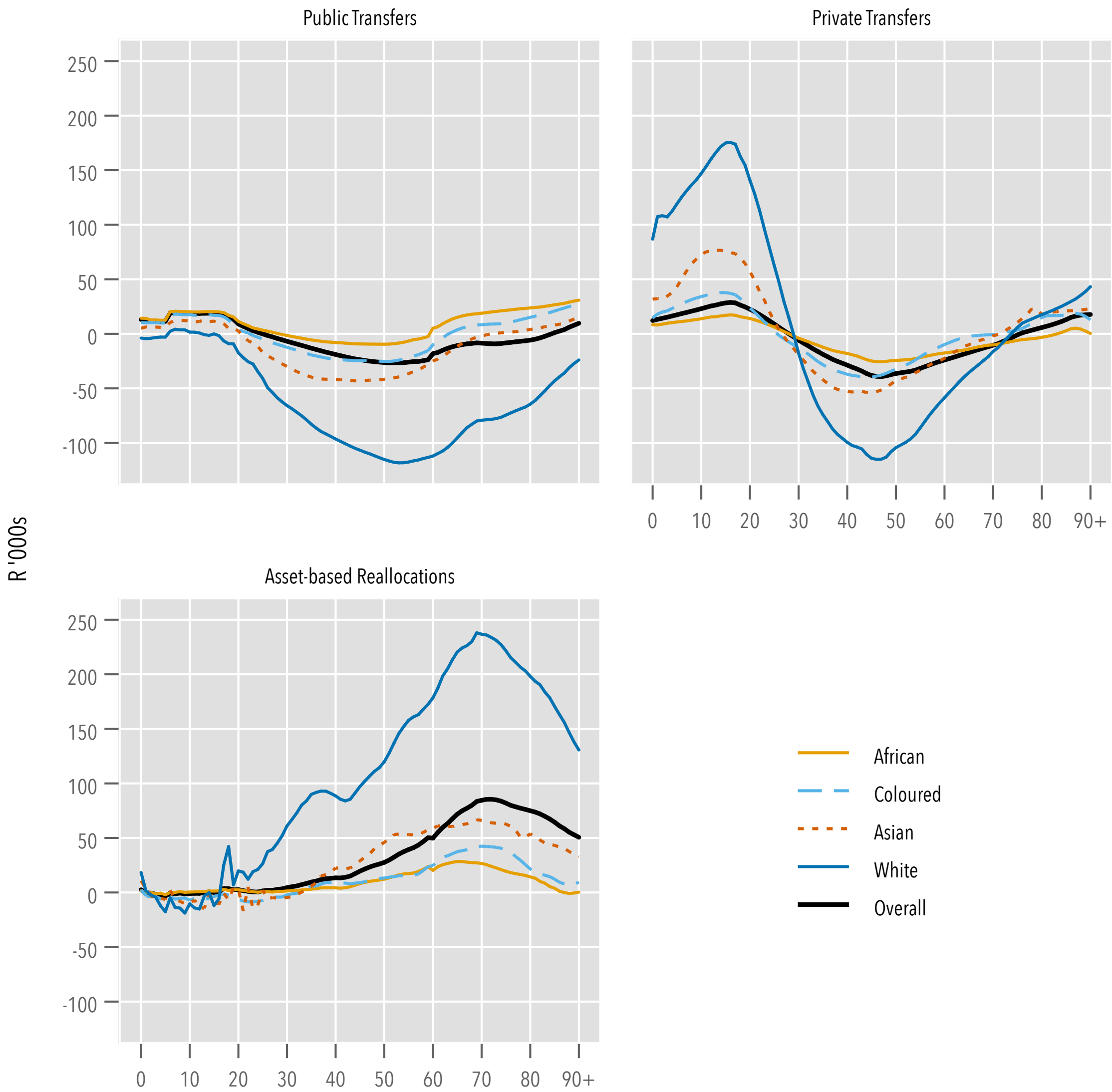


FIGURE 5.8. TRANSFERS AND ASSET-BASED REALLOCATIONS BY RACE, 2015

Notes: Profiles are expressed in 2015 Rands.

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

the mid-forties before returning to net inflows of R43 000 per capita for the oldest cohort. Whites are typically followed by Asians and then Coloureds and Africans, although there are some idiosyncrasies at particular ages. Interestingly, the switch from net inflows to net outflows is similarly timed across all four race groups, occurring within a span of four years in the late twenties, while the switch back to net inflows occurs over a span of more than ten years (starting at age 71 for Coloureds and rising to age 83 for Africans).

Asset-based reallocations—i.e. asset income less saving—are negligible at young ages, reaching R5 000 per capita at age 31 for the population as a whole. Net inflows rise gradually with age: by age 51 net inflows from asset-based reallocations are estimated at R30 000 and R50 000 around age 60, peaking at R85 000 per capita in the early seventies. Net inflows fall for older cohorts, reaching R51 000 at age 90. Net inflows from asset-based reallocations are substantially higher for Whites than for the other groups. At age 69, net inflows peak at R238 000 per capita for Whites: this is 3.6 times the level for Asians, 5.7 times that of Coloureds and 8.8 times that of Africans.

5.5.2 Public Transfers

Differences in net public or private transfers across groups are driven by differences in patterns of inflows and of outflows. As a result, these net profiles may obscure differences, or similarities, of the underlying profiles. This phenomenon is clearly illustrated in Figure 5.9, which presents public transfer inflows and outflows by race, with the shaded area representing the profiles of net public transfer outflows presented in the top lefthand panel of Figure 5.8.

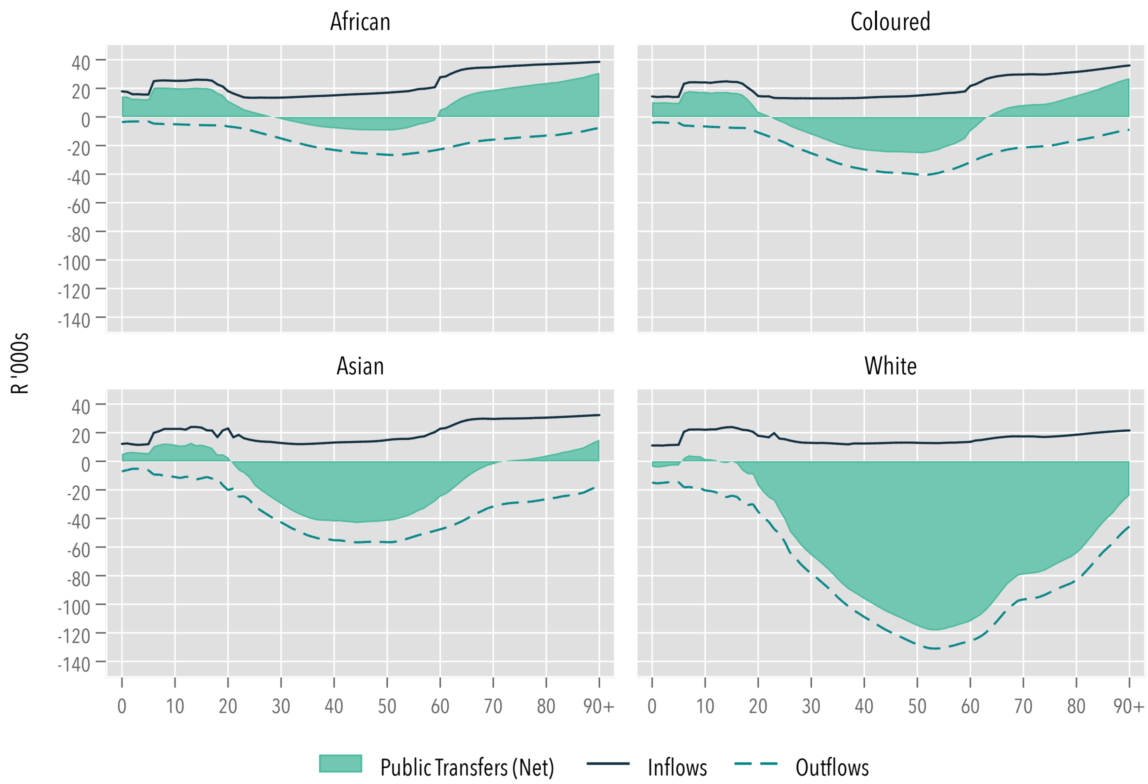


FIGURE 5.9. PUBLIC TRANSFERS BY RACE, 2015

Notes: Profiles are expressed in 2015 Rands.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

The differences in net public transfers highlighted in Figure 5.8 are more clearly visible here: net public transfer inflows are relatively larger for young and post-retirement African cohorts, while the net public transfer outflows are smaller and observed over fewer working-age cohorts compared with the other races. What Figure 5.9 reveals, though, is that these differences are primarily the result of differences in the public transfer outflow profiles, rather than differences in the inflow profiles. Race-specific public transfer inflow profiles remain within R7 000 of each other for cohorts under the age of 60 and within R14 000-R19 000 of each other for older cohorts, a narrow range considering the differences in net public transfers across groups.

Public transfer outflows are "the current flows from each age group (or the rest of the world) that fund public transfer inflows" (United Nations 2013, p.113), and consist of social contributions, taxes (on labour, capital and consumption) and grants to the government. Per capita public transfer outflows are most similar across race amongst children. At these ages, public transfer outflows derive almost entirely from taxes on consumption; per capita private consumption levels being most similar at young ages. However, the gap widens rapidly as cohorts enter the labour market and begin accumulating assets, reaching R70 000 at age 33. Between the ages of 49 and 62 years the gap peaks at between R100 000 and R105 000 per capita and, even though the gap narrows for older cohorts, it is still R38 000 at age 90. At its peak, public transfer outflows for Whites are estimated at R131 000 per capita; this is nearly five times the peak for Africans, 3.2 times the peak for Coloureds, and 2.3 times the peak for Asians.

Total public transfer inflows include cash transfers and in-kind transfers, the latter comprising the public consumption (education, health and other) described earlier. Figure 5.10 disaggregates public transfer inflows, with a particular emphasis on cash transfers. The figure groups the various social grants into three categories: pensions, which includes the old age grant and the war veterans grant; disability and sickness, which includes the disability grant; and family and children, which includes the child support grant and foster care grant. Receipts from the Unemployment Insurance Fund and the Compensation Funds are combined under 'unemployment' in line with their treatment in the survey. Of these various transfers, the largest in terms of expenditure in the 2015/16 financial year were the old age grant (R53.1 billion), the child support grant (R47.3 billion), the disability grant (R19.2 billion), and receipts from the UIF and Compensation Funds (R16.1 billion combined) (National Treasury 2018, pp.344, 592, 595). These are relatively small amounts compared to the aggregate control for total public transfer inflows of R1 034.7 billion (see Table 5.2).

Despite their relatively low values—total spending on the old age grant is just 5.1 percent of the value of total public transfer inflows—these cash transfers are relatively important on a per capita basis in particular age groups. The near universality of the old age grant and its relatively high value mean that pensions represent quite substantial public transfer inflows for retirement age cohorts. This is particularly true for Africans, rising from R15 000 per capita at age 65 to R19 000 at age 90, Coloureds (R12 000 to R18 000) and Asians (R11 000 to R16 000). Even amongst Whites, public transfer inflows in the form of pensions rise from around R3 000 to R9 000 for the same cohorts, the lower values linked to lower rates of access.

In contrast, while government expenditure on grants within the family and children category is slightly higher than that on pensions (5.4 percent of total public transfer inflows), lower access rates and smaller grant values mean that they constitute much smaller public transfer inflows on a per capita basis. Amongst Africans, these grants amount to public transfer inflows of around R3 000 per capita up to the age of 17, compared to around R2 000 and R1 000 per capita amongst similarly aged Coloureds and Asians respectively; these inflows are negligible on a per capita basis for Whites.

The remaining inflows—i.e. unemployment and net foreign, the latter representing a distri-

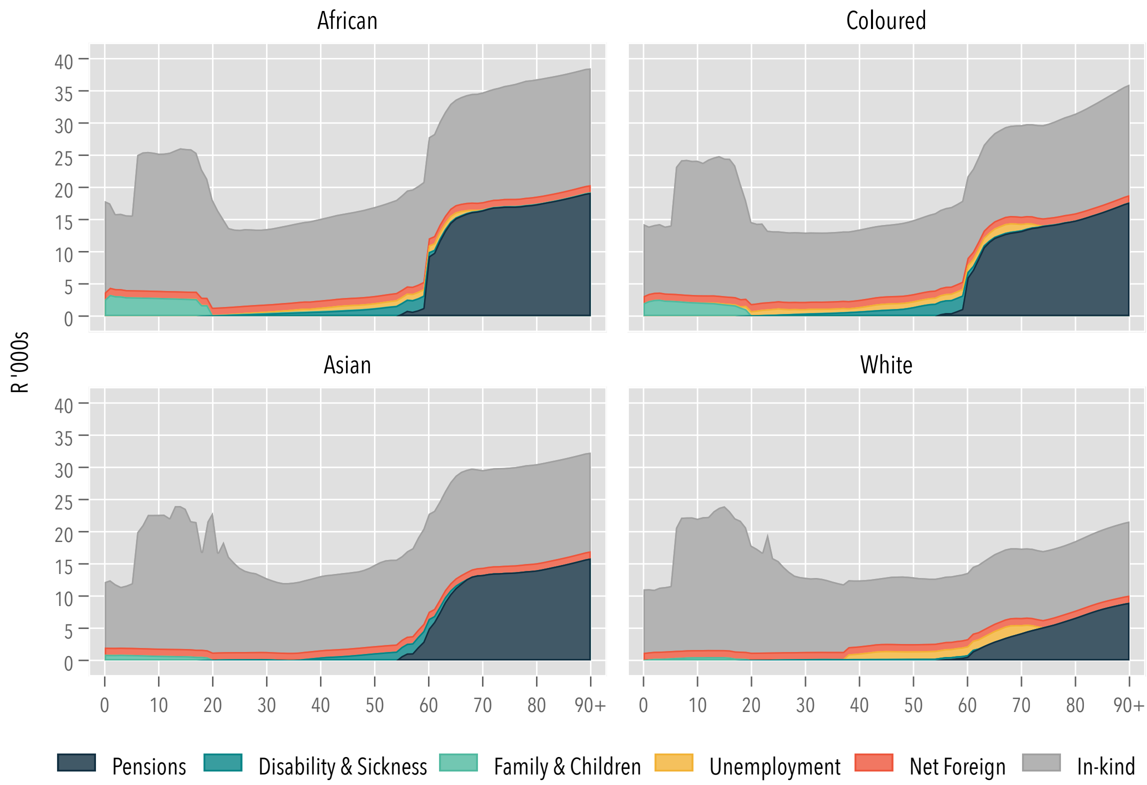


FIGURE 5.10. PUBLIC TRANSFER INFLOWS BY RACE, 2015

Notes: Profiles are expressed in 2015 Rands.

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

bution of receipts from foreign governments and international organisations net of payments—are small, never rising much above R1 500 per capita.

5.5.3 Private Transfers

Private transfers are comprised of transfers between households and transfers within households, referred to as inter-household and intra-household transfers respectively. Inter-household transfers include flows such as remittances, as well as maintenance payments and gifts; they also include transfers between households and the rest of the world (United Nations 2013, p.137). Intra-household transfers, on the other hand, are not typically observed in household survey data and are instead derived on the basis of a simple model of resource sharing within households.

One of the challenges of analysing differences in private transfers across groups that vary considerably in terms of income levels and access to resources is that the magnitude of transfers is strongly correlated with income levels. As a result, lower per capita transfers would be observed for poorer groups and vice versa for wealthier groups. To ameliorate this problem, the inter- and intra-household transfer profiles presented in Figures 5.11 and 5.12 are normalised using the group-specific labour income profiles, allowing the level of transfers to be related to peak labour income for each of the groups.

Figure 5.11 presents net inter-household transfers by race (the shaded areas), as well as the separate profiles for inter-household inflows and outflows. The first thing to note is that, on average, these flows are small relative to peak labour income in each group: at no point in the lifecycle do either inflows or outflows exceed 3.5 percent of peak labour income for any race group. Certainly, as will be shown below, inter-household transfers are dwarfed by intra-household transfers. The national profile, as discussed above, shows net inflows peaking around the age of 20, which dissipate by the late thirties, but gradually rise with age thereafter. The separate profiles of inflows and outflows, though, reveal that inter-household inflows and outflows are observed across the lifecycle (except for the youngest cohorts, who are rarely, if ever, household heads). However, while inflows rise throughout much of adulthood, outflows peak around age 50 and decline thereafter.

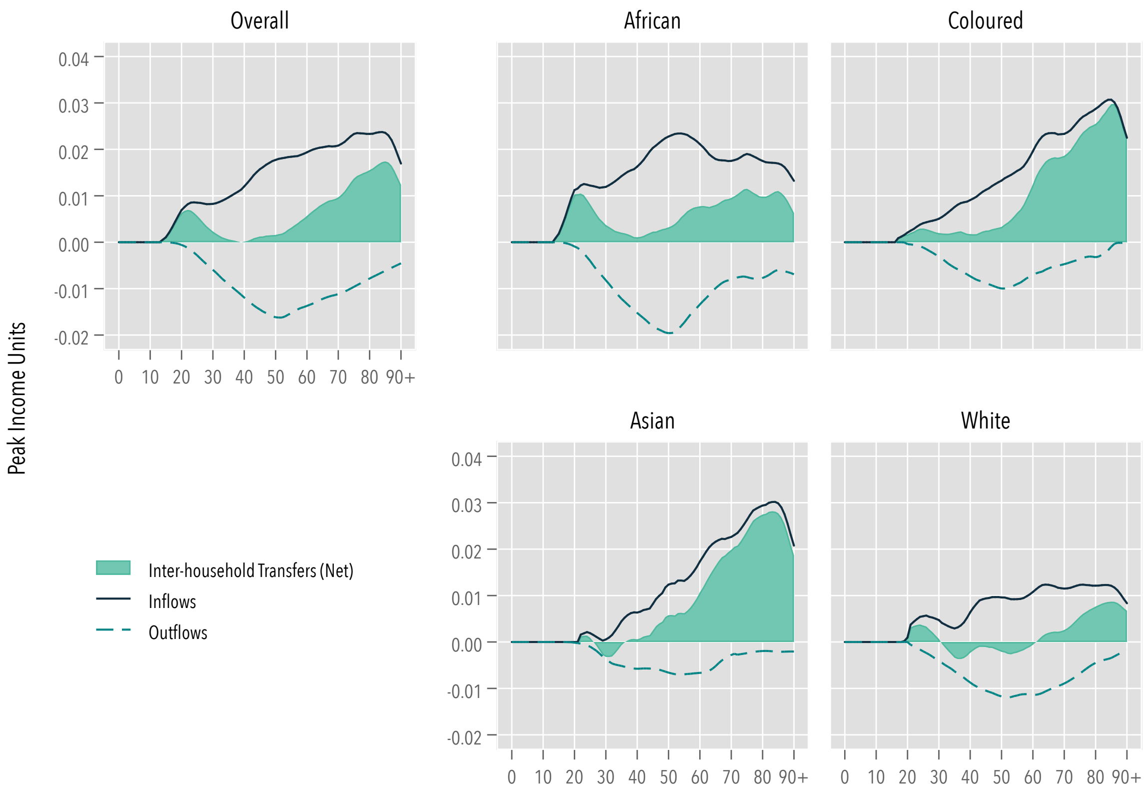


FIGURE 5.11. INTER-HOUSEHOLD TRANSFERS BY RACE, 2015

Notes: Profiles are normalised using group-specific labour income profiles.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

This general pattern does not, however, hold for each of the four race groups. While all four race groups see outflows rise during the working ages and peak at around age 50, it is clear that outflows for working age Africans are relatively large and persist into old age. Outflows at age 50 and age 80 are equivalent to 2.0 percent and 0.8 percent of African peak labour income respectively; for Coloureds, they are only 1.0 percent and 0.3 percent of Coloured peak labour income, and for Asians the figures are even lower. This suggests that inter-household transfer outflows may represent a greater burden for Africans than other race groups, despite these transfers being smaller in Rand terms for Africans, and is consistent with the notion of a 'black tax'.

In terms of inflows, there are two types of patterns. Coloureds and Asians are similar in that inflows rise more or less consistently with age until the early eighties, where they peak at just over three percent of their respective peak labour incomes. In contrast, amongst Africans and Whites, the correlation between age and the level of inflows is much weaker, with inflows relatively stable after age 40.

These various patterns of inflows and outflows give rise to unique patterns of net inter-household transfers for each race. Once again, the profiles for Coloureds and Asians are similar: net inter-household transfers are zero or very close to zero for cohorts under 45, but rise rapidly thereafter until the mid-eighties where they peak at close to three percent of peak labour income, before tapering off slightly. In contrast, all adult African cohorts experience net inflows, although these are negligible for cohorts in their thirties and forties. At their peak, net inflows are around one percent of peak labour income. For Whites, inflows are slightly positive for cohorts in their twenties and slightly negative for cohorts aged 32 to 60 years. Post-retirement cohorts see a steady rise in net inter-household transfer inflows until the mid-eighties, but never rise above one percent of peak labour income for Whites.

Inter-household transfers pale into insignificance, however, in comparison with intra-household transfers (Figure 5.12). For the population as a whole, net intra-household transfers are positive for cohorts under the age of 28 years, peaking at 32.1 percent of peak labour income at age 16. Net transfers are similarly positive for elderly cohorts and reach almost 19 percent of peak labour income by age 90. From age 28 to age 76, net intra-household transfers are negative (i.e. net outflows); at its peak, net outflows reach 44.1 percent of peak labour income. Given that intra-household transfers are a key mechanism for financing the consumption of dependent household members, it is not surprising that intra-household transfer inflows are substantial over the entire lifecycle, ranging between 13.7 percent and 48.9 percent of peak labour income. Intra-household transfer outflows are confined to adult cohorts and peak at over 70 percent of peak labour income for cohorts aged 47 to 54 years.

In contrast to inter-household transfers, the net intra-household transfer profiles for the four race groups follow broadly similar patterns, differing primarily in amplitude and timing of transitions between net inflows and net outflows. For each group, the young and the elderly receive net inflows, while working-age cohorts experience net outflows. The transition to net outflows, which occurs at age 28 for the population as a whole, occurs at the same age for Africans but occurs two years and one year earlier for Coloureds and Asians respectively, and one year later for Whites. Net inflows amongst children and young adults peak at 27.7 percent of peak labour income for Africans, 37.2 percent for Coloureds, 47.8 percent for Asians and 64.5 percent for Whites. These proportions are calculated using each group's own peak labour income, implying a much broader range for the per capita Rand values.

The transition back to net inflows, while similar for Coloureds, Asians and Whites around age 74, occurs a decade later for Africans at age 84. Further, while net inflows amongst these elderly cohorts average (unweighted) between 7.7 percent and 10.4 percent of own peak labour income for these three groups, for Africans the average is just 3.9 percent of own peak labour

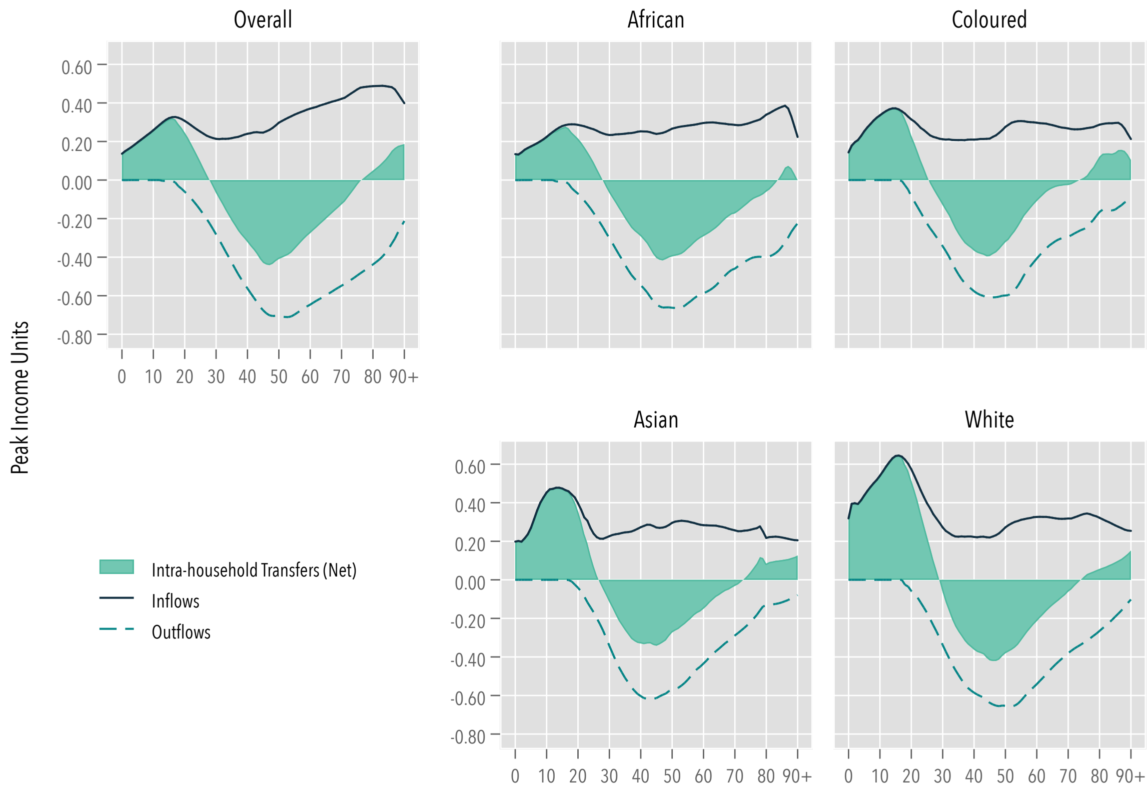


Figure 5.12. Intra-Household Transfers by Race, 2015

Notes: Profiles are normalised using group-specific labour income profiles.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

income. Thus, intra-household transfer inflows are short-lived and relatively small in magnitude amongst elderly African cohorts compared to those received by both young Africans and elderly Coloured, Asian and White cohorts.

The differences in net intra-household transfers across groups relate to differences in the patterns of inflows and outflows. Amongst young cohorts, cross-race differences are primarily the result of differences in inflows. Amongst older cohorts, however, the differences tend to be driven by differing patterns of outflows. In particular, the much more muted decline in outflows amongst African adults over the age of 70 underlies the late transition to and relatively small size of net intra-household transfer inflows amongst those elderly cohorts.

Figure 5.12 hints at the substantial flows of resources across age that occur within households. Using the NTA model of intra-household transfers (discussed in section 3.1), it is possible to map transfer flows by the age of the giver of the transfer and the age of the receiver (as per Lee and Donehower 2011). Plotting the magnitude of the transfers between each pair of ages generates a visual representation of the major patterns of intra-household resource flows, allowing a characterisation of the linkages between generations.

In constructing these matrices, only transfers made to finance consumption are included within the aggregate. This means that transfers of resources to household heads for the purpose of saving are excluded from consideration. The benefit of excluding this particular flow is that it removes confounding resource flows that exist in the transfer model but which may not appropriately reflect the situation in reality: it seems more plausible that saving occurs at the individual level where the surplus arises, rather than at the household level where it is performed by the household head. The matrices are based on the aggregate values of transfers between age-pairs; since these values are correlated with individuals' and households' access to resources, they are expressed as a proportion of total consumption-related intra-household transfers for the particular group. The choice of group-specific denominators is to allow a better comparison of the patterns of flows without them being obscured by magnitude differences.

Figure 5.13 details the magnitude of consumption-related intra-household transfers between age-pairs for the four race groups. The matrix for the total population is presented in Figure C.3 in Appendix C. Each graph has the age of the giver of the transfer on the vertical axis and the age of the receiver of the transfer on the horizontal axis; yellower shades reflect larger aggregate transfers, while bluer shades reflect smaller transfers. Reading from the vertical axis—say at age 50—reveals the transfers made by this cohort to every other cohort, while reading up from the horizontal axis reveals the transfers received by a cohort from every other cohort.

There are three main transfer patterns that might typically be discerned in this type of matrix. First, there may be a ridge along the diagonal, where the age of the giver of the transfer is similar to that of the receiver. This ridge is typically thought of as representing spouse-to-spouse transfers (Lee and Donehower 2011, pp.194-195), although individuals may not be spouses or partners. A second ridge may exist to the left of the first ridge, with givers typically 20 to 45 years older than receivers; this ridge represents parent-to-child transfers, although again the individuals may not be parents and children. This ridge is less likely to be at a 45 degree angle and, towards the extreme upper end, may increasingly represent grandparent-to-grandchild transfers. A third ridge may exist to the right of the first, where givers are a generation younger than the receivers, representing adult child-to-parent transfers and, potentially, adult grandchild-to-grandparent transfers.

For all four races, the spouse-to-spouse ridge is clearly discernible, beginning with cohorts in their early twenties. The ridge extends more clearly to older ages for Whites than for Africans, with those of Coloureds and Asians intermediate between them. This is the combined result of differences across groups in various factors, including life-expectancy, patterns of household formation and marriage rates amongst older cohorts.

While the parent-to-child ridge is also evident for all four groups, the origin of transfers to young Africans cohorts is much more diffuse as illustrated by the paucity of yellow-shaded areas. Thus, while the bulk of parent-to-child transfers for a given receiving cohort originate from a relatively narrow age range of givers amongst Whites, this age range is broader for Coloureds and substantially broader for Africans. In fact, compared with the other three groups, the parent-to-child ridge is far less distinct from the spouse-to-spouse ridge for Africans. This pattern of transfers is congruent with various aspects of African household formation described in the literature, including the relatively high prevalence of multi-generational and skipped generation households (Hall and Mokomane 2018) as well as the formation of households—and particularly the clustering of unemployed youth—around recipients of the old age grant (Klasen and Woolard 2009).

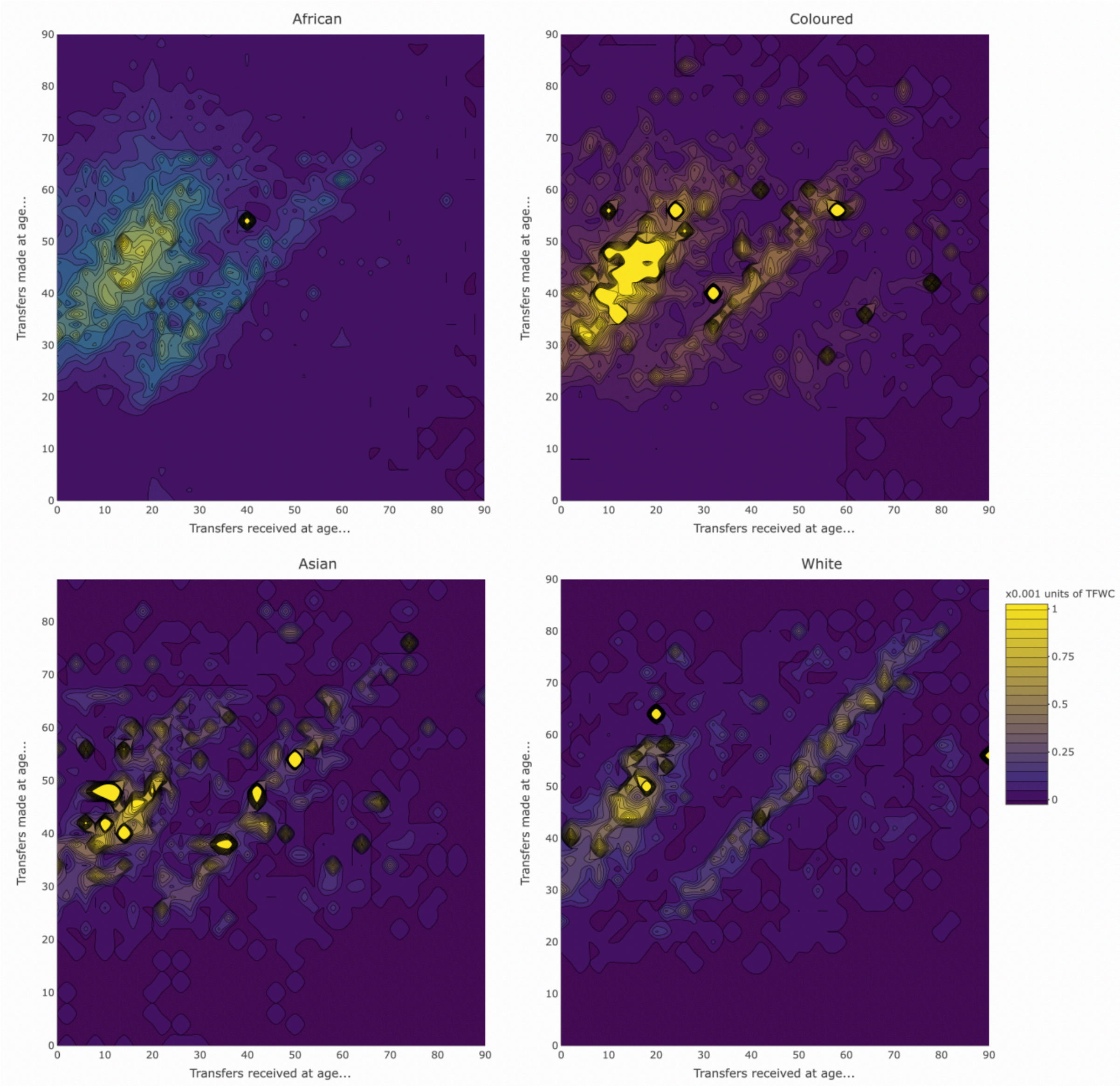


FIGURE 5.13. AGGREGATE INTRA-HOUSEHOLD TRANSFERS ACROSS AGE BY RACE, 2015

Notes: Flows are aggregated for the population and expressed relative to own-group total consumption-related intra-household transfers (TFWC). Flows are aggregated at two-year intervals (i.e. 46 intervals).
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

Amongst Coloureds and to some extent Asians, there is evidence of the existence of an adult child-to-parent ridge. This ridge is not discernible in the African and White matrices, though: in the case of Africans, this may be due to the prevalence of downward transfers illustrated by the very diffuse (grand)parent-to-(grand)child ridge, while for Whites it may relate to the relative scarcity of multi-generational households.[4]

[4] Although they focus on the distribution of children across household types, the results of Hall and Mokomane (2018) are indicative of the differences in the prevalence of different household structures across race. They find that 35 percent of children in South Africa reside in nuclear or single-parent households, while 62 percent reside in extended households, in which all members are related. These proportions are 32 percent and 66 percent for Africans, compared with 73 percent and 23 percent for Whites (Hall and Mokomane 2018, p.35).

5.5.4 Financing Consumption across the Life Course

Previous NTA estimates for South Africa suggest that assets are by far the most important source of financing of consumption amongst older cohorts. Based on the 2005 accounts, Oosthuizen (2015, p.27) estimates that asset-based reallocations accounted for 128.0 percent of their lifecycle deficit for cohorts aged 65 years and older; at the same time, this age group made net public transfers to younger cohorts equivalent to 1.0 percent of their lifecycle deficit and net private transfers of 27.0 percent. Asset-based reallocations were even more important for the 'younger elderly', accounting for 134.9 percent of the lifecycle deficit for 65-74 year olds.

This result is somewhat surprising given the country's socioeconomic context. High unemployment, informal employment and an historically weak policy emphasis on ensuring workers save for their retirement has meant that access to private pensions and retirement savings is not widespread amongst older cohorts. Poverty rates amongst the elderly have historically been higher than those of other adult cohorts—Statistics South Africa (2014a, p.29) show this to be the case in 2006 and, to a lesser extent, in 2009 and 2011—with the old age grant representing a key anti-poverty intervention by government. In the 2015/16 financial year, nearly 3.2 million individuals received more than R53.1 billion in old age grants (SASSA 2016, p.26). Total spending on the old age grant is estimated at 3.8 percent of households' consumption expenditure in 2014/15, with income from the old age grant received by the poorest 20 percent of households representing 28.5 percent of their consumption and 15.6 percent of consumption for households in the second poorest quintile (Oosthuizen 2017, p.21). Despite this, the 2005 accounts indicate net public transfer outflows for post-retirement cohorts.

The importance of asset-based reallocations for older cohorts continues in 2015. From the data presented in Table C.1, asset-based reallocations finance R315.3 billion (145.5 percent) of the R216.8 billion lifecycle deficit for cohorts aged 60 years and older, while this age group makes downward transfers through both public and private systems of R46.5 billion and R51.9 billion (21.5 percent and 24.0 percent of the lifecycle deficit).[5] However, given the substantial variation in the patterns of resource flows across race groups, it seems likely that this breakdown for the total population aged 60 years and older may mask important group-specific differences.

Figure 5.14 explores the changing balance between labour income, transfers and assets in financing consumption for ten-year age cohorts across the lifecycle using a ternary plot. At each point on the diagram, the shares of labour income, transfers and assets sum to 100 percent. The grey-bordered triangle contains all combinations where the three shares are all positive; outside of the triangle, either one or two of the shares is negative. The three vertices of the triangle represent points where one of the flows finances 100 percent of consumption and the other two are zero percent. For example, at the bottom lefthand vertex, the share of consumption financed by labour income is 100 percent, while transfers and asset-based reallocations are both zero; in the same way, transfers finance 100 percent of consumption at the bottom righthand vertex, while asset-based reallocations finance 100 percent of consumption at the top vertex. The negatively-sloped gridlines relate to labour income and are read on the lower horizontal

[5] Considering only cohorts aged 65 years and older, asset-based reallocations, net public transfer outflows and net private transfer outflows are equivalent to 121.1 percent, -11.9 percent and -9.3 percent of this group's lifecycle deficit in 2015.

axis; thus, the white dashed gridline going through the bottom lefthand vertex indicates all combinations where labour income equals 100 percent of consumption, while the white dashed gridline to the right—which coincides with the side of the triangle opposite the labour income vertex—indicates all combinations where the labour income share is zero. The positively-sloped gridlines are read off the upper horizontal axis and relate to transfers, while the horizontal gridlines are read off the vertical axis and relate to asset-based reallocations.

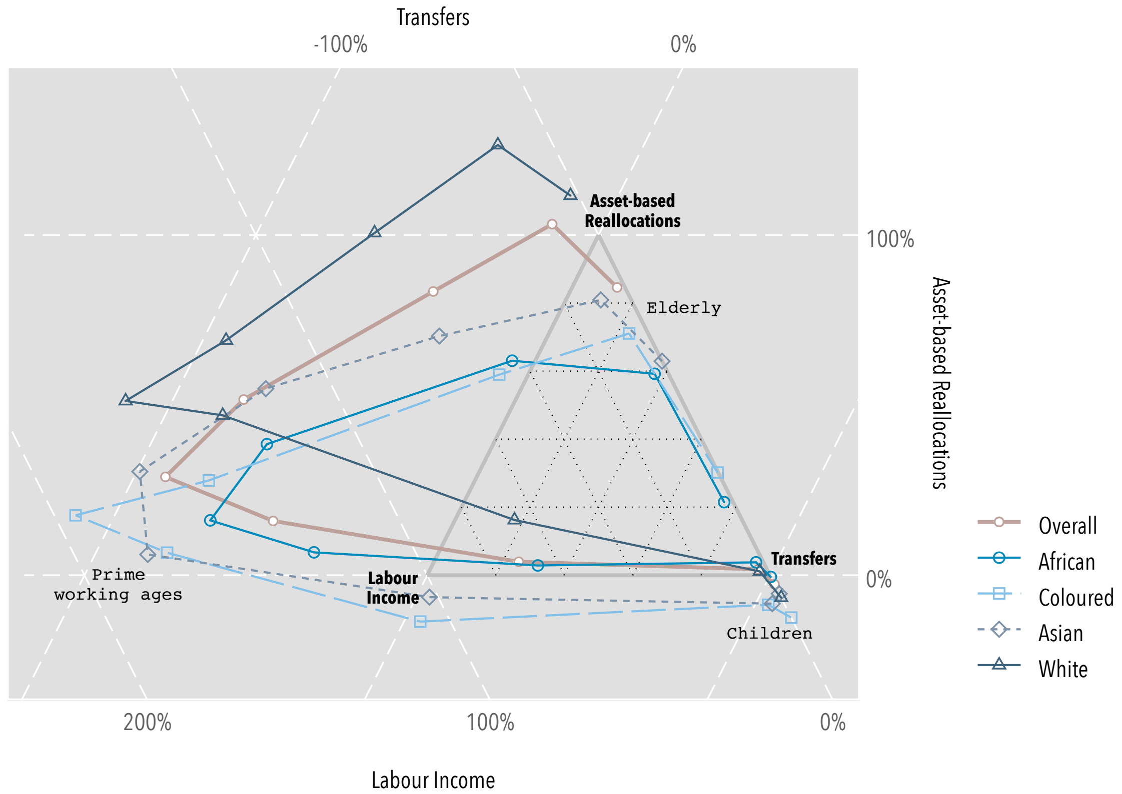


FIGURE 5.14. FINANCING OF CONSUMPTION ACROSS THE LIFECYCLE, 2015

Notes: Aggregate values calculated for ten-year age cohorts starting with 0-9 year olds and ending with those aged 80 years and above. At each point, the proportions of consumption financed by labour income, transfers and asset-based reallocations sum to 100 percent. The proportion financed by labour income is measured using the negatively-sloped gridlines, that by transfers is measured using the positively-sloped gridlines, and that by asset-based reallocations using the horizontal gridlines.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

With no labour income and minimal assets, children find themselves around the bottom righthand vertex implying that transfers more than fully finance their consumption. For the entire 0-9 year cohort, transfers finance 102.6 percent of consumption, with the excess saved. As cohorts move into the labour market, the importance of transfers declines in response to rising labour income: the share of transfers within consumption falls to 95.8 percent for 10-19 year olds and to 24.8 percent for 20-29 year olds, while that of labour income rises to 2.4 percent and 71.3 percent respectively. For the 40-49 year cohort, labour income accounts for 161.9 percent of consumption, while net transfers are negative (outflows) and equivalent to 90.8 percent of consumption. Across these cohorts, assets slowly increase as a share of consumption and this continues for older cohorts as labour income begins to decline in importance. Thus, assets account for 103.2 percent of consumption for the 70-79 year cohort, while labour income and transfers are just 12.0 percent and -15.1 percent respectively. For the oldest cohort—those aged 80 years and older—net transfers have turned positive (13.1 percent of consumption), while labour income is negligible (2.3 percent); the remaining 84.6 percent is accounted for by assets.

Each of the four race groups follows this broad pattern: total reliance on transfers as children, dominance of labour income during the prime working ages, and decline of labour income in old age. However, while the four race groups are clustered together as children, they quickly begin to diverge with age. Compared with the overall path, that of Coloureds and Asians tends to loop out further to the lower lefthand corner of the figure, while that of Whites loops out further to the top lefthand corner. For Coloureds and Asians, asset-based reallocations remain slightly negative while labour income increases, so that the 10-19 year and 20-29 year cohorts are located below the horizontal base of the triangle. In contrast, for Whites and Africans, asset-based reallocations are positive from the 10-19 year cohort onwards; for both groups the 10-19 year and 20-29 year cohorts are located within the area of the triangle.

By the 40-49 year cohort, there are substantial differences between the four groups. Labour income is most important for Coloureds, accounting for 193.8 percent of consumption, while it is least important for Africans at 155.2 percent. Asset-based reallocations are most important for Whites (51.2 percent of consumption), and least important for Africans (16.1 percent) and Coloureds (17.6 percent). Net transfers for all four groups are negative, with the largest proportional outflows observed for Whites (113.6 percent of consumption) and Coloureds (111.4 percent) and the smallest for Africans (71.4 percent).

As cohorts move into old age, the four groups continue to diverge. Asset-based reallocations increase relatively rapidly with age amongst Whites, peaking at 126.5 percent of consumption amongst 70-79 year olds, as labour income and net transfer outflows fall relative to consumption. Nevertheless, even for the oldest cohort, net transfers are negative (-14.0 percent of consumption). At the other extreme, labour income peaks at a much lower share of consumption amongst Africans and asset-based reallocations grow relatively slowly as cohorts move towards and beyond retirement age. Asset-based reallocations peak at just 63.1 percent of consumption for Africans in the 60-69 year cohort; the share falls marginally for those in the 70-79 year cohort (59.2 percent), but more than halves for the oldest cohort (21.5 percent). This sharp decline coincides with a rapid increase in the importance of transfers, from -6.7 percent of consumption for the 60-69 year cohort to 36.8 percent for the 70-79 year cohort, and to 75.9 percent for the cohort aged 80 years and older.

Analyses of systems of support are clearly hamstrung by reliance on a single set of national-level profiles. For young cohorts, Figure 5.14 reveals that the overall pattern of support is most similar to that of Africans, but for elderly cohorts it is most similar to those of Whites and Asians. Critically, the characterisation of the South African generational economy as one in which assets are the dominant source of financing of consumption amongst the elderly does not accurately reflect the diverse experiences of the four race groups.

Figure 5.15 explores the support systems in more detail, focussing on the financing of the lifecycle deficit (as opposed to consumption in Figure 5.14) for cohorts under 20 and those over

65. Here, the flows of interest are private transfers, public transfers (both net), and asset-based reallocations. These cohorts are characterised by relatively little labour income and, by switching to a focus on the lifecycle deficit, it is possible to split net transfers into its two very different components.

Whereas Figure 5.14 showed the four races clustered close together at young ages at the transfers vertex, once public and private transfers are separated from each other to focus on the financing of the lifecycle deficit the four groups are more dispersed. Asset-based reallocations remain negligible across all groups, but there is significant variation in the shares of private and public transfers. Overall, private transfers account for a gradually-increasing proportion around three-fifths of the deficit amongst young cohorts. For Africans, this proportion is around two-fifths, compared to around three-quarters for Coloureds, and around 90 percent and 100 percent for Asians and Whites respectively. The importance of familial (private) transfers in financing childhood lifecycle deficits therefore varies substantially by race with a range of approximately 60 percentage points separating the estimates for Africans and Whites. This finding echoes that of Mejía-Guevara (2015) for Mexico in 2004: within the highest socioeconomic status group, private transfers effectively account for 98 percent of the lifecycle deficit amongst those under the age of 20 years, compared with 45.2 percent for the lowest status group (own calculations based on Mejía-Guevara 2015, p.27).

For post-retirement cohorts, assets are initially very important in financing the lifecycle deficit. For the full cohort aged 66-67 years, asset-based reallocations are equivalent to 1.5 times the lifecycle deficit; this proportion is as high as 211.0 percent for Whites and just under 90 percent for both Africans and Coloureds. As age increases, there is a strong reduction in the share of asset-based reallocations, illustrated by the near-vertical paths follows by each of the groups and, at least initially, a relatively rapid increase in the importance of familial transfers. Indeed, all four groups transition from net private transfer outflows in their late sixties to net private transfer inflows by their early seventies or, in the case of Africans, their early eighties. For Coloureds, Asians and Whites, familial transfers peak amongst the very oldest cohorts at around one-third of the lifecycle deficit; for Africans the peak occurs at just 14.8 percent of the deficit.

There is also an increase with age in the importance of public transfers. Amongst Whites, for example, net public transfer outflows halve in size to 41.5 percent of the lifecycle deficit between the ages of 66-67 years and 80-81 years, while Asians shift from net outflows to net inflows over the corresponding cohorts. The increase is particularly strong during the eighties: across these cohorts, assets continue to decline in importance but the growth of familial transfers stalls, with all groups moving closer to the public transfers vertex.

The patterns for older cohorts are similar to the results for Mexico. For the Mexican population aged 65 years and above, asset-based reallocations are found to be equivalent to 140 percent of the lifecycle deficit in the group with the highest socioeconomic status compared to 54.5 percent in the lowest group; net public transfer inflows represent 17.1 percent and 56.7 percent respectively of the deficit, while net private transfers are negative (outflows) and equivalent to 44.2 percent and 11.2 percent respectively of the deficit (own calculations based on Mejía-Guevara 2015, p.27).

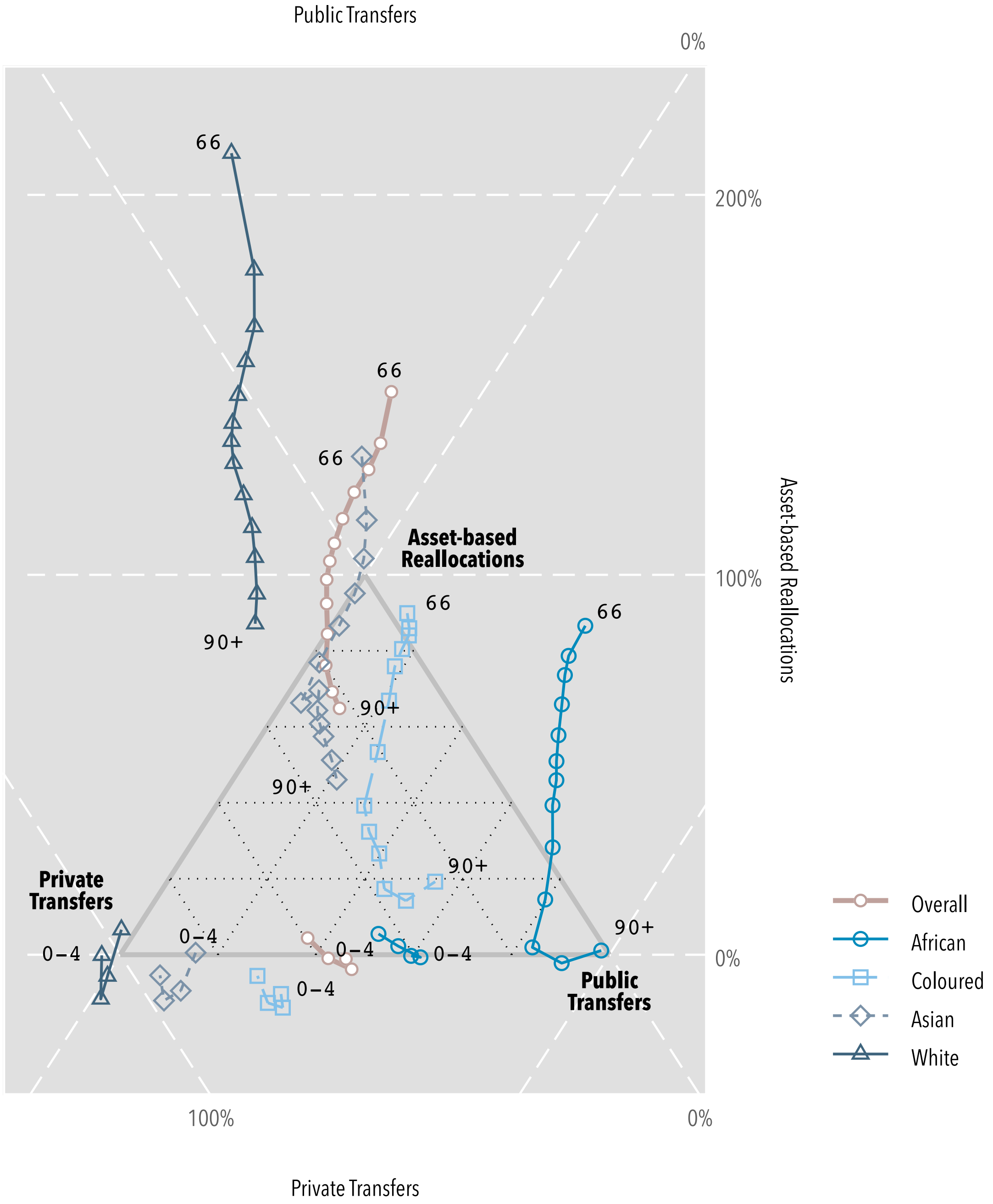


FIGURE 5.15. FINANCING OF THE LIFECYCLE DEFICIT AMONGST YOUNG AND ELDERLY COHORTS, 2015

Notes: Aggregate values calculated for five-year age cohorts under the age of 20, and two-year cohorts starting with 66-67 year olds and ending with those aged 90 years and above. At each point, the proportions of the lifecycle deficit financed by private transfers, public transfers and asset-based reallocations sum to 100 percent. The proportion financed by private transfers is measured using the negatively-sloped gridlines, that by public transfers is measured using the positively-sloped gridlines, and that by asset-based reallocations using the horizontal gridlines.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

5.5.5 The Direction of Intergenerational Flows

Section 5.5.4 has shown how labour income, private and public transfers, and asset-based reallocations vary across the life course in terms of their importance in financing consumption for different age cohorts. In this section, the focus shifts to measuring intergenerational resource flows, using the arrow diagrams first proposed by Lee (1994b). Lee introduces the concept of lifecycle wealth, which includes capital and transfer wealth, the latter defined as "the present value of expected transfers to be received in the future, minus the expected value of transfers to be made in the future" (Lee and Mason 2011c, p.35). Under specific circumstances—stable population, golden rule growth where the discount rate r equals the population growth rate n, no productivity growth—the per capita demand for lifecycle wealth can be expressed as:

$$W = c(A_c - A_{yl}) \tag{5.1}$$

where W is the per capita demand for lifecycle wealth, c is mean per capita consumption for the population, A_c and A_{yl} refer to the average ages of consumption and labour income for the stable population or "the average ages at which the average dollar is consumed and earned" (Patxot *et al.* 2012, p.451).

At the individual level, lifecycle wealth varies with age. At young ages lifecycle wealth is negative due to the support they receive from older generations; the support received can be thought of as a debt, which will be paid off when the young grow up and support succeeding generations (Lee and Mason 2011a, p.86). Given the forward-looking nature of lifecycle wealth, lifecycle wealth will typically turn positive for older cohorts. Per capita demand for lifecycle wealth, which is averaged across the entire population, may therefore be negative (implying downward transfers to younger cohorts, $A_c < A_{yl}$) or positive (implying upward transfers to older cohorts, $A_c > A_{yl}$). Given the NTA flow identity (equation 3.2), this transfer of resources across cohorts can be decomposed into flows that occur through private transfers, public transfers and asset-based reallocations.

Figure 5.16 presents estimates of lifecycle and transfer wealth arrows for South Africa and for each of the four race groups. In each case, the tail of the arrow designates the average age of the outflow (labour income, transfer outflows) and the point of the arrow denotes the average age of the inflow (consumption, transfer inflows); the width of the arrow represents the per capita inflow (per capita consumption, per capita transfer inflow), while the area of the arrow indicates lifecycle wealth. Both the per capita inflow and lifecycle wealth are expressed as a proportion of peak labour income (average of labour income for the population aged 30-49 years for each group). The upper panel presents estimates based on group-specific population age structures, while the lower panel uses the national population age structure for each of the groups so that differences between groups are solely due to differences in their NTA age profiles.

For the country as a whole, the average age of consumption is 33.8 years compared to 41.5 years for labour income, implying a downward transfer of output to younger cohorts. Across the full population, per capita consumption averages 57 percent of peak labour income (the annual flow in the figure), while per capita demand for lifecycle wealth is -4.41 years of labour income. The lifecycle wealth arrow for Whites is located at significantly higher ages and is shorter than

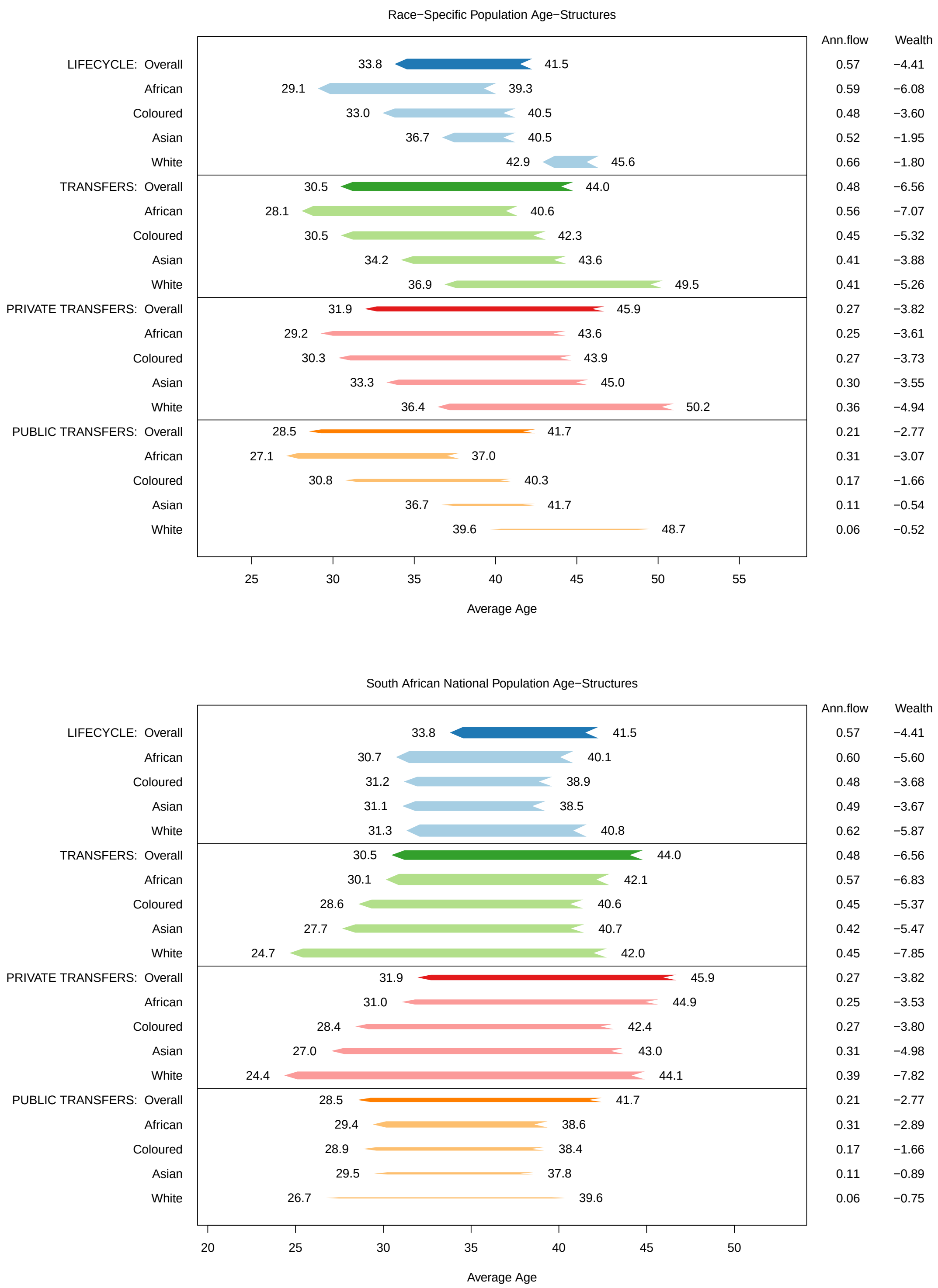


Figure 5.16. Lifecycle and Transfer Wealth Arrows, 2015

Notes: The tail of the arrow represents the average age of the outflow and the head of the arrow the average age of the inflow. The width of the arrow indicates the per capita inflow, while its area indicates lifecycle wealth, both of which are expressed relative to peak labour income for each group. The lower panel uses the national population age structure for all groups to remove the impact of the age structure on the arrows.

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

those of the other three race groups; conversely, that of Africans is located at younger ages and is substantially longer. This pattern aligns with the cross-country results presented by Lee and Mason (2011a, p.88): lower-income countries were found to have longer lifecycle wealth arrows that were generally located at younger ages (at least in terms of the average age of consumption). The African lifecycle wealth arrow is similar to that of the Philippines (average ages of consumption and labour income of 27.8 years and 38.5 years); the arrow for Whites is similar to that of the United States (average ages of consumption and labour income of 41.8 years and 44.0 years) (Lee and Mason 2011a, p.88).

Resources flow strongly downwards to younger cohorts through both private and public transfers. For private transfers, there is a 14.0 year difference between the average ages of inflows (31.9 years) and outflows (45.9 years), while the difference for public transfers is 13.2 years with the average ages of inflows and outflows being 28.5 years and 41.7 years. Private transfer wealth is estimated at -3.82 years of labour income, while public transfer wealth is -2.77 years of labour income. Thus, the average South African expects to make future private transfers in excess of future private transfers received equivalent to 3.82 years of labour income; similarly, on a per capita basis, future public transfers made are expected to exceed future public transfers received to the value of 2.77 years of labour income.

While the private transfer arrows are relatively similar across race in terms of average ages of inflows and outflows, the public transfer arrows are quite different. For Africans, the average ages of public transfer inflows and outflows are 27.1 years and 37.0 years, compared with 39.6 years and 48.7 years for Whites. The widths of the arrows (i.e. mean per capita annual inflow) differ across race groups, private transfer arrows being thickest for Whites and narrowest for Africans and vice versa for the public transfer arrows. Inter-group differences in the widths of public transfer arrows are, though, much larger than for private transfers with the result that mean per capita total transfer inflows are largest for Africans (56 percent of peak labour income) and narrowest for Whites and Asians (41 percent).

Constructing the arrows using the national population age structure for all groups removes the effect of demography and serves to reduce differences in the timing of each set of arrows. The lifecycle wealth arrows become very similar, with the average ages of inflows within 0.6 years of each other and of outflows within 2.3 years of each other. In fact, per capita lifecycle wealth for Africans and Whites is almost identical at -5.60 and -5.87 years of labour income respectively. For transfers, the arrows shift significantly with the arrows for Whites shifting leftwards and those for Africans rightwards. Removing the effect of the differing population age structures thus reveals the strength of downward transfers amongst Whites compared with the other groups: the average age of inflows falls from 36.4 years to 24.4 years for private transfers, and from 39.6 years to 26.7 years for public transfers. In contrast, the strength of downward transfers amongst Africans is muted with the average age of inflows rising by roughly two years for both private and public transfers. This effect is consistent with the patterns of transfer flows shown earlier, specifically relatively large inter- and intra-household transfer outflows at older ages.

5.6 Sub-Population Estimates and Projections

Given the extent of differences in the NTA profiles between South Africa's four race groups, a key question to ask is the extent to which projections using the national profiles may be biased. This is particularly important given the differences in the population age structures for the four groups. While Africans are estimated to account for 80.3 percent of the population in mid-2015, they represent 86.2 percent of the 0-4 year cohort compared to 55.1 percent of 80+ cohort; conversely Whites represent more than one-third (34.2 percent) of the 80+ cohort, compared to just 4.1 percent of the 0-4 year cohort and 8.3 percent of the overall population (own calculations, Statistics South Africa 2018b).

The estimation of the first demographic dividend is one such projection that may be potentially biased and which is increasingly referenced in policymaking. As discussed in section 4.4.1 (equation 5.2), the first demographic dividend is estimated as the rate of change of the (economic) support ratio (SR), which is defined as:

$$SR_t = \frac{L(t)}{N(t)} = \frac{\sum_{a=0}^{\bar{\omega}} \gamma(a)P(a,t)}{\sum_{a=0}^{\bar{\omega}} \phi(a)P(a,t)} \tag{5.2}$$

where $\gamma(a)$ and $\phi(a)$ are respectively the per capita labour income and consumption age profiles, and $P(a,t)$ is the population by age in year t. Accounting for sub-groups, denoted by j, equation 5.2 can be rewritten as:

$$SR_t = \frac{L(t)}{N(t)} = \frac{\sum_{j=1}^{J} L(t)}{\sum_{j=1}^{J} N(t)} = \frac{\sum_{j=1}^{J}\sum_{a=0}^{\bar{\omega}} \gamma_j(a)P_j(a,t)}{\sum_{j=1}^{J}\sum_{a=0}^{\bar{\omega}} \phi_j(a)P_j(a,t)} \tag{5.3}$$

Unfortunately, Statistics South Africa does not publish longer-term population projections by race and it is therefore not possible to estimate the first demographic dividend more than five years into the future using official statistics. Instead, a demographic dividend is simulated using population data from countries with population age structures similar to those of the four race groups in 2015. To do this, correlation coefficients are calculated of the 2015 population age structures for all of the countries for which the United Nations (2017) published estimates (excluding South Africa) and the official estimates of the 2015 age structures for each of the four race groups. For Africans, the closest match is Botswana; for Coloureds it is Suriname; for Asians it is Trinidad and Tobago; and for Whites it is the Netherlands. For each country in each year between 1990 and 2100, a ratio is calculated of the population in each age cohort to the population in the corresponding cohort in 2015. These ratios are then applied to the 2015 population age structures for the four race groups, with the resulting age cohort totals in each year adjusted multiplicatively to match the United Nations (2017) data.

The result is a set of population projections for four groups that are consistent with the

UN projections for South Africa and that, in 2015, are very similar to the population age structures of the country's four race groups. Combined with the race-specific labour income and consumption profiles, it is then possible to simulate a support ratio separately for each of the four groups, as well as for country as a whole. The simulation presented below should, however, not be viewed as an actual estimate of the first demographic dividend for South Africa using sub-group information since, although the 2015 population age structures for the chosen countries are similar to those of South Africa's four race groups, there is no evidence to suggest that their trajectories have been or are likely to be similar over time. Instead, the simulation represents a thought experiment to assess the difference between a first demographic dividend calculated using national-level profiles and national-level population projections, and one calculated using sub-group profiles and sub-group population projections that are consistent with the national-level estimates.

Figure 5.17 presents estimates of the support ratio and first demographic dividend for South Africa for the 1990-2100 period, using the national-level population projections and NTA profiles. These baseline estimates are compared to a support ratio and demographic dividend calculated from the race-specific NTA profiles and the set of four population projections described above.

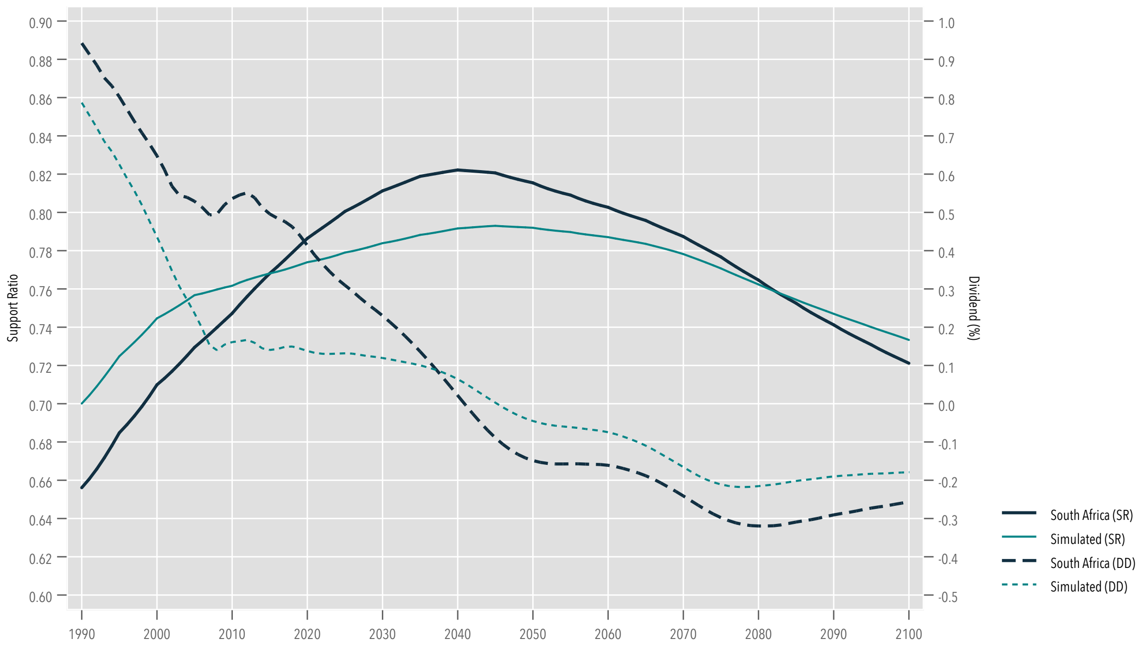


Figure 5.17. Support Ratios and Demographic Dividends, 1990-2100

Notes: The simulated support ratio and demographic dividend are for illustrative purposes only. Underlying group-specific data for the simulated support ratio and dividend are completely consistent with those underlying the baseline estimates.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

It is clear from the figure that the simulated support ratio and demographic dividend are quite different from the baseline estimates, although they do follow similar trends. The baseline support ratio is lower than the simulated support ratio prior to 2015 and after 2082 and, while the gap is relatively small in absolute terms, it averages 5.0 percent of the baseline support ratio from 1990 to 2008 and 3.0 percent from 2020 to 2060. However, from the demographic dividend estimates it is clear that it is possible for the dividend to be over- or underestimated by a significant margin. For example, for the 2005-2025 period, the gap between the baseline and simulated dividends averages 0.31 percentage points, or two-thirds of the baseline dividend. Further, given the varying slopes it may be possible to incorrectly identify the timing of the positive first dividend period substantially, even by decades.

5.7 Distribution of Aggregate Controls by Race

The distribution across the four race groups of the aggregate flows described in the set of National Transfer Accounts for South Africa for 2015 is presented in Table 5.3. The aggregate flows in Rand terms presented in the 'Overall' column correspond with those presented in Table 5.2. In the final row of the table, the racial composition of the population is provided.

Table 5.3. Aggregate Controls and Distribution across Race, 2015

Flow		**Overall**	**Proportion (%) attributable to...**			
		R bil	African	Coloured	Asian	White
Labour income	**YL**	**2 166.5**	**51.7**	**10.8**	**5.5**	**32.0**
Employment earnings	YLE	1 945.8	52.0	11.3	5.3	31.4
Self-employment earnings	YLS	220.7	49.2	6.9	6.5	37.3
Consumption	**C**	**2 820.5**	**57.9**	**8.6**	**4.1**	**29.4**
Private consumption	CF	1 991.6	47.6	8.8	4.8	38.7
- Education	*CFE*	*69.9*	*50.9*	*9.8*	*5.7*	*33.6*
- Health	*CFH*	*135.0*	*33.7*	*12.2*	*3.5*	*50.6*
- Other	*CFX*	*1 786.7*	*48.6*	*8.5*	*4.9*	*38.0*
Public consumption	CG	828.9	82.4	8.2	2.4	7.0
- Education	*CGE*	*204.6*	*83.8*	*7.8*	*2.0*	*6.4*
- Health	*CGH*	*120.8*	*89.2*	*5.7*	*2.4*	*2.7*
- Other	*CGX*	*503.5*	*80.2*	*8.9*	*2.5*	*8.3*
LIFECYCLE DEFICIT	**LCD**	**654.0**	**78.2**	**1.3**	**-0.4**	**20.9**
REALLOCATIONS	**R**	**654.0**	**78.2**	**1.3**	**-0.4**	**20.9**
Transfers	**T**	**-33.5**	**-960.7**	**33.6**	**79.4**	**947.6**
Private transfers	TF	12.8	126.5	29.4	-7.3	-48.6
- Inflows	*TFI*	*1 346.5*	*51.4*	*10.2*	*5.1*	*33.3*
- Outflows	*TFO*	*1 333.8*	*50.7*	*10.0*	*5.2*	*34.1*
Public transfers	TG	-46.3	-661.1	32.5	55.5	673.1
- Inflows	*TGI*	*1 034.7*	*82.3*	*8.4*	*2.3*	*6.9*
- Outflows	*TGO*	*1 081.0*	*50.5*	*9.5*	*4.6*	*35.4*
Asset-based reallocations	**RA**	**687.6**	**27.5**	**2.9**	**3.5**	**66.1**
Private ABR	RAF	746.9	29.3	3.4	3.6	63.7
- Private asset income	*YAF*	*902.2*	*42.5*	*6.8*	*4.3*	*46.4*
- Private saving	*SF*	*155.3*	*106.0*	*23.1*	*7.8*	*-36.9*
Public ABR	RAG	-59.3	50.4	9.4	4.6	35.5
- Public asset income	*YAG*	*-109.9*	*50.4*	*9.4*	*4.6*	*35.5*
- Public saving	*SG*	*-50.6*	*50.4*	*9.4*	*4.6*	*35.5*
Population		**55.3 mil**	**80.2**	**8.9**	**2.5**	**8.3**

Notes: Proportions in rows sum to 100.

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

The extent of inequality in South Africa is reflected in the low shares of labour income and consumption—particularly private consumption—accounted for by Africans: while the group accounts for four-fifths of the country's population, it accounts for just over half of total labour income (51.7 percent) and less than half of private consumption (47.6 percent). In contrast, Whites account for almost one-third of labour income (32.0 percent) and almost two-fifths of private consumption (38.7 percent), while representing just 8.3 percent of the national population. The equalising impact of public consumption is clearly evident—82.4 percent of public consumption accrues to Africans, while 7.0 percent accrues to Whites—with shares roughly corresponding to population shares. The disaggregation also reveals the extent of inequality in the consumption of health as higher income groups opt out of the public system. Almost 90 percent of public consumption of health accrues to Africans compared to 2.7 percent for Whites; in contrast, Whites account for 50.6 percent of private consumption of health compared to Africans' one-third share (33.7 percent). Both Coloureds and Asians also account for relatively large shares of the private consumption of health considering their population shares.

Asians are the only group that generate a lifecycle surplus in aggregate terms, although it is admittedly only estimated at R2.5 billion or 0.4 percent of the aggregate lifecycle deficit. Like Asians, Coloureds are close to having consumption and labour income in balance. The national lifecycle deficit of R654.0 billion is therefore almost entirely attributable to Africans (78.2 percent) and Whites (20.9 percent), with the latter group's share roughly 2.5 times their population share.

In aggregate terms, Africans receive net transfer inflows through both public and private mechanisms. While private transfer inflows and outflows are distributed in roughly the same proportions across race groups as labour income, public transfer inflows are distributed similarly to public consumption with Africans receiving 82.3 percent of inflows. Public transfer outflows, on the other hand, more closely reflect the labour income distribution with Whites, Asians and Coloureds each accounting for relatively large shares of the total. Private asset income is even more skewed towards Whites, who account for 46.4 percent of the total, with Asians accounting for 4.6 percent of the total which is almost twice their population share. In contrast, though, Africans account fully for total saving with dissaving amongst the ageing White population offsetting the saving by Coloureds and Asians.

5.8 Discussion and Conclusion

The purpose of this research has been to answer three key questions. First, to what extent does the economic lifecycle differ across race groups in South Africa? Second, how do the systems of intergenerational flows differ across groups within South Africa, and what are the implications of these differences? Third, what are the implications of these results for the construction of NTAs in high-inequality countries?

The results presented above have clearly demonstrated marked differences in the economic lifecycles of South Africa's four race groups. Depending on the profile, these differences are evident in the levels of the profiles, their shapes, or the transitions between surplus and deficit. The stark inequalities that characterise the South African economy are mirrored in the labour income profile for Whites that peaks at over R300 000 per capita per annum compared to a peak of R70 000 for Africans, and in the fact that the (unweighted) average per capita consumption for cohorts above the age of 20 for Africans is just over one-fifth of that of Whites.

Once sub-population profiles are normalised by own-group peak labour income, differences in the shapes of the profiles are discernible. Thus, for example, the labour income profiles for Asians and Coloureds are skewed slightly towards younger ages compared to the national profile, with declines in labour income occurring at older ages for Whites than for any of the other groups. These normalised profiles were also used in the analysis of private transfers within and between households, revealing the large inter-household transfers relative to peak labour income made by African adults essentially from their forties onwards, as well as the existence throughout adulthood of per capita inter-household transfer inflows of 1.0 percent to 2.5 percent of peak labour income amongst African cohorts. While intra-household transfer outflows peaked at similar levels relative to own-group peak labour income for all four race groups, the profiles reveal substantially larger per capita outflows amongst elderly African cohorts compared with their peers in other race groups.

It should not come as a surprise, given what we know about inequality in South Africa, that the patterns of intergenerational support differ markedly by race. Overall, as was illustrated in Figure 5.16, resources flow strongly downwards in South Africa, with differences between the races in mean ages of inflows and outflows largely driven by differing population age structures. This downward flow of resources is also observed in terms of both private and public transfers. Transfer wealth is negative for all groups, indicating that the expected value of transfers made in the future is greater than that of transfers received in the future. However, the composition of this transfer wealth differs between race groups: the vast majority of transfer wealth for Whites is in the form of private transfer wealth, while for Africans private transfer wealth accounts for just over half of the total, highlighting the importance of the public sector in facilitating the transfer of resources across ages for poorer groups.

This relative importance of public transfers for Africans in particular is illustrated in Figure 5.15 for both young and old cohorts. For African children, public transfers finance around three-fifths of the lifecycle deficit compared to around two-fifths for Coloured children and virtually nothing for White children. This is not to say that White children receive nothing at all through public transfers; rather, their public transfer inflows are roughly balanced with their public transfer outflows, largely due to taxes generated on their private consumption. For the elderly, this reliance on government is even more pronounced: public transfers finance the lifecycle deficit amongst the oldest Africans almost entirely, while accounting for just under three-fifths of the deficit amongst their Coloured counterparts. These findings provide further evidence for the importance of social assistance—and specifically the old age grant—in supporting consumption and living standards amongst the elderly in South Africa.

Relatedly, the estimates highlight the extent to which the balance between private and public consumption varies between race groups and across age. Public consumption accounts for a relatively large share of per capita consumption for children and the elderly; lower shares for working age cohorts are the result of both lower absolute levels of public consumption in these ages due to low consumption of education and health driven by differences in access or utilisation rates, and higher absolute levels of private consumption. Public consumption accounts for 50 percent to 70 percent of per capita consumption for African children and teenagers and between 50 percent and 60 percent for Africans over the age of 75. While this pattern is echoed in the other three race groups, for Whites the ranges are between 9 percent and 17 percent for cohorts under 20 and 6 percent to 8 percent for cohorts over 75.

The public sector is clearly a critical component of South Africa's generational economy, serving to mediate large flows of resources across age and, importantly, between groups. The disaggregation of the aggregate controls in Table 5.3 reveals that, with public transfer inflows and outflows almost balanced in aggregate, Africans receive 82.3 percent of the inflows and contribute 50.5 percent of the outflows. There are two points worth making here. First, it should be recognised that Africans are responsible for a sizeable proportion of public transfer outflows, equivalent to almost two-thirds of the public transfer inflows they receive as a group. Second, this balance of flows is entirely to be expected where fiscal tools are used in a progressive manner to address the worst excesses of poverty and inequality.

The financing of the lifecycle deficit amongst elderly cohorts is important for understanding the potential for realising the second demographic dividend. As already discussed, wealth may be accumulated in two forms, namely capital and transfer wealth. Reliance on asset-based reallocations implies the accumulation of assets (capital) by working-age cohorts, which may generate income or be liquidated to finance the lifecycle deficit in retirement. These assets may be accumulated domestically or abroad, and will have a positive impact on economic growth through higher labour productivity. The second demographic dividend arises as relatively large cohorts approach retirement, the point at which their assets accumulated for retirement are at their peak, accentuating the labour productivity enhancing effect and potentially raising living standards permanently. Reliance on transfers, whether public or private, to finance the lifecycle deficit in old age generates (positive) transfer wealth. Transfer wealth, however, has no direct positive impact on the economy, instead implying a burden on future generations to fund the consumption of older generations. Controlling for the level of aggregate wealth, societies that finance the old age lifecycle deficit through the accumulation of transfer wealth—countries with state pensions funded from tax revenue such as many in Europe, and those where there is strong reliance on younger family members such as Taiwan and several other south-east Asian countries (Lee and Mason 2011a, pp.93-94)—find themselves in a weaker position to harness a second demographic dividend compared with those where the deficit is financed through assets.

At the national level, South Africa's NTA profiles suggest that the country is well-positioned to harness a second demographic dividend: asset-based reallocations are equivalent to nearly 145 percent of the lifecycle deficit for cohorts aged 60 years and above. However, the evidence suggests that the likelihood of a second dividend may be overstated: the group for which asset-based reallocations are most important relative to the lifecycle deficit (Whites) is also the group with the oldest population age structure, while the group most reliant on transfer wealth (Africans) has the youngest population age structure. In fact, given the age structure of the White population, it seems plausible that Whites are already generating a second dividend.

The findings have raised a number of issues pertinent for the construction and analysis of NTAs in high inequality settings. The first is that national level profiles can be distorted by a combination of economic inequality and demographic differences. This is clearly evident in the unconventional shape of South Africa's consumption profile in terms of which per capita consumption increases considerably over the course of adulthood instead of the relatively stable consumption levels observed in other countries. In contrast, race-disaggregated consumption profiles, however, follow the more conventional pattern (see Figure 5.3 with the national profile the result of a rising proportion of Whites in older cohorts. The result is that, while the national profile may be representative of the national population, it is not necessarily representative of any of the sub-populations of interest. Further, patterns observed nationally may not easily be reconcilable with the evidence due to this phenomenon, as is the case for the national pattern of financing of the lifecycle deficit for elderly cohorts, which is dominated by asset-based reallocations. Relatedly, these national-level patterns may lead to incorrect policy conclusions, such as seems to be the case for South Africa's second demographic dividend.

The same type of compositional effect that causes this distortion in the national consumption profile is relevant when it comes to projections of static national-level NTA profiles into the future. Section 5.6 tried to assess the impact of inequality on the accuracy of projections of the support ratio and first demographic dividend by comparing estimates constructed at the national level to estimates constructed from sub-population profiles and population projections. While longer-term population projections by race are not available, the results presented in Figure 5.17 are indicative of the potential for distortion. South Africa's first demographic dividend is not particularly large over the period for which estimates are presented; nevertheless, the simulated dividend averaged just one-third of the dividend calculated from the national profiles. There is therefore clear potential to over- or under-estimate the magnitude of the demographic dividend, or to incorrectly identify the period during which the country is expected to enjoy the dividend.

In countries characterised by stark inequalities, therefore, the construction of sub-population NTAs would appear to have the potential to add significant value in terms of the interpretation and understanding of the national-level accounts.

Chapter 6

Gender, Household Production and National Transfer Accounts

6.1 Introduction

Amongst other things, National Transfer Accounts quantify resource flows within and between households, allowing researchers to gauge the magnitude of resource flows within households. It is clear that these flows are substantial, with private intra-household transfers in South Africa estimated to be roughly 60 percent of labour income in 2015 (own calculations based on 2015 NTA profiles). However, these flows represent only a portion of the true extent of resource transfers within households. What is missing from the NTA estimates is an accounting of the non-market services—such as cooking, cleaning and care of children—that are produced daily in significant quantities in households in every society.

Unpaid work is critical to the functioning of the economy, regardless of the particular economic system. As Chadeau (1985, p.237) notes, "[unpaid] labour performed by and for the benefit of household members is unquestionably the source of economic values and a condition for social survival". Antonopoulos (2008) argues that unpaid work can be thought of us a subsidy made by households to the business sector, and as a subsidy to the state. In the absence of unpaid work, households would need to pay for these services; thus unpaid work lowers the cost of labour and subsidises the market. Various types of unpaid work also overlap with the services that should arguably be provided by the state. However, unpaid work is completely overlooked in conventional economic measures, rendering unpaid work invisible from an economic perspective and diminishing the value placed on such work by society.

The past few decades have seen growing interest in quantifying unpaid work and developing measures that more accurately reflect total production. Thus, we have seen the proliferation of time-use studies that value household production and the development household satellite accounts, which directly incorporate household production within a national accounting framework. More recently, the importance of unpaid work has been recognised in the United Nations' Sustainable Development Goals (SDG). Within SDG5 ("Achieve gender equality and empower all women and girls"), Target 5.4 explicitly focuses on unpaid work—"Recognise and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate" (United Nations 2015)—thus providing impetus at the supranational level for more careful and systematic consideration of unpaid work.

Beyond the issues of gender equity, the incorporation of unpaid work into policy development and assessment is crucial for efficient and effective policy. Himmelweit (2002) argues that non-market work should be considered alongside market work in analyses of the impact and effectiveness of policy. While acknowledging the equity considerations that would support such an approach, her argument is that, by ignoring unpaid work, policy effectiveness may suffer due to the strongly interlinked nature of the paid and unpaid economies, and the existence of strong patterns of specialisation by gender. Similarly, Esplen (2009) argues that policymaking that aims to support greater economic participation by women must be informed by an understanding of the interlinked nature of paid and unpaid work.

From a generational economy perspective, consideration of unpaid work is essential, particularly where gender is a variable of interest. The response from the NTA network has been the development of National Time Transfer Accounts, which aim to quantify household production, consumption and transfers across the lifecycle by gender. This is important for various reasons. Sambt *et al.* (2016, p.252) note that "[accounting] for household production is essential for better evaluation of production and consumption within the whole economy and without it we do not have an accurate measure of household economic growth and overall well-being". Kluge (2014, p.708) argues that specialisation by males and females in paid and unpaid work respectively "result in considerable transfers of time and money within households"; a focus purely on monetary transfers would therefore limit our understanding of dependency within a generational context. Finally, in the context of substantial investments by families, women in particular, in the human capital of children mean that incorporating unpaid work is "crucial to make the resources flowing to children, and women's total economic contribution, more visible" (Vargha *et al.* 2017, p.930).

Finally, consideration of unpaid work and its linkages with paid work is important in the context of the increase in female labour force participation that has occurred over the past several decades in many countries around the world. In South Africa, this process of the feminisation of the labour force has been documented by Casale and Posel (2002). However, Folbre (2006, p.184) notes that this "[increased] participation in paid employment is often purchased at the expense of time once devoted to personal care, sleep and leisure"; this is more likely to be the case in contexts where norms and institutions do not adapt sufficiently quickly to changes in women's labour force participation. Thus, this popular policy objective may have significant negative consequences for women. At the same time, this transition of women from the unpaid to the paid economy biases estimates of economic growth using conventional macroeconomic aggregates such as GDP upwards. As Esplen (2009, p.41) notes, "[Assigning a monetary value to unpaid work] makes evident the fact that care work does not come without financial costs, and that some policy prescriptions show gains only because they do not incorporate all of these costs, including the costs of unpaid care".

The focus of this chapter then is on analysing the generational economy in South Africa from a gender perspective, while expanding the traditional NTA notion of 'production' to include non-market work. However, instead of presenting results for the profiles corresponding to the full NTA identity (equation 3.2), I consider only the flows that comprise the lifecycle deficit—labour income and consumption—and the corresponding NTTA profiles. These estimates are the first such estimates for South Africa, and one of the first on the continent.

Specifically, this chapter seeks to address three key questions. First, what are the gender-specific patterns of household production over the lifecycle, in both temporal and monetary terms? Second, what is the total economic contribution, including household production, of males and females and how much of this is accounted for by household production? Third, what do these profiles of household production and consumption imply for demographic dividends and the potential for a gender dividend?

6.2 Gender Differences in Labour Income and Consumption in 2010

NTA profiles reflect general patterns of behaviour that exist within societies. Thus, to the extent that behaviour varies across across groups, disaggregations of the average profiles will begin to reveal these behavioural differences. Disaggregation of labour income profiles by gender, for example, reveals the extent to which labour market engagement and labour market outcomes vary by gender. In all countries for which there is data, mean labour income for males is typically higher than that of females at every age. South Africa is no exception.

Figure 6.1 presents overall and gender-disaggregated labour income and consumption profiles for South Africa for 2010. Values are expressed relative to 'peak labour income', following NTA convention, by dividing all values by the unweighted mean of labour income between the ages of 30 and 49 years.

Labour income follows the typical bell-shaped profile, with very little labour income amongst children and the elderly. At age 20, labour income is still less than 20 percent of peak labour income, but it rises rapidly to pass 80 percent by age 31, and 100 percent by age 39. Between the ages of 39 and 55 years, labour income remains above one, but begins to drop sharply during the late fifties. By age 65, labour income is just 40 percent of peak labour income and 19 percent at age 70.

Consumption generally rises once children reach school-going age, levels off during the late teens and twenties, and gradually rises thereafter. Infants (under the age of one year) consume the equivalent of 35 percent of peak labour income and, although it falls slightly for toddlers, it rises sharply at age six as children start entering the education system in significant numbers. Rising per capita consumption with age is observed over most of adulthood, a feature of the South African generational economy that was highlighted and discussed in section 5.

The extent of gender specialisation in market work is clear. While per capita labour income is very similar for younger males and females, a gap begins to emerge in the mid-twenties and, by age 40 is substantial. This gap only really narrows at very old ages when relatively few individuals remain active in the labour market. At age 25, mean labour income for males is only 3.4 percent of mean labour income for 30 to 49 year olds (or 0.034 income units) higher than that of females. However, by age 35, the gap has widened to 14.5 percentage points and

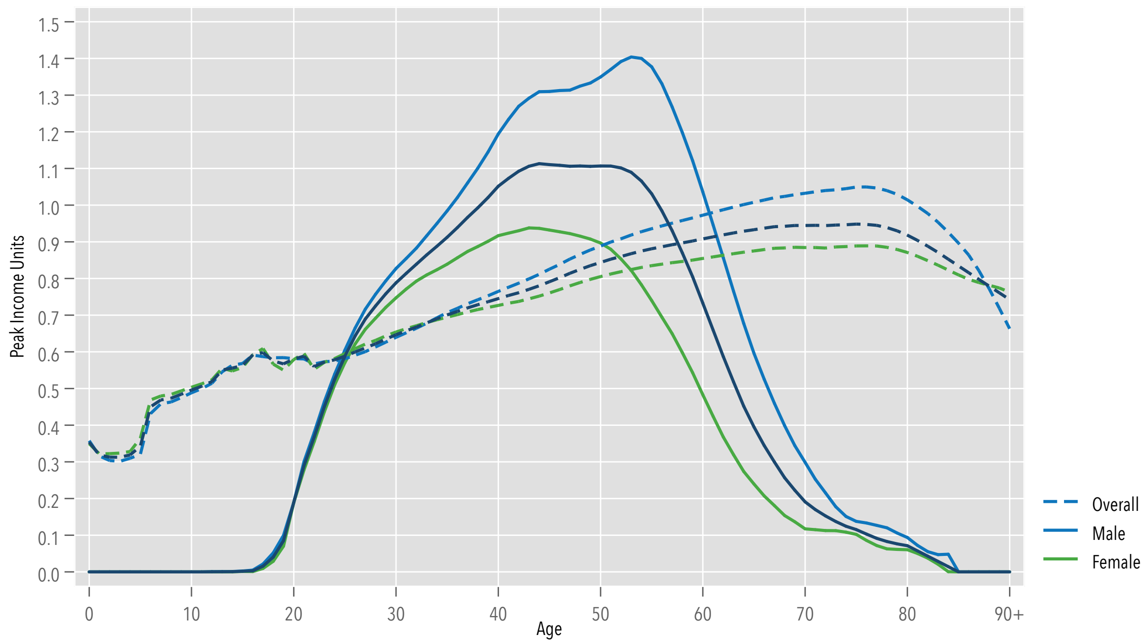


Figure 6.1. Labour Income and Consumption across the Lifecycle by Gender, 2010

Notes: Profiles are standardised by dividing through by the average labour income for 30 to 49 year olds ('peak labour income'); this average equals one income unit.
Source: Own calculations, Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2010a, 2011, 2013a); UNESCO (2018); United Nations (2017); World Bank (2018b).

is 27.7 percentage points by age 40. The gap peaks at over 60.0 percentage points during the mid-fifties, but is still 18.1 percentage points at age 70, which is between five and ten years beyond common retirement ages.

For consumption, the differences are far more muted. Consumption is very similar for males and females up to the mid-thirties, after which a relatively small gap favouring males emerges. At its peak during the seventies, mean per capita consumption for males is estimated to be just over 0.150 peak income units. Although the methods for disaggregating consumption within households between males and females are not particularly robust, this finding is congruent with poverty results for South Africa: adult women are found to reside in poorer households than their male counterparts, while this difference is not evident for children (Rogan 2015; World Bank 2018a).

What is clear from Figure 6.1 is that men and women differ substantially in the extent to which labour income exceeds consumption during the prime working ages. The lifecycle surplus—where labour income exceeds consumption—is larger in absolute terms for males than for females and lasts longer. This difference in the ability of men and women to generate lifecycle surpluses highlights the need to include unpaid household production in these estimates in order to derive a more comprehensive picture of production and consumption and, by extension, of dependency.

6.3 The Allocation of Time across the Lifecycle

In constructing the NTTA, the focus is on the distinction between market work and non-market work and, while a variety of activities are distinguished within non-market work or household production, they are categorised into housework and care. Housework includes all household production that is not care-related; in other words, activities such as cooking, cleaning and household maintenance. Care work includes care of children and adults within the household, as well as care for non-household members and volunteer work.

The focus of this section is on time allocations. Carrasco and Serrano (2011, p.65) point out three advantages of analysing differences between males and females in terms of temporal units. First, analyses of time use readily reveal gender disparities, and at the same time enable the consideration of changes over the lifecycle. This is a particular strength of NTTA. Second, since no reference is needed to wages or other market values, time-based analyses are immune to biases related to issues such as wage discrimination. Finally, there is no need to rely on "inferred measurements", while analyses over time are not impacted by monetary variables.

Figure 6.2 presents the average pattern of time use at each age across seven main activity groups. Three of these groups—market work, housework and care—are viewed as productive activities, while the remaining four—learning, doing nothing, sleeping and all other—are non-productive activities. For the entire population aged ten years and above, an average of 2.8 hours per day is spent in market work activities, while a further 2.8 hours is spent in unpaid household production (2.5 hours doing chores, and 0.3 hours in care activities). An average of 0.9 hours per day is spent in learning activities, while sleep, doing nothing and all other activities account for 9.3 hours, 0.8 hours and 7.3 hours per day respectively. These estimates of time spent in market work and unpaid work in 2010 are very similar to those observed in 2000: NTTA estimates for 2000 show that the average person aged 10 years and above allocated 2.7 hours to market production and 2.7 hours to unpaid work (Oosthuizen 2018, p.11).

Time allocations to market work rise gradually from 0.2 hours per day amongst 10-year-olds to 0.8 hours amongst 18-year-olds. Thereafter, the rise is more rapid with time in market work reaching 3.0 hours at age 24, 4.1 hours at age 28, and peaks at 4.8 hours per day between the ages of 35 and 42 years. There is a gradual decline during the forties and early fifties, which accelerates during the late fifties and early sixties: from 4.0 hours at age 53, the allocation falls to under three hours by age 59 and 1.9 hours by age 64. Cohorts in their eighties allocate roughly 0.4 hours per day to market work.

For housework, the time allocation is more stable across age. It rises from 0.8 hours amongst 10-year-olds to 2.5 hours by age 18. However, between the ages of 19 and 73, time allocated to housework remains in a narrow range between 2.6 and 3.0 hours per day. On average, time spent caring for others peaks at 0.5 hours per day for cohorts in their twenties and thirties, but consumes less than half that time for cohorts over the age of 40. It is important to note that, despite the effort made in the 2010 Time-Use Survey to capture all time spent on care, it is likely that time spent caring for others is likely underestimated since it is typically performed in parallel with other activities, or is supervisory in nature (Suh and Folbre 2015; Folbre 2018).

Learning activities, including attending school and doing homework, consume an average of between 3.0 and 3.4 hours per day for cohorts aged 10 to 17 years. This falls to 1.0 hours by

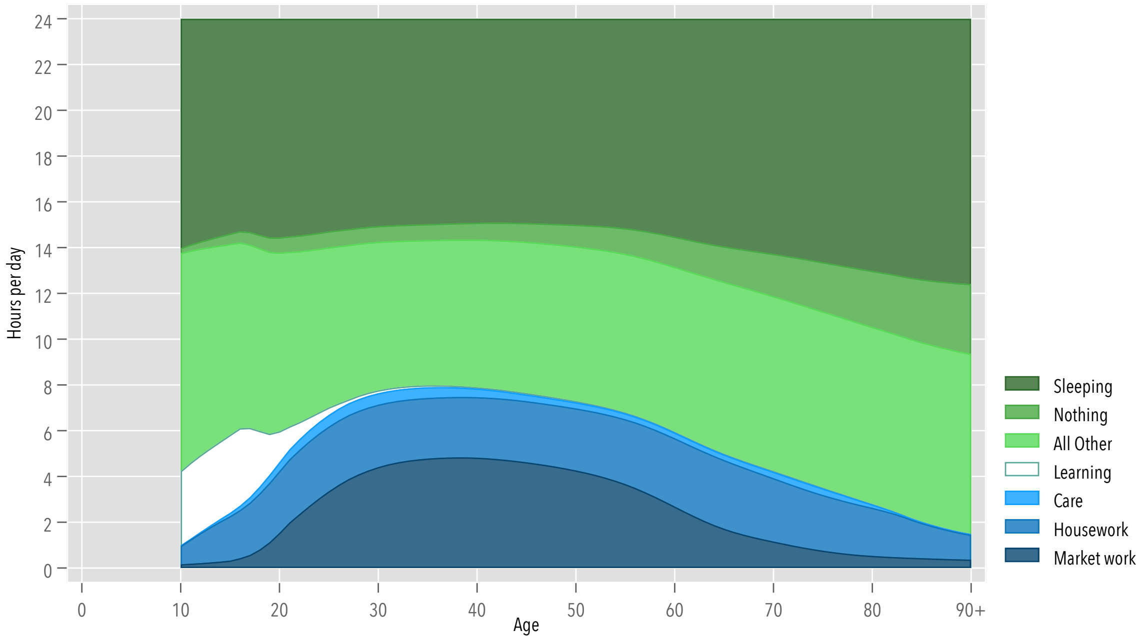


FIGURE 6.2. ALLOCATION OF TIME ACROSS THE LIFECYCLE, 2010
Source: Own calculations, Statistics South Africa (2010c).

age 21 and 0.3 hours by age 25. Sleep consumes relatively more time amongst the youngest and the oldest cohorts, while the same is true of 'all other activities'. In contrast, age is positively associated with time spent "doing nothing": cohorts aged 70 years and older report spending an average of 2.4 hours per day doing nothing, compared to 0.6 hours per day for cohorts under the age of 40 years.

Gender-specific patterns of time allocation across the lifecycle are presented in Figure 6.3. Allocation of time to market work follows the expected pattern, linked to labour force participation rates: hours are very low for those in their teens, high during the prime working ages, and fall to low levels again for the elderly. There are, though, important differences by gender. First, men spend more time in market work than women at virtually every age: averaging across the population aged 10 and above, men spend 3.5 hours per day in market work compared with 2.1 hours for women. As a result, the peak in time allocated to market work is significantly higher for men than for women (6.1 hours compared with 3.8 hours). Time spent in market work in 2010 appears to have been somewhat higher than in 2000: Sambt *et al.* (2016, p.260), in a multi-country NTTA analysis that includes South African data for 2000, find that South African men spent 3.1 hours and women 1.7 hours per day in market work.

Second, men's and women's hours in market work peak at different ages, with peak hours occurring roughly half a decade earlier for men than for women. Third, women's hours in market work drop relatively steeply from its peak. By age 60, for example, men spend 3.7 hours in market work, roughly three-fifths of the peak for males, whereas women spend 1.8 hours in market work, or just under half of the female peak. This gap persists until the late seventies.

Allocations of time to non-market work are quite different, with women spending significantly more time than men in these activities at all ages. Averaged across the population aged

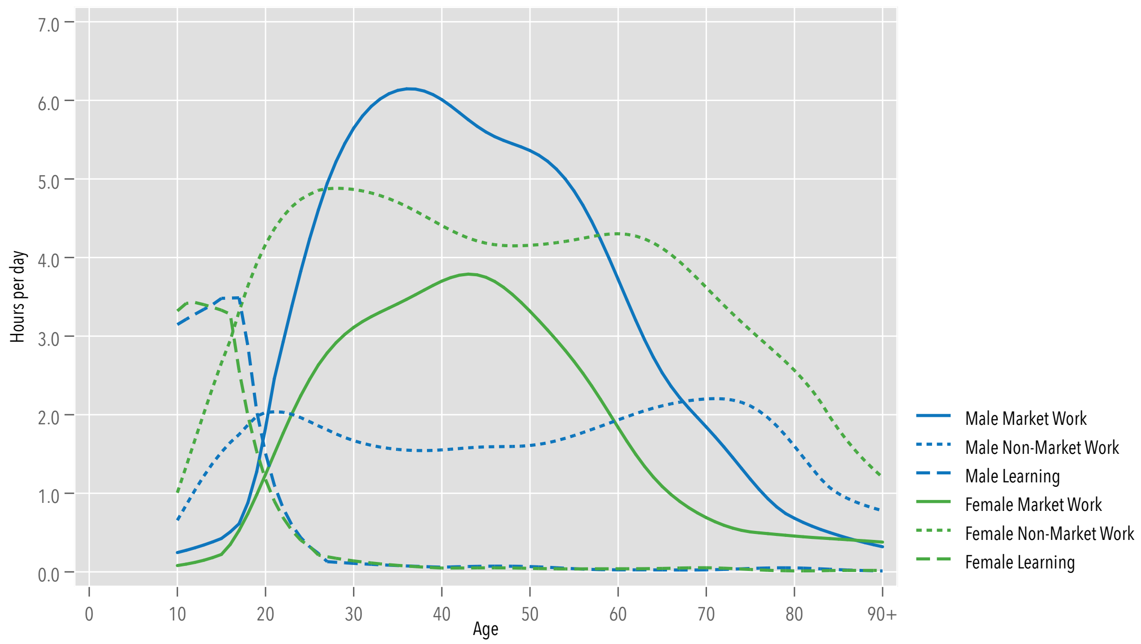


Figure 6.3. Allocation of Time across the Lifecycle by Gender, 2010
Source: Own calculations, Statistics South Africa (2010c).

at least 10 years, women spend 3.9 hours per day in non-market work, more than twice the 1.6 hours of men. For women, therefore, time allocated to non-market work is "in the order of part-time jobs" (Zagheni and Zannella 2013, p.946). Using 2000 data, Budlender and Brathaug (2004, p.36) find slightly less time being spent in productive activities that fall outside the GDP production boundary: 1.3 hours per day for men and 3.7 hours for women; however, Sambt *et al.* (2016, p.260) find slightly more time allocated to these activities (1.9 hours and 4.3 hours per day respectively). While time allocations to non-market work are similar to those of market work in terms of being substantially lower during the teens and old age, they are different in the extent to which they remain relatively stable in the intervening years. Women spend between four and five hours on average in non-market work for close to 50 years, while men allocate between 1.5 and 2.2 hours for 66 years. Time spent in non-market work therefore remains within relatively narrow ranges for both men and women over substantial fractions of the life course. Women, though, spend large amounts of time in these activities for much of the life course, while men never really spend large amounts of time in these activities.

Importantly, for both genders there are two peaks in time spent in non-market work: for men there is a peak in the early twenties and then again in the late sixties and early seventies, while for women there are peaks in the twenties and thirties and again in the late fifties and early sixties. Interestingly, while women's peak time allocation to non-market work occurs during the main childbearing ages, the peak for men is during what is traditionally seen as the first decade of retirement.

The ramping up of time allocated to market and non-market work during the teenage years coincides with declining time spent in learning activities, which includes attendance, homework and study time. This is not particularly surprising, given that children are allowed to exit the education system from age 16, and in this sense the patterns observed in terms of time are consistent with falling rates of participation at these ages (Department of Basic Education 2018, pp.9-10). For girls, though, declines in time allocated to learning activities are observed at much younger ages than they are for boys. While young girls spend more time on average in learning activities than boys, by age 14 their positions are reversed and the time advantage that boys enjoy over girls continues to widen until age 18, by which age boys are spending almost 53 minutes per day more than girls in learning activities.

Within non-market work, household activities dominate the time allocations of both men and women (Figure 6.4). Averaged across the population aged 10 years and above, care activities represent 7.6 percent of men's time in non-market work and 13.3 percent for women. For women, time allocated to care peaks at just under one hour (48-54 minutes) per day between the ages of 22 and 34 years, with a second, much smaller peak of just over 20 minutes per day between the ages of 54 and 63 years. Men, in contrast, spend minimal time in care activities. Average time spent in care generally remains below ten minutes per day, apart from the late forties—where it reaches just over 11 minutes per day—and the late sixties and seventies during which the time allocated to care ranges between 10 and 21 minutes per day. (Budlender 2008, p.16) suggests that this pattern may "be partly explained by the fractured family set-up, where few than half of all children live with their fathers and many adults do not live with their partners". In 2008, for example, it is estimated that just 35 percent of children under 18 years lived with both biological parents, while 40 percent were co-resident with their mother but not their father (Budlender and Lund 2011, p.929).

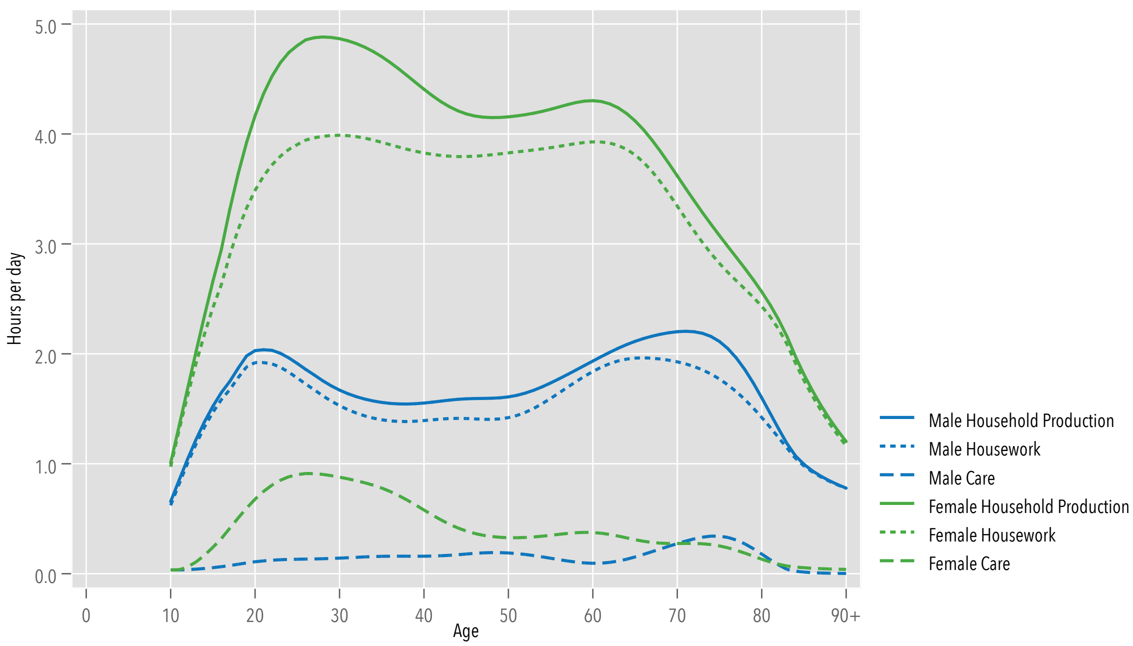


Figure 6.4. Household Production across the Lifecycle by Gender, 2010
Source: Own calculations, Statistics South Africa (2010c).

While peaks in time in care activities are synchronised with demanding stages of the lifecycle, time spent in household activities remains within a relatively narrow range for a large proportion of the lifecycle. This is particularly true for women, whose time in household activities remains within a 10 percent range of its 4.0 hour peak for 47 years, between the ages of 21 and 67 years. For men, this is true for eight years around the age of 20 and another 12 years between the ages of 59 and 74 years.

Consumption of non-market work across the life course is calculated by allocating time spent in non-market production as described above. These consumption profiles for males and females are presented in Figure 6.5. Total consumption for each gender is disaggregated into consumption of housework, and of care.

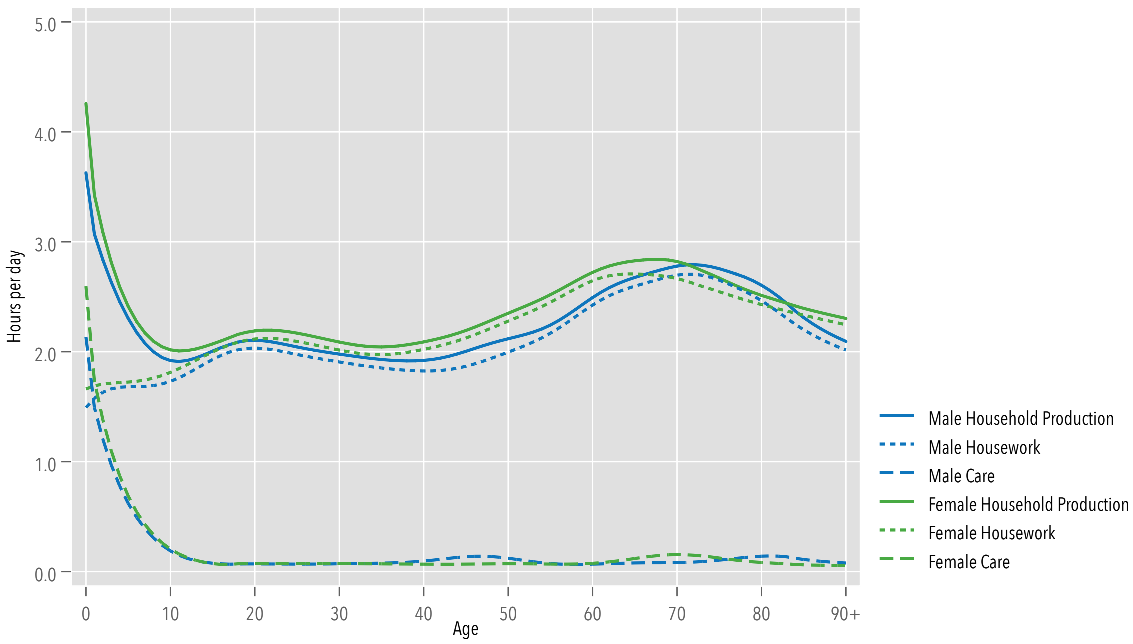


Figure 6.5. Consumption of Non-Market Work across the Lifecycle by Gender, 2010

Notes: Consumption profiles for the full population are available in Figure D.1 in the appendix.
Source: Own calculations, Statistics South Africa (2010c).

Gender differences in the consumption of housework and care are, for the most part, very small. In terms of housework, the gap in consumption at each age is never more than 17 minutes. Consumption of housework generally rises to around age 21, reaching just over two hours per day; initially thereafter consumption declines marginally, but peaks again in the sixties for women and early seventies for men at around 2.7 hours per day before declining again. The pattern for the consumption of care is very different: it is highest at age zero and declines rapidly thereafter. After age 11 consumption of care never exceeds 10 minutes per day for either gender. Female infants tend to consume more care than male infants: 28 minutes a day more at age zero and 15 minutes at age one. The very small amount of care for adults, particularly for the elderly, is somewhat surprising, although it may be a function of the survey focussing much more on childcare and not differentiating between care for the elderly and for general 'adultcare'.

The result of these small gender differences means that the overall consumption profiles for males and females are also very similar. Consumption is highest amongst infants and young children, driven by the large quantities of care consumed at these ages, with local peaks in the early twenties for both genders and in the late sixties and early seventies for females and males respectively. While it is possible that actual consumption of non-market work is very similar for males and females, it is likely that these similarities are the result of the methods used to allocate total household production to household members. It is rare in the South African data that production can be allocated to a particular household member, with production of housework in particular simply allocated on a per capita basis. For this reason, too much emphasis should not be placed on gender differences in consumption of household production.

The difference between production and consumption of non-market work is net time transfers; these net time transfers are plotted by gender across the lifecycle in Figure 6.6, along with the per capita inflows and outflows. The figure clearly shows that while net outflows are substantial for women, particularly between the ages of 20 and 45 years, there is no age at which men experience net outflows. Thus, there appear to be significant time transfers from females to males, although it should be noted that the challenges related to determining consumption of household production mentioned above also impact estimates of net time transfers.

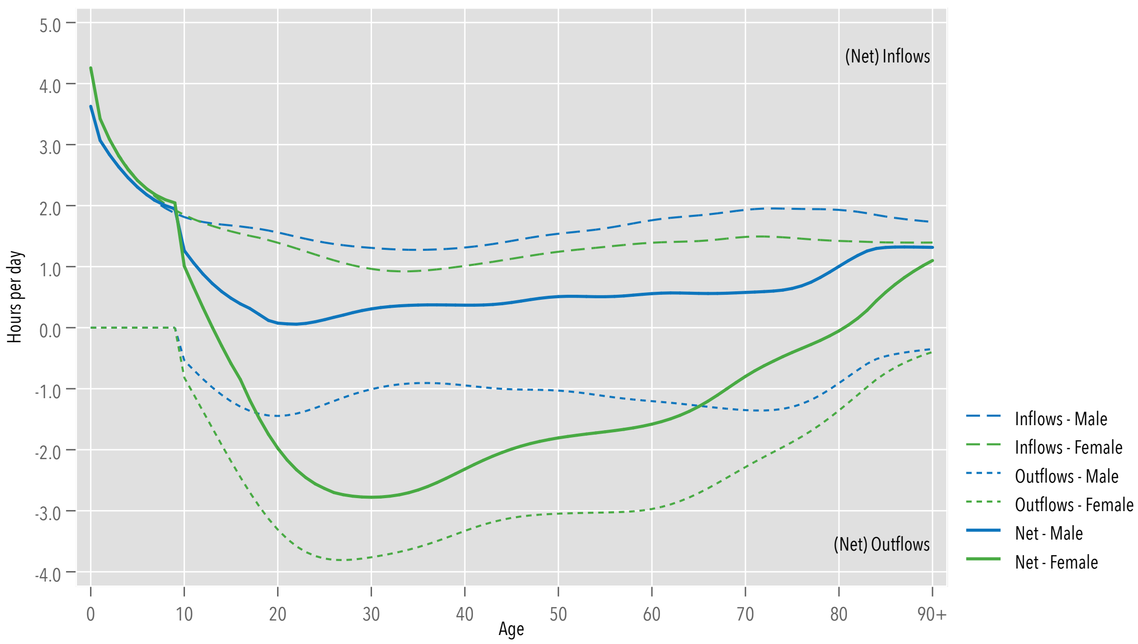


Figure 6.6. Time Transfers across the Lifecycle by Gender, 2010
Source: Own calculations, Statistics South Africa (2010c).

Infants and young children experience significant net time transfer inflows: net inflows are just under four hours per day on average for infants, falling to two hours per day for 9-year-olds, with only minor differences between males and females. However, from age 10 when data on household production becomes available, the paths for males and females diverge rapidly. By 14 years, females are already making net time transfers to others, while their male counterparts are still receiving net inflows of 0.6 hours per day. At its peak, females make net transfers to others of 2.8 hours per day during their late twenties and early thirties. Net time transfer outflows amongst female cohorts fall below two hours per day at age 49, and below one hour at age 69. In contrast, males see their net time transfer inflows falling to 0.1 hours per day in their early twenties, after which they gradually grow. Elderly cohorts over 80 years of age receive net time transfer inflows.

These patterns of net time transfer inflows over the life course are the result of the distinct patterns of time transfer inflows and outflows. Time transfer inflows are very similar by gender across the lifecycle: they are high but falling for infants and young children and, for virtually all cohorts over the age of 10, range between one and two hours per day with per capita inflows somewhat higher for males than females. In contrast, there is substantial variation in time transfer outflows across age and between males and females. Outflows increase rapidly from age 10 where they are first observed in the survey data; this is particularly true for females. Time transfer outflows peak at 3.8 hours per capita for females in their late twenties, while female cohorts aged 19 years to 60 years make time transfers to others of at least three hours per capita per day. For males, the peak in transfer outflows is 1.4 hours, occurring amongst young men age 17 years to 23 years and amongst older men aged 70 years to 72 years. Indeed, time transfer outflows made by males remain fairly constant over the life course (0.9 hours to 1.4 hours from age 13 to age 80), which stands in stark contrast to those made by females, which range between 1.4 hours and 3.8 hours over the same age range.

To get a better sense of the direction of time transfers, Table 6.1 presents estimates of the mean ages of inflows and outflows, and the distribution of each of the flows across gender and age group. As discussed in section 5.5.5, the mean ages of inflows and outflows indicate the general direction of the flow: where the mean age of the inflow is larger than that of the outflow, there is a transfer from younger to older cohorts, and vice versa. The shares presented in the final set of eight columns indicate which groups are the largest receivers of time transfer inflows and which are the largest givers of time transfer outflows.

Comparisons of the mean ages of time transfer inflows and outflows for each activity show that transfers are consistently downwards (i.e. to younger age groups). This is true for the population as a whole, as well as for males and females separately, and echoes findings by Zagheni and Zannella (2013, p.942) for Italy, Spain, France and Germany. The only exceptions to this are for care of adults. Overall, for both intra-household and inter-household care of adults, time transfers are from younger to older cohorts: the mean ages of inflows and outflows are 44.8 years and 40.8 years in the case of intra-household care, and 38.2 years and 36.0 years in the case of inter-household care. However, there are interesting differences by gender. Within the household, transfers related to care of adults flow downwards for men but flow upwards for women, with the gap between the mean ages of inflows and outflows being 10.9 years and 9.9 years for men and women respectively. The mean age of time transfer outflows for females is 35.5 years, compared to 55.3 years for males. On average, care for spouses would follow this pattern of upward transfers for females and downward transfers for males, but the large differences in the mean age of outflows between males and females suggest very different patterns of care. Inter-household care for adults differs in that time transfers for males go from younger to older cohorts, while for females transfers are slightly downwards.[1]

Male and female cohorts under the age of 18 years account for the largest shares of time

[1] It should be noted, though, that the true age of recipients of inter-household care is not known since the survey provides no information on the person being cared for. As a result, inter-household care is allocated on a per capita basis to age-qualifying individuals in the national population.

Table 6.1. Time Transfers, 2010

Activity	Flow	Mean Age			Share of Flow (%)							
					0-17 yrs		18-39 yrs		40-59 yrs		60+ yrs	
		T	M	F	M	F	M	F	M	F	M	F
HOUSEHOLD PRODUCTION	In	23.4	23.7	23.1	25	26	15	12	8	7	3	4
	Out	33.9	32.2	34.5	6	10	13	39	5	18	2	6
HOUSEWORK	In	25.8	25.9	25.7	23	22	17	13	9	8	4	4
	Out	34.0	31.6	34.9	6	11	13	36	5	19	2	6
Cleaning	In	26.3	26.0	26.5	22	22	17	14	9	9	4	4
	Out	34.2	32.3	35.0	7	11	15	34	6	18	3	7
Laundry	In	24.4	24.7	24.1	24	24	17	14	8	7	3	4
	Out	32.6	25.4	34.8	8	11	12	39	3	21	1	6
Cooking	In	25.7	26.5	24.6	23	22	19	12	9	7	4	4
	Out	34.2	29.7	35.2	5	11	9	42	3	22	1	7
Household maintenance	In	27.4	25.3	29.0	20	22	12	18	6	13	3	5
	Out	38.9	38.8	39.3	8	2	32	11	23	9	11	3
Household management	In	27.2	26.5	27.9	16	21	26	14	6	10	3	5
	Out	37.3	35.4	39.5	6	5	29	19	13	14	6	7
Pet care	In	33.5	30.8	35.9	18	15	12	13	10	18	6	7
	Out	41.2	42.3	40.2	7	8	13	17	17	19	10	9
Travel	In	26.6	25.6	27.4	21	22	15	15	8	10	4	5
	Out	34.6	34.5	34.7	8	8	19	29	11	15	4	5
Purchases	In	27.9	27.7	28.2	19	20	16	16	9	11	4	4
	Out	35.7	36.1	35.4	5	8	20	31	10	17	4	5
Collecting fuel & water	In	23.5	22.0	25.0	26	25	14	14	5	8	3	4
	Out	29.8	26.9	31.2	13	18	15	30	5	14	2	5
CARE	In	10.5	10.8	10.3	38	43	5	5	4	3	1	2
	Out	33.6	37.3	32.7	2	7	10	55	5	15	2	4
Care of children, intra-household	In	2.8	2.8	2.7	47	53	0	0	0	0	0	0
	Out	31.4	32.5	31.3	1	8	6	66	2	14	0	4
Care of children, inter-household	In	8.4	8.4	8.4	50	50	0	0	0	0	0	0
	Out	38.5	37.4	38.7	0	4	11	45	1	26	2	10
Care of adults, intra-household	In	44.8	44.4	45.4	1	1	17	20	31	7	7	16
	Out	40.8	55.3	35.5	2	10	2	38	9	18	14	7
Care of adults, inter-household	In	38.2	37.2	39.2	2	2	29	28	13	15	5	7
	Out	36.0	32.9	40.8	8	3	35	18	13	12	4	6
Care, unspecified	In	27.4	25.3	30.0	24	20	14	11	15	6	1	9
	Out	40.3	45.9	36.5	4	5	16	34	4	16	15	5
Volunteering	In	27.4	26.4	28.3	19	19	18	18	9	10	3	4
	Out	39.1	39.8	38.5	4	4	18	27	21	16	4	5

Notes: T denotes the total population, M and F refer to males and females respectively; 'In' and 'Out' refer to inflows and outflows.

Source: Own calculations, Statistics South Africa (2010c).

transfer inflows for most household production activities. The exceptions to this are, unsurprisingly, inter- and intra-household care of adults, household management and pet care. In terms of inter-household care of adults, males and females aged 18-39 years account for 29 percent and 28 percent of total inflows; however, 31 percent of inflows of intra-household care of adults accrues to males aged 40-59 years while another 20 percent accrues to females aged 18-39 years. The data reveals that females dominate as the source of time transfer outflows. Women aged 18-39 years are the dominant source of time transfer outflows in all but four activities, namely household maintenance, household management, pet care and inter-household care of adults. Furthermore, women aged 40-59 years rank first or second in all but seven activities (household maintenance, household management, travel, purchases, collecting fuel and water, inter-household care of adults and volunteering).

6.4 The Value of Unpaid Work

6.4.1 Choosing Appropriate Wage Rates

The wage data used here comes from the LMD dataset described in section **??**. Occupational data is coded using the South African Standard Classification of Occupations (SASCO). Gross monthly earnings reported in the microdata for all employed individuals are converted to gross hourly earnings by dividing by monthly hours, calculated as usual weekly hours worked multiplied by 52 weeks and divided by 12 months. Outliers are identified using a cutoff of three standard deviations above the mean; this impacts 45 observations, less than 0.1 percent of the total number of observations with data on wages and hours worked.[2]

As discussed in section 3.4.1, there are a number of approaches to valuing unpaid work: the replacement cost approach, which can be either a generalist or specialist replacement, and the opportunity cost approach, which can be either an economy-wide representative wage or an opportunity cost wage based on individual characteristics. The NTTA methodology favours the use of specialist replacement wages for the valuation of unpaid work (Donehower 2018, p.23) and this is the approach followed here for combining the NTA estimates of labour income and consumption with the NTTA estimates. However, since there is a measure of discretion in choosing a particular methodology, certain estimates will be presented using other approaches.

Specialist Replacement Approach: The aim of the specialist replacement approach is to arrive at a value that one might expect to pay someone skilled in a particular household production activity to perform that activity. Thus, the approach requires matching household production activities to relevant occupational codes in the labour force survey microdata. There is, though, a degree of subjectivity in the approach. For example, does one consider a "pre-primary education teaching professional" to be an appropriate match to an activity such as childcare, or is a "secretary" an appropriate match to an activity like household management?

Two versions of specialist replacement wages are calculated here. The first, termed occupation matching here, matches household production activities to relevant occupational categories as per standard NTTA methodology. The second option is an attempt to recreate the occupational classification used by Budlender and Brathaug (2004) for their estimates of the value of household production in 2000. While they detail the occupations they associate with each activity code, these do not always match to the current SASCO descriptors. Further, their valuations are done at a slightly different level of aggregation to those done here. In terms of both sets of specialist replacement wages, a mean wage is calculated at the level of each main activity (e.g. cooking, cleaning, childcare). These two sets of specialist replacement wages are

[2]Further detail on the impact of identifying outliers is presented in Appendix D.2.

denoted as options A1 and A2 respectively (see Figure 3.1 above).

Generalist Replacement Approach: The generalist replacement approach uses the wage of workers who typically perform duties similar to a wide range of household production activities. The classic generalist is a housekeeper or domestic worker; Landefeld and McCulla (2000, p.295) term this the "housekeeper cost method". For the analysis below, a mean domestic worker wage is calculated based on the employed in three narrow occupational categories (SASCO codes 9131-9133): domestic helpers and cleaners; helpers and cleaners in offices, hotels and other establishments; and hand-launderers and pressers. This generalist replacement wage is denoted as option B.

Opportunity Cost Wages: The opportunity cost method seeks to measure the wage foregone by allocating time to household production. The simplest option to estimate this wage using data on all wage earners in the economy, and can be calculated as a mean (Budlender and Brathaug 2004) or median wage (Giannelli *et al.* 2011). Poissonnier and Roy (2015) take a slightly different approach and use the prevailing minimum wage as an alternative generalist replacement wage. Given South Africa's extremely high level of inequality, which would result in a relatively high mean wage that would arguably represent a departure from the notion of an opportunity cost wage, I follow Giannelli *et al.* (2011) and compute a median wage across all wage-earners. This version of the opportunity cost approach is denoted as option C.

The second option within the opportunity cost approach is to calculate opportunity cost wages at the individual level based on what the individual earns or could expect to earn in the labour market (denoted as option D). Estimating opportunity cost value of individuals' time is complicated by the fact that the TUS 2010 does not collect information on the wages of the employed; instead, it asks individuals about the total value of income from all sources. It is therefore necessary to look to alternative data sources to provide an approximation of the opportunity cost of time spent in household production. Using the LMDS 2010 data to estimate opportunity cost hourly rates for all individuals aged 10 and above, I calculate mean rates for all combinations of age (10 to 75+) and educational attainment (primary, incomplete secondary, complete secondary, diploma/certificate, and degree) and impute these mean rates to individuals in the TUS 2010 dataset. Where a particular age-education combination is missing in the LMDS data but exists in the TUS data, the mean rate for the full age cohort is used instead. With these opportunity cost wage rates, time spent in household production is valued at the individual level. Individual time spent in household production and the individual value of household production are then aggregated to the national level, from which an average opportunity cost rate can be calculated.

To estimate opportunity cost hourly rates in the LMDS 2010 data, the following basic earnings model is used:

$$lnW_i = \boldsymbol{X}_i\beta + \mu_i \tag{6.1}$$

where W_i denotes the hourly wage of individual i, $\boldsymbol{X}_i$ is a vector of individual characteristics and μ_i is a random error term. Since the wage earners are not a random sample of the population, I follow the Heckman (1979) approach and include a selection equation to estimate the probability of an individual being employed. Explanatory variables included in the selection equation are age, broad educational attainment groupings (primary; incomplete secondary;

complete secondary; diploma or certificate; degree; other), the number of children under the age of 15 in the household, gender, and marital status. For the wage equation, included explanatory variables are: race; age (15 to 75+); educational attainment; province and whether the individual is in an urban area. Since the purpose of running the model is to predict wages for the non-employed population, I do not include controls for variables such as occupation or industry of employment. The results are presented in Table D.2 in the appendix.

The estimated coefficients are used to predict hourly wages for the non-employed population aged 10 years and older. Thus, an individual's opportunity cost wage rate is equal to their hourly wage if they are employed, or their predicted hourly wage if they are not employed.

Table 6.2 presents estimated hourly wages according to the five options described above: the specialist replacement wages based on occupation matching (A1) and following Budlender and Brathaug (2004) (A2); the generalist replacement wage rates using the mean domestic worker wage (B); and the opportunity cost wages calculated as an economy-wide median wage (C) and based on individuals' actual or imputed wages. As expected, the domestic worker generalist wage is the lowest of the five across all activities, while the economy-wide median is the second-lowest for eight of the 15 activities. The two sets of specialist wages range between R10 and R44 per hour and, depending on the activity, can be very similar or very different. Substantial differences are, for example, observed for household management and childcare, where the occupation matching approach yields wages that are roughly four and two times the wages calculated following Budlender and Brathaug (2004). Opportunity cost wages based on individuals' actual or imputed wages are the highest wages for nine of the 15 individual activities, being surpassed by specialist wages for household management and the five care activities.

Weighted by the total time spent in each activity by the entire population, opportunity cost wages are, though, significantly higher than the other four types of wages. At R24.77, the average opportunity cost wage (D) is approximately 40 percent to 60 percent higher than the average specialist replacement wages, roughly 60 percent higher than the economy-wide median wage, and 160 percent higher than the mean domestic worker wage.

6.4.2 Unpaid Work Valued

Combining the wages presented in Table 6.2 with the total time spent in household production activities, it is possible to estimate the value of household production. In Table D.3, estimates of the value of household production relative to GDP are presented. In total, the value of household production is estimated at between R402.2 billion and R1 047.3 billion in 2010, equivalent to between 14.6 percent and 38.1 percent of GDP. Compared with previous estimates for South Africa, this is a somewhat narrower range. Budlender and Brathaug (2004, p.39), using a range of wage rates and a 24-hour time measure based on the 2000 Time Use Survey, estimate household production to be equivalent to between 11 percent and 50 percent of GDP, respectively calculated using a generalist replacement wage calculated from census data, and an economy-wide mean wage (as opposed to the median wage used here) calculated from Labour Force Survey data. Interestingly, their estimate based on opportunity cost wages is 38 percent, very similar to the corresponding estimate here.

The majority of the value of household production is from housework activities, which

Table 6.2. Estimated hourly wage rates by type of activity (2010 Rands)

	Replacement Cost			**Opportunity Cost**	
	Specialist	Specialist	Generalist		
	Occupation Matching	*Following Budlender & Brathaug (2004)*	*Domestic Worker*	*Economy-wide median*	*Own/ imputed wage*
	(A1)	(A2)	(B)	(C)	(D)
Cleaning	10.55	11.38	9.51	15.38	23.86
Laundry	18.16	14.08	9.51	15.38	22.36
Cooking	16.98	16.98	9.51	15.38	24.70
Household maintenance	22.87	19.77	9.51	15.38	27.49
Household management	43.63	11.38	9.51	15.38	37.42
Pet care	13.29	15.72	9.51	15.38	36.89
Travel	19.10	19.10	9.51	15.38	29.64
Purchases	13.29	11.38	9.51	15.38	32.23
Collecting fuel and water	13.29	11.38	9.51	15.38	18.06
Care of children, intra-hh	42.75	22.38	9.51	15.38	23.87
Care of children, inter-hh	42.75	22.38	9.51	15.38	28.01
Care of adults, intra-hh	32.21	41.72	9.51	15.38	35.87
Care of adults, inter-hh	32.21	41.72	9.51	15.38	19.87
Care for unspecified individuals, intra-hh	29.05	15.72	9.51	15.38	27.52
Volunteering	13.29	13.29	9.51	15.38	30.70
Average	17.73	15.48	9.51	15.38	24.77

Notes: Average wages are weighted by the total number of hours of work performed in each activity by the population.

Source: Own calculations, Statistics South Africa (2010b).

represents between 75 percent and 89 percent of the total, depending on the wage rate used. Care for household members accounts for between 9 percent and 22 percent of the total. Females account for roughly seven-tenths of the value of total household production, ranging from 70.8 percent (opportunity cost using own/imputed wages) to 73.8 percent (occupation matching wage rates). That the opportunity cost wage rates would provide the lower bound for females' share of household production is unsurprising, given higher actual wage rates for men (noting that gender was not used as an explanatory variable in predicting wages for the non-employed). For housework, females' share of the total value is within one percentage point of 70 percent across valuation methods, while for care it ranged between 80 percent and 85 percent. Males account for very little of the care for household members—roughly 11 percent—but account for between 42 percent and 48 percent of care for non-household members.[3]

The time profiles of household production and consumption presented in Figures 6.4 and 6.5 are valued using the various wage rates calculated above, and are standardised using peak labour income. These profiles are presented in Figure 6.7.

The general shapes of the profiles of time spent in household production for males and females are preserved once the time is valued. In the case of the domestic worker (generalist) wage and the economy-wide median (opportunity cost) wage, the shape is preserved exactly since all time is valued using the same wage, irrespective of the activity or the individual performing

[3]Additional disaggregations of total time allocated to productive activities and of the value of this time using a specialist replacement (occupation matching) wage are presented in Table D.3 in the appendix.

Table 6.3. Value of aggregate household production relative to GDP, 2010

	Under 18 yrs	18-39 yrs	40-59 yrs	60 yrs plus	Male	Female	TOTAL
A1. Specialist: Occupation Matching							
Housework	2.6	10.8	5.2	2.0	6.2	14.4	20.6
Care	0.4	4.7	1.2	0.4	1.0	5.7	6.7
Care for HH members	0.4	4.2	0.9	0.3	0.6	5.2	5.8
Care for non-HH members	0.1	0.5	0.3	0.1	0.4	0.5	0.9
Household Production	3.0	15.5	6.4	2.4	7.2	20.1	27.3
Value in R (billions)	*82.9*	*425.0*	*176.1*	*66.0*	*196.8*	*553.1*	*749.9*
A2. Specialist: Following Budlender & Brathaug (2004)							
Housework	2.5	10.3	5.0	1.9	5.9	13.9	19.7
Care	0.3	2.7	0.8	0.3	0.8	3.3	4.1
Care for HH members	0.2	2.3	0.5	0.2	0.4	2.8	3.2
Care for non-HH members	0.1	0.4	0.3	0.1	0.4	0.4	0.9
Household Production	2.7	13.1	5.8	2.2	6.7	17.2	23.8
Value in R (billions)	*75.1*	*359.3*	*159.2*	*61.0*	*182.9*	*471.6*	*654.5*
B. Generalist: Domestic Worker							
Housework	1.6	6.8	3.2	1.3	3.9	9.0	12.9
Care	0.1	1.1	0.3	0.1	0.3	1.4	1.7
Care for HH members	0.1	1.0	0.2	0.1	0.1	1.2	1.3
Care for non-HH members	0.0	0.2	0.1	0.0	0.2	0.2	0.4
Household Production	1.8	7.9	3.6	1.4	4.2	10.4	14.6
Value in R (billions)	*48.3*	*217.3*	*98.5*	*38.0*	*115.5*	*286.7*	*402.2*
C. Opportunity Cost: Economy-wide Median							
Housework	2.7	10.9	5.2	2.1	6.3	14.6	20.9
Care	0.2	1.8	0.6	0.2	0.5	2.2	2.8
Care for HH members	0.1	1.5	0.3	0.1	0.2	1.9	2.1
Care for non-HH members	0.0	0.3	0.2	0.1	0.3	0.3	0.6
Household Production	2.8	12.8	5.8	2.2	6.8	16.9	23.7
Value in R (billions)	*78.2*	*351.5*	*159.4*	*61.5*	*186.8*	*463.8*	*650.6*
D. Opportunity Cost: Own/Imputed Wage							
Housework	4.2	17.6	8.5	3.4	10.2	23.3	33.6
Care	0.3	3.0	0.9	0.3	0.9	3.6	4.5
Care for HH members	0.2	2.4	0.6	0.2	0.4	3.0	3.4
Care for non-HH members	0.1	0.5	0.4	0.1	0.5	0.6	1.1
Household Production	4.5	20.5	9.4	3.7	11.1	27.0	38.1
Value in R (billions)	*122.8*	*564.2*	*259.3*	*101.0*	*306.2*	*741.1*	*1 047.3*

Notes: Figures expressed as share of GDP, which was R 2 748.0 billion in current prices (South African Reserve Bank 2018b). Rand values of household production are in 2010 current prices.

Source: Own calculations, Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2010a,b,c, 2011, 2013a); UNESCO (2018); United Nations (2017); World Bank (2018b).

the activity. However, specialist wages differ by activity, while the own/imputed (opportunity cost) wages differ by individual characteristics; as a result, the shapes of the profiles valued with these wages differ from each other and from the time profiles.

The overall ranking of the five sets of wage rates is broadly reflected in the levels of the two sets of profiles, with the generalist wage profiles consistently lowest of the five and the own/imputed (opportunity cost) wage profiles consistently highest. For males, the remaining three profiles are virtually indistinguishable from each other across the life course; for females, the profile based on the occupation matching specialist replacement wage is generally somewhat higher than the alternative specialist replacement wage-based profile and the economy-wide median wage-based profile.

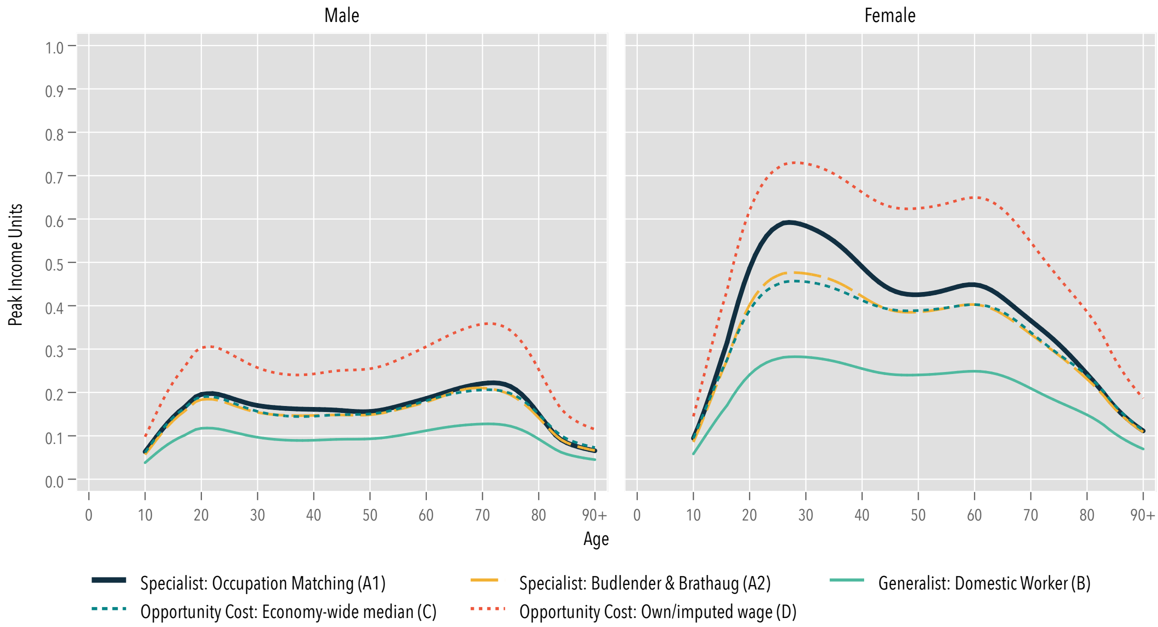


Figure 6.7. Value of Household Production across the Lifecycle by Gender, 2010

Notes: Time spent in household production is valued using specialist replacement wages. Profiles are standardised by dividing through by the average labour income for 30 to 49 year olds ('peak labour income'); this average equals one income unit.

Source: Own calculations, Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2010a,b,c, 2011, 2013a); UNESCO (2018); United Nations (2017); World Bank (2018b).

6.5 Combining Market and Home Production

By converting the time profiles for household production into monetary terms it is possible to get a sense of total production by gender across the life course. Time spent in household production is valued using specialist replacement wages (occupation matching); values are annualised and standardised as per NTA convention. Figure 6.8 presents the production, consumption and transfers of non-market work over the life course.

Overall, the per capita annual value of household production ranges between 30 and 40 percent of peak labour income (i.e. 0.3-0.4 income units) for all but two years between the ages of 19 and 71 years. Under the age of 15 years and over the age of 80 years, the value is below 20 percent of peak labour income. As with the time profiles, the gap between the value profiles for males and females is substantial, reaching over 40 percent of peak labour income between the ages of 26 and 33 years. The gap is at least 20 percent of peak labour income for each cohort aged 18 to 65 years. The per capita annual value of household production amongst females peaks at just over 59 percent of peak labour income in the late twenties, with a second lower peak at almost 45 percent of peak labour income around the age of 60 years. For males, there are also two peaks, although they are at much lower levels and the peak at older ages (around 22 percent of peak labour income) is slightly higher than that at younger ages (just under 20 percent of peak labour income).

Consumption of non-market production is highest for infants and is estimated to be 75 percent of peak labour income. Following a rapid decline, it remains between 18 percent and

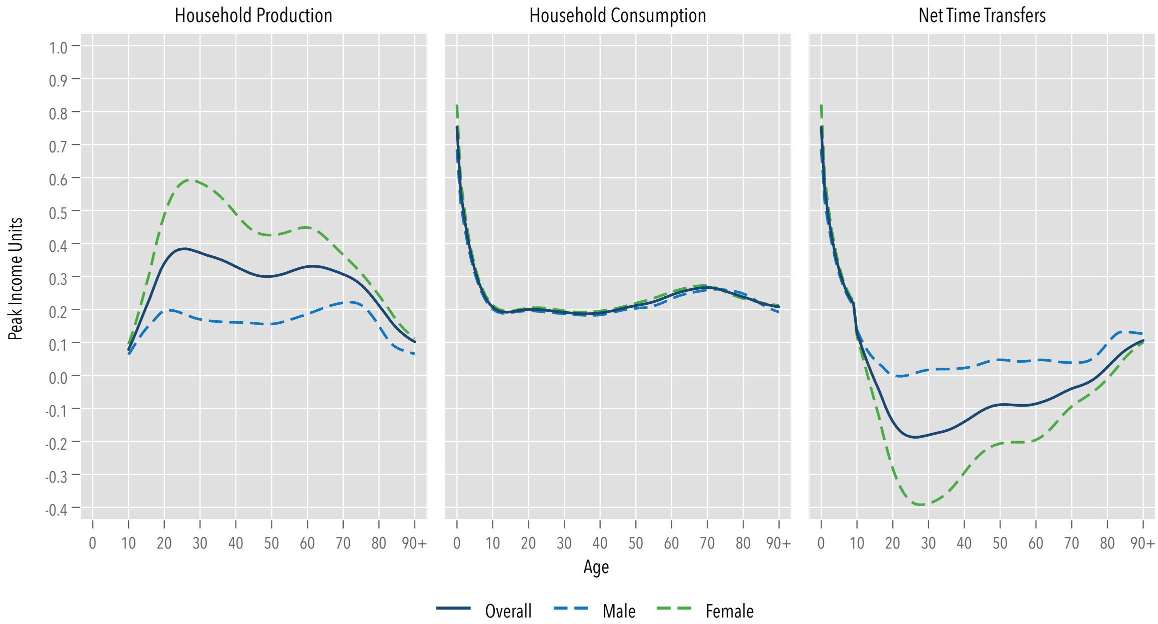


Figure 6.8. Value of Household Production, Consumption and Transfers across the Lifecycle by Gender, 2010

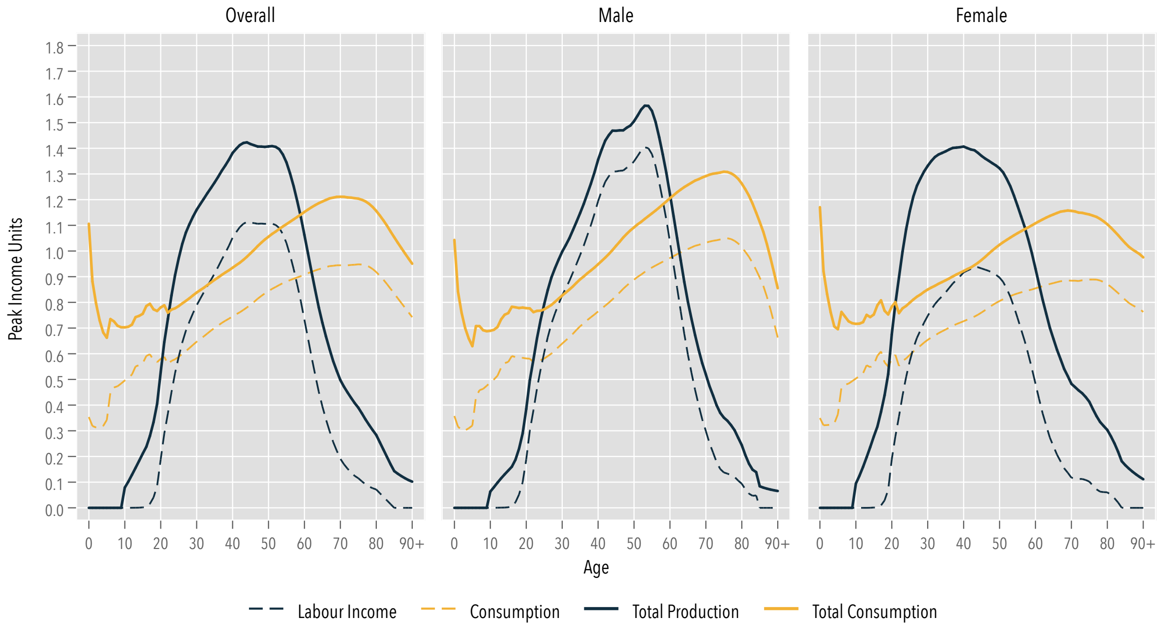
Notes: Time spent in household production is valued using specialist replacement wages. Profiles are standardised by dividing through by the average labour income for 30 to 49 year olds ('peak labour income'); this average equals one income unit. Net transfer are calculated as consumption less production.
Source: Own calculations, Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2010a,b,c, 2011, 2013a); UNESCO (2018); United Nations (2017); World Bank (2018b).

21 percent of peak labour income for cohorts aged between 10 and 49 years. For most cohorts in their sixties and seventies, consumption is higher at between 25 percent and 27 percent of peak labour income, but falls again to under 21 percent for those aged 90 years and older.

Combining production and consumption profiles reveals large transfers to children, ranging between 75 percent of peak labour income at age zero and 22 percent at age 9. On average, cohorts become net producers at age 15 and only return to being net consumers again at 78 years of age. By age 89, younger cohorts are making net transfers of non-market production to the value of more than 10 percent of peak labour income. Male cohorts, however, are never net producers: net transfer inflows fall below two percent of peak labour income between the ages of 18 and 28, but never turn negative (indicating net transfer outflows). Female cohorts, in contrast, make net transfers from age 13 to age 80: net transfer outflows rise to almost 40 percent of peak labour income during their late twenties and remain above 20 percent until age 60.

Figure 6.9 illustrates the impact of including non-market work in NTA estimates of production and consumption by gender. In the upper panel, the broken lines represent market production (NTA labour income, YL) and market consumption (NTA consumption, C); the solid lines represent total production and total consumption, combining both market and non-market production. The lower panel presents the market lifecycle deficit and the total lifecycle deficit (i.e. market plus non-market).

Clearly, the inclusion of non-market boosts per capita production for all cohorts aged at



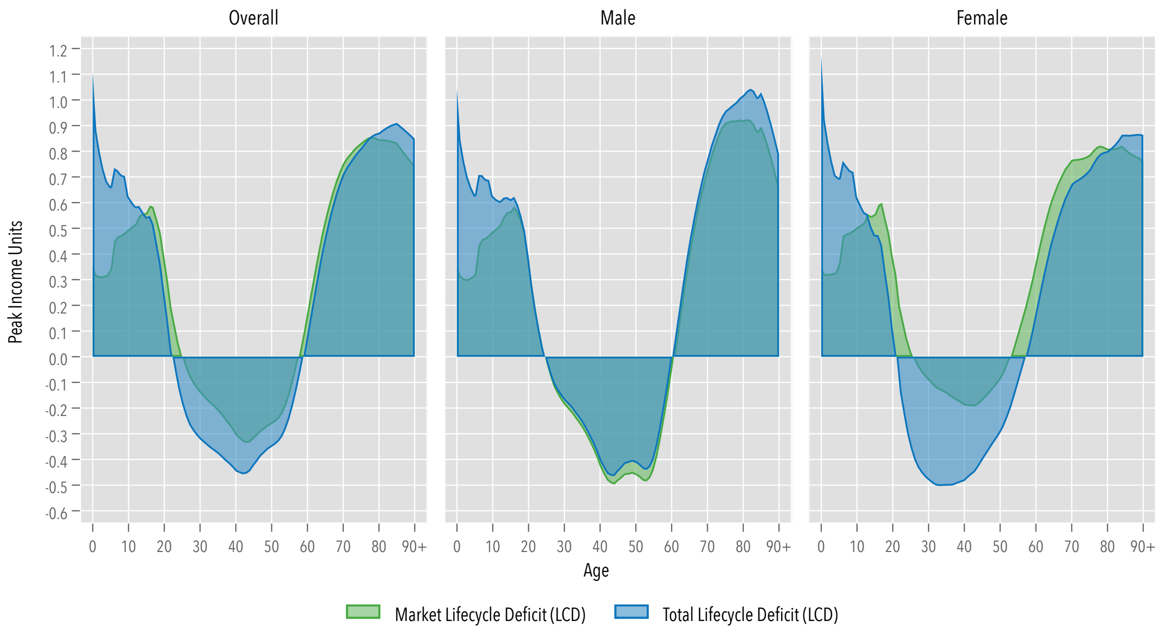


Figure 6.9. Total Production and Consumption across the Life Course by Gender, 2010

Notes: Time spent in household production is valued using specialist replacement wages. Profiles are standardised by dividing through by the average labour income for 30 to 49 year olds ('peak labour income'); this average equals one income unit. Broken lines represent NTA flows (i.e. market production/consumption only).
Source: Own calculations, Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2010a,b,c, 2011, 2013a); UNESCO (2018); United Nations (2017); World Bank (2018b).

least 10 years and per capita consumption at all ages. At age 44 when total production is at its peak for the total population, total production is almost 28 percent higher than labour income, while total consumption is 25 percent higher than NTA consumption. While the impact on consumption is identical in absolute terms for males and females–as previously noted, the overall non-market consumption profile is used–the impact on production is very different by gender.

Considering the cohorts aged 30 to 49 years, for example, including non-market production raises per capita production by between 11 and 21 percent for males, compared to between 46 and 78 percent for females. In terms of total production, using the specialist replacement wages, females outproduce males in per capita terms in all cohorts up to age 41 and in all cohorts aged 72 years and older; in contrast, considering only labour income, males outproduce females at all ages.

Including consumption of non-market services in our estimates of total consumption has a very large effect on the value of per capita consumption amongst infants and young children. Thus, children are revealed to be substantially more 'expensive' than pure market estimates would suggest. Total consumption is more than triple the level of NTA consumption at age zero, more than double NTA consumption between the ages of one and four years, and more than 40 percent higher between the ages of five and 10 years. Not only are children more expensive in absolute terms relative to their own NTA consumption levels, they are also more expensive relative to other cohorts. For example, using unweighted averages, total consumption per capita amongst children under 10 years is almost 83 percent of that amongst adults between the ages of 30 and 49 years; using only NTA consumption, this ratio falls to under 52 percent.

The net effects of the changes when including household production within total production and consumption is illustrated by the changed shapes of the lifecycle deficit profiles presented in the lower panel of Figure 6.9. Two key impacts are immediately evident from the lifecycle defats for the total population: first, the deficits for infants and young children are substantially increased in line with the high per capita consumption of household production observed for these cohorts; and second, the larger per capita surpluses observed for prime working age cohorts, particularly those in their twenties, thirties and forties. A third, less substantial effect is the slight reduction in the per capita deficit amongst cohorts in their sixties and seventies and the slight increase in the deficit amongst cohorts in their eighties and above.

While the larger deficits amongst infant and child cohorts is observed for both males and females, the increased surpluses amongst working age cohorts are driven entirely by increased surpluses for women. In fact, male surpluses at these ages are slightly reduced given the fact that males are net consumers of household production at every age. Deficits are significantly reduced through the inclusion of household production for female cohorts in their teens and early twenties, as well as for those in their mid-fifties, sixties and seventies. The particular burden placed on women by childbearing and -rearing is clear in the leftward slant of the total lifecycle surplus profile, compared with the market surplus profile for both men and women which leans towards older ages. The result of these changes is that, for the population as a whole, the period of lifecycle surplus is extended by four years to 36 years, with the surplus period starting three years earlier at age 23 rather than age 26. The duration of the surplus period for males is unchanged at 36 years. For females, however, the surplus period is extended from 27 years to 36 years, equal to that of males. The start of the surplus period is brought forward by four years to age 22, with the last age of surplus shifting from age 52 to age 57.

6.6 Demographic Dividends and the Potential for Gender Dividends

6.6.1 Estimating Demographic Dividends

Including non-market production within a broader measure of total production has a number of implications for our conceptualisation of the demographic dividend.[4] First, by changing the labour income and consumption profiles, the magnitude and trajectory of the first demographic dividend are impacted. Critically, the inclusion of unpaid childcare means that the cost (i.e. consumption) of children is raised substantially compared with pure market NTAs, with the implication that conventional estimates of the first demographic dividend may be underestimates of the true dividend. Second, demographic change has implications for the household production demands placed on both women and men, a prospect also raised by Folbre (2013, p.i146). For example, assuming a constant per capita consumption profile of childcare, as fertility declines and the number of children relative to adults falls, caregivers would theoretically experience reductions in the time required for childcare. Caregivers would consequently be able to allocate additional time to market production, to other types of household production, or to leisure and self-care activities; they could also opt to increase the time allocated to care per child.

As was discussed in Section 3.2, within NTA the first demographic dividend is estimated on the basis of the support ratio (SR): the rate of change of the support ratio is the first dividend (see equation 3.7). The support ratio is calculated as:

$$SR_t = \frac{L(t)}{N(t)} = \frac{\sum_{a=0}^{\bar{\omega}} \gamma(a)P(a,t)}{\sum_{a=0}^{\bar{\omega}} \phi(a)P(a,t)} \tag{6.2}$$

where $\gamma(a)$ and $\phi(a)$ are respectively the per capita labour income and consumption age profiles, and $P(a,t)$ is historical or projected population data by age. The support ratio is therefore calculated as the population-weighted labour income profile divided by the population-weighted consumption profile and is essentially the ratio of total production to total consumption in a given year: the greater the support ratio, the higher total labour income is relative to total consumption. The rate of change of the support ratio over time is the first demographic dividend.

By combining the profiles of per capita value of household production and consumption with the per capita labour income and consumption profiles, a 'full' support ratio and a 'full' demographic dividend can be estimated.

$$FSR_t = \frac{L(t) + L_{hh}(t)}{N(t) + N_{hh}(t)} = \frac{\sum_{a=0}^{\bar{\omega}} \Big[\gamma(a) + \gamma_{hh}(a)\Big] P(a,t)}{\sum_{a=0}^{\bar{\omega}} \Big[\phi(a) + \phi_{hh}(a)\Big] P(a,t)} \tag{6.3}$$

[4] Given the particular nature of household production, there is no counterpart of the second demographic dividend. The gender dividends discussed here are, therefore, extensions of the concept of the first demographic dividend.

where $\gamma_{hh}(a)$ is the value of per capita household production and $\phi_{hh}(a)$ is the value of per capita household consumption.

Following the logic of the first demographic dividend, it is possible to estimate a 'time dividend' using the age profiles of the household production and consumption expressed in *time units*, instead of the NTA labour income and consumption profiles. A time support ratio (TSR) can therefore be defined as:

$$TSR_t = \frac{\sum_{a=0}^{\bar{\omega}} \gamma_{hh}(a)P(a,t)}{\sum_{a=0}^{\bar{\omega}} \phi_{hh}(a)P(a,t)} \tag{6.4}$$

where $\gamma_{hh}(a)$ and $\phi_{hh}(a)$ are respectively the time-invariant per capita household production and consumption age profiles (expressed in time units). The time dividend is then the rate of change of the time support ratio. A distinction it therefore made here between the market or NTA support ratio (SR), which incorporates the NTA labour income and consumption profiles only; the household or NTTA support ratio (HSR), which incorporates the monetary-value NTTA household production and consumption profiles only; the full support ratio (FSR), which incorporates the NTA labour income and consumption profiles and the monetary-value NTTA household production and consumption profiles; and the time support ratio (TSR), which incorporates the time-denominated NTTA household production and consumption profiles only.

6.6.2 Gender and Demographic Dividends

Three results from the preceding analysis inform the analysis of demographic dividends here. First, section 6.2 found substantial differences in the labour income profiles of males and females. Second, section 6.3 illustrated significant gender specialisation in productive activities, with females spending significantly more time in household production and less in market production. Finally, section 6.5 revealed that including household production impacts materially on production and consumption profiles and that this impact varies by gender and age.

Given these findings, I ask three questions related to demographic dividends:

1. How might reducing gender inequalities in labour income across the life course impact on estimates of the first demographic dividend?

2. To what extent can demographic change in South Africa be expected to change the demand for and supply of time in productive activities within the household?

3. How does incorporation of household production and consumption into total production and consumption impact on estimates of the first demographic dividend?

To answer the first question, I run a set of simulations that narrow the gap between the labour income profiles of males and females linearly over the 2010-2050 period. Three simulations are presented. The first narrows the gap by 50 percent over the period by gradually adjusting the female labour income profile, while leaving the male profile constant. The second simulation is identical, except that it narrows the gap by 25 percent over the period. The third simulation is somewhat different in that, although the gap is still narrowed by 25 percent, both the male and female labour income profiles are adjusted over the 2010-2050 period. These simulations consider only the narrowing of the gender gap in labour income and ignore potential impacts on labour supply or on engagement in household production for women (or men), which may counter the potential gains in terms of the demographic dividend. Since labour income for females is lower than that of males at all ages, all three simulations entail raising labour incomes for females while the third also lowers that of males. These simulations, along with the conventional NTA demographic dividend (the baseline), are presented in Figure 6.10.

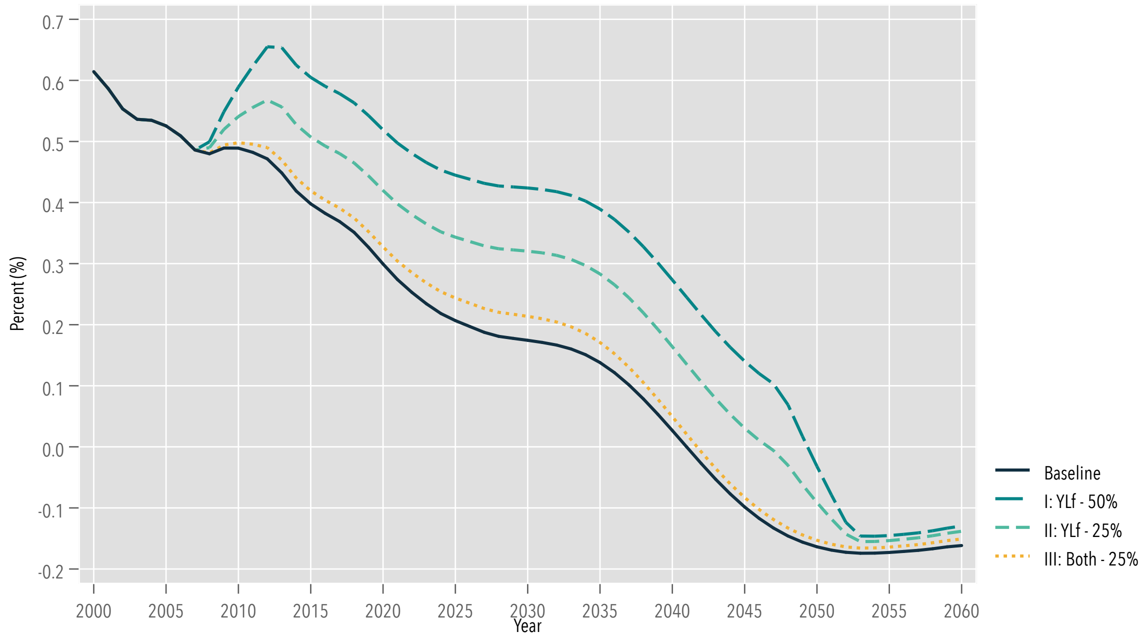


FIGURE 6.10. IMPACT ON THE DEMOGRAPHIC DIVIDEND OF REDUCING GENDER DIFFERENCES IN LABOUR INCOME, 2000-2060

Source: Own calculations, Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2010a,b,c, 2011, 2013a); UNESCO (2018); United Nations (2017); World Bank (2018b).

Raising labour incomes amongst females has a non-negligible impact on the magnitude of the demographic dividend. Simulation I, which narrows the gender gap by 50 percent, has the largest impact: averaged across the full 2010-2050 period, the estimated dividend is 0.22 percentage points higher than the baseline dividend. The estimates suggest that demographic change, on its own, will raise consumption per capita by 16.5 percent over the 2010-2050 period, compared to an increase of 6.4 percent (a difference of more than ten percentage points) if the gap remained constant. Narrowing the labour income gender gap by 25 percent has a somewhat weaker, but still significant, impact on per capita consumption, raising it by 12.0 percent by 2050.

If improvements in female labour income come at the cost of male labour income—i.e. the gender gap is narrowed by raising female labour income and lowering male labour income—the impact in terms of the demographic dividend is much more muted. The estimated demographic dividend over the 2010-2050 period is only marginally higher than the baseline dividend; the result is that consumption per capita is projected to rise by 7.6 percent under scenario III, just 1.2 percentage points more than the increase projected for the baseline.

The second question refers to the time support ratio (TSR), which relates the time-denominated total production to the total consumption of non-market services over time. Where estimated total production rises relative to total consumption as the population structure changes, the TSR rises and there is demographic dividend, referred to here as a time dividend. Figure 6.11 presents estimates of the time dividend with respect to total household production, as well as for its main components namely care and chores.

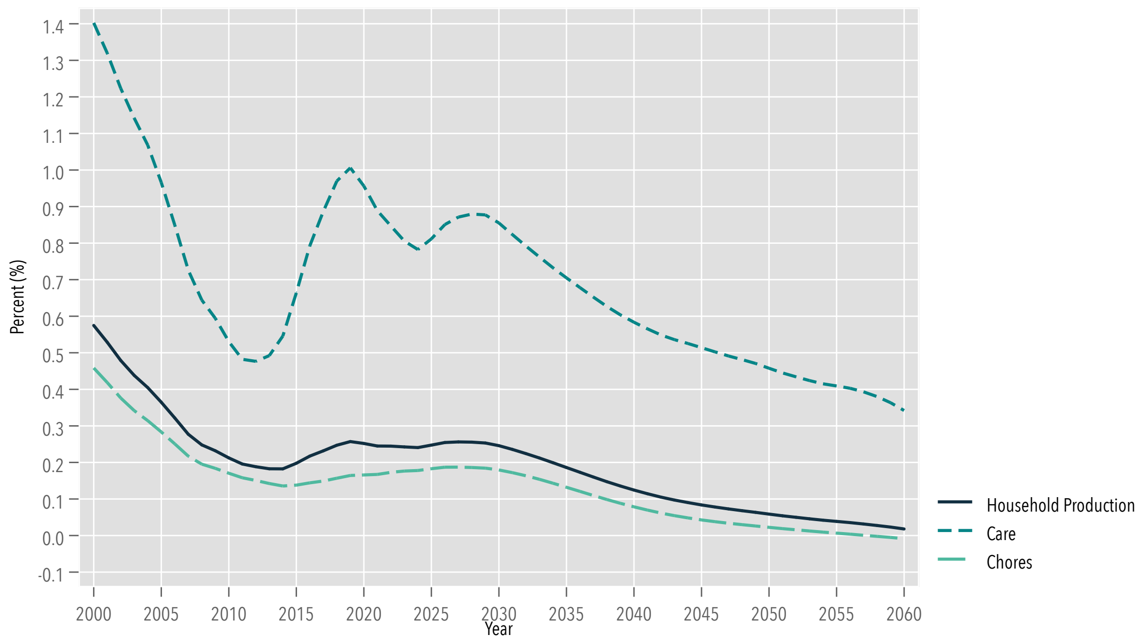


Figure 6.11. Impact on the Demographic Dividend of Demography-Induced Changes in Demand for and Supply of Household Production, 2000-2060

Source: Own calculations, Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2010a,b,c, 2011, 2013a); UNESCO (2018); United Nations (2017); World Bank (2018b).

The estimated time dividend for total household production is positive for the entire period between 2000 and 2060. The dividend is highest at the start of the period (0.57 percent in 2000) and falls quite rapidly to below 0.2 percent in 2011. However, the dividend ranges between 0.21 percent and 0.26 percent for almost two decades from the late 2010s to the early 2030s before gradually drifting downwards for the remainder of the period. Due to the dominance of chores within total household production, the time dividend related to chores follows a very similar path to that of total household production, albeit at a slightly lower level. The dividend begins the period at 0.46 percent in 2000, and is projected to fall slightly below zero in 2058.

For care, however, the projected time dividend is substantially larger, even though it follows a broadly similar path over the period. The time dividend for care is estimated to have been 1.40 percent in 2000, but by 2010 was less than half that (0.53 percent). It is projected to rebound sharply during the mid-2010s, ranging between 0.70 percent and 1.01 percent for 20 years from 2016 onwards. Even by the end of the period in 2060, the time dividend for care is projected to be relatively large at 0.34 percent.

The data suggests that, holding the profiles of household production and consumption constant, total production of unpaid work will rise over the period relative to total consumption.

This is particularly the case for care: the vast majority of the care measured in the survey data is childcare and the period will see the most rapid rates of population growth amongst producers of childcare rather than amongst consumers of childcare. This means that behaviour at the household level will change over time: household members will be able to consume more household production, raising the per capita consumption of non-market work; they will be able to reduce the time spent in household production, thereby lowering the the NTTA production profiles over time; or they may opt for a combination of the two. The latter two options would essentially free up time for producers of non-market work, enabling them to either increase the time allocated to leisure and self-care activities or to increase time allocated to market work. Given women's specialisation in non-market work, to the extent that individuals allocate more time to market work, this represents an important opportunity to increase women's participation in the labour market over the coming decades, with relatively little direct disruption of patterns of household production.

The third question revolves around the nature of the full support ratio (FSR), and the extent to which it may differ from the conventional NTA support ratio (SR). Since the FSR will be sensitive to the choice of wage rates used to value household production, five FSRs are calculated that correspond to the five sets of wage rates presented in Table 6.2. The demographic dividends calculated on the basis of these FSRs are presented in Figure 6.12.

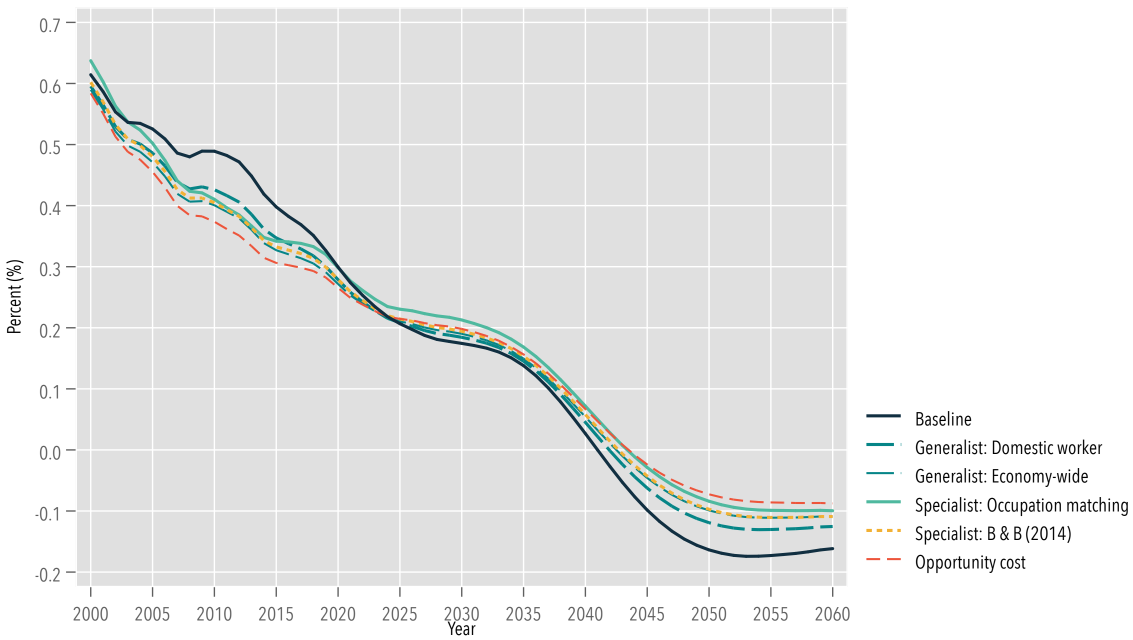


FIGURE 6.12. IMPACT ON THE DEMOGRAPHIC DIVIDEND OF INCLUDING HOUSEHOLD PRODUCTION IN ESTIMATES OF TOTAL PRODUCTION, 2000-2060

Source: Own calculations, Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2010a,b,c, 2011, 2013a); UNESCO (2018); United Nations (2017); World Bank (2018b).

There are two key points to note from the figure. First, even though the wage rates used to value time in household production vary significantly and yield large differences in the total value of household production relative to GDP (Table D.3), they have only a small impact on the estimated magnitude of the FSR-based demographic dividend. Across the five estimates, the range of demographic dividend values in each year remained within 0.05 percent.

Second, although the FSR-based demographic dividend is quite similar to the conventional NTA demographic dividend over the period, the former follows a slightly flatter path between 2000 and 2060. The FSR-based dividends are initially typically lower than the NTA demographic dividend, but during the latter half of the period are typically higher. Thus, for example, the NTA demographic dividend is projected to fall below zero in 2041, one or two years sooner than the FSR-based dividends. The net effect, though, is that the FSR-based dividends do not differ materially from the NTA demographic dividend: in 2050, total (market and non-market) consumption per capita is between 6.4 percent and 7.3 percent higher than in 2010, depending on the wage rates used, compared to 6.4 percent for the baseline (NTA) dividend.

6.7 Discussion and Conclusion

The exclusion of non-market work from the SNA production boundary has important implications for gendered analyses of the generational economy using National Transfer Accounts. This is because non-market work is substantial when valued, irrespective of the wage rate used, and because it is unevenly distributed between males and females. Using five different sets of wage rates to value time spent in these activities, it is estimated that household production is equivalent to between 14.6 percent and 38.1 percent of GDP. Using the specialist replacement wage preferred in the NTTA methodology, the proportion is 27.3 percent. In aggregate, females account for 71.3 percent of time spent in household production activities. Females also account for at least that proportion of the value of household production using any set of wage rates except the opportunity cost (own/imputed wage) approach.

However, neither the magnitude of household production nor the fact that the lion's share of this work is performed by women and girls comes as a surprise; both findings have been extensively documented internationally and for South Africa. However, the NTTA methodology has provided a new lens through which to view household production: its link to NTA, its emphasis on age in addition to gender, and its consideration of consumption of household production contribute to a more nuanced understanding of both patterns of household production and the nature of dependence within the generational economy more broadly defined. In particular, there are four key areas where the NTTA methodology has yielded new results and concrete evidence to add to the debates on these issues.

First, NTTAs have at their core an explicit consideration of age, with the result that they are able to describe the particular lifecycle characteristics of household production and, indeed, of market work. This is a key advantage of NTTAs, allowing the identification of particular life stages during which there may be significantly more (or fewer) demands placed on individuals' time. While time spent in market work is found to peak between the ages of 30 and 59 years for both men and women, time allocations to household production are found to have two peaks. For females, these two peaks occur during the late twenties and around age 60, driven primarily by care activities; for males, the two peaks occur slightly earlier and about a decade later respectively, the result of surges in time allocated to housework.

The result of these variations in time allocations across age is evident in the distribution of total time spent by the South African population in household production activities presented in Table D.3. The cohort aged 30-49 years accounts for 34.8 percent of total time spent in household production, and 38.8 percent of time spent caring for others; however, this cohort accounts for just 25.4 percent of the population. Similarly, those aged 18-29 years account for 33.3 percent of time spent in household production and 40.6 percent of time spent in care activities, compared to their population share of 23.4 percent.

Second, through the application of the NTTA methodology, it has been possible to provide an estimate of the true cost of children. Using conventional NTAs, the infants and young children appear to be relatively inexpensive: per capita consumption by infants, for example, is just 35.4 percent of peak labour income. Using the NTA estimates to construct a synthetic cohort, it is estimated that, on average, the cost of raising a child from birth to their 18^{th} birthday in South Africa is 8.2 times peak labour income (around R493 000 in 2010 Rands). However, once their consumption of household production is factored in, this cost increases by two-thirds to 13.7 times peak labour income or just over R820 000. Of this total, the public sector finances 29.3 percent of the cost; families finance the rest, with 30.8 percent of the cost representing private consumption and 39.9 percent representing consumption of unpaid care and domestic work.

This detailing of the cost of childcare can be extended to eldercare and care generally and essentially demonstrates that market-based estimates of the cost of care exaggerate the importance of the state (Yoon 2014). This notion is encapsulated in the concept of the welfare triangle, which describes the distribution of the costs of care between the state, the market and the family, or the welfare diamond, which includes the voluntary sector (see Jenson and Saint-Martin 2003; Razavi 2007). The NTTA research does not address the voluntary sector, but the results presented here confirm the importance of including provision of care by families in order to more accurately characterise the institutional arrangements of care provisioning within South Africa.

A clearer detailing of the costs of children is critical to understanding fertility choices and, in low fertility societies, may be the difference between the success and failure of policies aimed at raising fertility. While South Africa does not currently find itself in this position, the figures presented here shed light on the extent of the burden carried by families and the relatively low level of support provided by the state. Further, this data can contribute to debates around the extent to which some of these costs might be 'socialised' given that these children represent future workers. Key in the South African context, though, would be further analysis of these costs by socioeconomic status.

Third, the NTTA estimates indicate that significant resource transfers exist outside the scope of conventional NTA estimates, with implications for how dependence is understood from a generational economy perspective. The evidence presented above indicates the existence of substantial time transfers from females to males (Figure 6.6) and from older to younger cohorts (Table 6.1). These time transfers represent critical, yet rarely recognised, contributions to sustaining market work. As Antonopoulos (2008, p.6) notes, "unpaid care work entails a systemic transfer of hidden subsidies to the rest of the economy that go unrecognized, imposing a systematic time-tax on women throughout their life cycle". First, these time transfers include a significant amount of time that is spent building children's human capital: feeding children, keeping their environments clean and safe, facilitating their learning and socialisation, and caring for them when they are ill, amongst other activities. Second, these time transfers represent the provision of services to other household members that may often facilitate their market work.

Fourth, using the gender-disaggregated NTA and NTTA estimates, it is possible to begin exploring the implications of expected demographic change in terms of time and gender dividends. Given the patterns of the production and consumption of non-market work across the lifecycle illustrated in Figures 6.4 and 6.5, it is clear that changes in the population age structure may impact on the relative sizes of aggregate demand and supply of non-market work. Indeed, projections of the time support ratio presented in section 6.6.2 indicate that South Africa is currently experiencing a household production time dividend as the population gradually ages, and that the time dividend is particularly large for care. In other words, assuming that current patterns of per capita consumption of non-market work remain constant, producers of non-market work will find themselves with additional time on their hands, which would allow them to allocate time to other activities, productive or not; should patterns of per capita production remain constant instead, per capita consumption would increase without requiring additional time allocations by producers.

Section 6.6.2 also investigated the potential for a so-called 'gender dividend' that would arise if the labour income gender gap were to be narrowed by raising per capita labour income amongst women. Closing the gender gap by 25 percent would almost double the magnitude of the baseline demographic dividend, thus quantifying some of the potential economic gains from boosting women's labour income. The NTA and NTTA frameworks are not prescriptive in terms of particular policy interventions that should be pursued, leaving various routes to achieve this narrowing of the gender gap. Increasing female employment-to-population ratios, raising women's average hours of work, raising their hourly remuneration, or facilitating women's greater access to higher skilled occupations are all potential ways of achieving this narrowing of the labour income gender gap.

However, the notion of the gender dividend as a policy objective relies on the fact that women are willing either to enter the labour force or, where relevant, to increase the intensity of their participation (e.g. through longer working hours). Further it assumes that women have time available to allocate to market work, that the timing of their availability coincides with the needs of employers, and that allocating more time to paid work does not exacerbate the dual burden that many employed women already face. Satisfying these conditions would arguably only be possible in an environment that acknowledges and addresses the unequal burden of household production. As argued by Elson (2017, p.54), greater equality in unpaid work can only be achieved through strategies and interventions that "recognize, reduce, and redistribute women's unpaid work": recognition that unpaid work is productive work, reduction of the amount of unpaid work that is required, and redistribution of unpaid work so that it is equally shared between males and females.

While the NTTA framework provides rich information on household production and gender in the context of the generational economy, there are a number of key areas that it is unable to address, but which are nevertheless important for consideration from a policy perspective.

First is the existence of qualitative differences in the time allocated to household production between males and females.

Second, this research does not address the critical concern around the impact of women's non-market work responsibilities on their ability to find and keep employment. As Hook (2010, p.1481) notes, "[women] tend to do housework tasks that are less time flexible and discretionary than men", and that these time-inflexible tasks "are more likely to limit paid work and leisure opportunities". Further, women's care responsibilities may make informal employment more attractive since it allows them to combine paid and unpaid work: Roncolato (2016, p.82) find support for "the argument that women in ... small agriculture and informal employment, combine paid and unpaid work more often and intensively than some working in more formally structured jobs". However, as they note, this can be interpreted as a benefit of this type of employment, or it may reflect the outcome of women's constrained choices.

Inequalities between males and females in responsibility for non-market work is the outcome of numerous factors operating at the individual, family, community and societal levels and which, as has been shown, may be constraining national economies.

The three R's—recognise, reduce, redistribute—frame the global policy debate around gender and household production. In South Africa, much progress remains to be made in all three areas. At a societal level, broad-based recognition of the economic value of non-market work remains elusive and, without this, there is relatively little appetite amongst policymakers to drive reduction and redistribution. Critically, there needs to be a willingness across all sectors of South African society to engage in an open and honest discussion around the social and cultural norms that both constrain women's access to wage employment and compel women to shoulder a disproportionately large share of non-market work.

Chapter 7

Conclusion

The effects of changing population age structures are being felt in almost every country around the world. As the share of dependents—children and the elderly—within the total population changes, so societies experience changes in the economic forces acting upon them. This is the result of the complex web of interactions between individuals and households reflected in the economic flows quantified by National Transfer Accounts. Whether these changing forces are favourable or not, governments are faced with critical policy choices in order to capture the benefits and ameliorate the costs of changing populations.

This thesis has focussed on measuring the flows of resources across cohorts in South Africa society using the NTA methodology. The estimates allow a detailed description of these flows at a given point in time; repeated cross-sectional estimates allow the discernment of changes over time; and disaggregations of these estimates allow for comparisons of these flows between sub-populations.

Broadly speaking, South Africa's generational economy shares many features with those of other countries: children and the elderly consume more than they produce, while the prime working-age cohorts produce more than they consume; there are substantial transfers within households and from state, particularly to younger cohorts; and asset-based reallocations gain in importance throughout the working-ages and are important in financing consumption amongst the elderly. However, once the country's labour income and consumption profiles were presented in Chapter 4 in comparison to those of the 45 countries for which there are NTA estimates, it was immediately clear that there were important differences. Particularly high unemployment amongst the youth in South Africa results in a labour income profile that appears to be shifted towards older ages, while there is far greater variation in per capita consumption across age in South Africa than the median country or the countries falling within the interquartile range, with consumption amongst children much lower and that amongst the elderly much higher than expected.

Rising per capita consumption across the lifecycle is something of an anomaly, particularly in terms of the consistency of the increase during adulthood. However, this pattern was shown in Chapter 5 to be driven by a composition effect, with younger cohorts having higher proportions of Africans whose per capita consumption is relatively low and older cohorts having higher proportions of Whites whose per capita consumption is relatively high. Analysis of race-disaggregated NTAs reveals important differences in the patterns of resource flows across age for each group and highlights the stark inequalities within South African society. Nevertheless, resources flow strongly downwards to younger ages in South Africa and this is true for each race group. However, transfer wealth is primarily private transfer wealth for Whites, while for Africans public transfer wealth is somewhat more important. Indeed, the public sector plays a vitally important role in supporting the consumption of poorer groups within South African society.

As another sub-population categorisation, gender-disaggregation reveals substantial differences in the lifecycle deficits of men and women driven by large differences in their labour income profiles. This reflects the delineation by national accounts of the SNA production boundary to exclude non-market work, such as housework and care. By quantifying time allocated to these activities by gender across the lifecycle and valuing this time using various wage rates, it is clear that unpaid work represents a substantial proportion of total (paid and unpaid) production. Using a specialist replacement wage, unpaid work is valued at more than 27 percent of GDP in 2010, with women accounting for 71 percent of the time allocated to unpaid work and at least that proportion of the value of unpaid work irrespective of the wage rate used. The estimates reveal that conventional NTAs substantially underestimate the true cost of children by not accounting for the value of unpaid care: considering a child's total consumption from birth to age 18, two-fifths is in the form of unpaid work, with the remainder roughly evenly split between private and public consumption.

An important theme has been that of the demographic dividend, the boost to economic growth that arises from the changing age structure of the population. In the context of South Africa's pressing socioeconomic problems, rooted in and exacerbating high unemployment, poverty and extreme inequality, the demographic dividend takes on added significance. Unfortunately, the first demographic dividend is almost over and is expected to dissipate within 20 years and, while the second dividend is potentially substantial over the remainder of the century, there remain shortcomings in critical policy areas underpinning this dividend. Principally, the lack of good quality employment opportunities constrains the country's ability to harness what remains of the first dividend and to maximise the benefits of the second. At the same time, weaknesses in the institutions that facilitate the accumulation of human capital—both education and health—also impede South Africa's progress.

One factor that counts in South Africa's favour in terms of harnessing the second dividend relates to the extent to which consumption amongst the elderly is financed through assets. However, the analysis in Chapter 5 reveals that this aggregate pattern is driven primarily by elderly Whites and, to a lesser extent, Asians, while elderly Africans and Coloureds are much more reliant on transfers—and specifically public transfers—to finance their consumption. With Africans the youngest of the four race groups, this suggests that future elderly cohorts may finance an increasingly large share of their consumption from public transfers, thus weakening the potential effect of the second dividend. Race-disaggregated NTAs reveal the potential effects of inequalities across sub-populations on estimates of the demographic dividend, which may potentially result in substantial over- or under-estimation of the magnitude and/or duration of the demographic dividend. This is a key finding not only for South Africa, but for the many other unequal societies around the world.

While this paints a relatively gloomy picture of the likelihood of a second dividend, it is important to remember that these projections are based on static NTA profiles, an assumption that is highly improbable in reality. While estimates of the dividends are relatively robust to NTA estimates from different years, it was shown that there are a number of options available to improving the dividends in terms of their magnitude and/or duration. Lower fertility, improvements in labour market outcomes, particularly amongst the youth, and a narrowing of the gender gap in mean labour income are all able to positively impact the potential demographic dividend. The NTA results are not prescriptive from a policy perspective in terms of how to achieve specific outcomes such as these, allowing policy choice and flexibility across and even within countries. Nevertheless, each of these changes would require not inconsequential changes in behaviour or economic conditions, highlighting the challenge from a policy perspective. Further, as was highlighted in Chapter 6, some of these changes may have a material impact on the way in which families allocate and arrange their various responsibilities.

While the policy challenge may be daunting, government should not shy away from it. Small improvements may accumulate over time and lead to synergies in other areas. A key example here would be the feedback loops between women's education and health, fertility, labour market participation, incomes, and the reinforcing effects on the demographic dividend. Some of these interventions may have the additional benefit of increasing equity, such as a more equitable distribution of household production, and care in particular, between men and women. Patterns of time use may themselves also be impacted by the changing population age structure—the data suggests a large time dividend in terms of care and a smaller, though still positive, dividend in terms of housework over the next 40 years—and the potentially declining demand for household production may present more space to address gender inequalities in time-use. That said, however, it should be noted that the estimated time dividends do not specify how the time freed up in this process would be allocated; indeed, this time may very well be used to increase time allocations to care per care recipient.

The results presented have highlighted the rich detail available within the NTAs and suggest various avenues for future research. One potential criticism of the NTA-based estimates of the demographic dividend is that they rely on static NTA age profiles derived from cross-sectional data sources and projected unchanged forward in time, when it is clear that these profiles can and do change in response to various economic, social and institutional factors. This problem can be addressed through the incorporation of updated age profiles over time and provides a rationale for constructing as many sets of accounts as is possible from a data perspective. Combining multiple sets of accounts over an extended period of time also makes it possible to analyse changes in the age profiles over time and, potentially, trace them back to specific changes in policy or other factors.

Further, flowing from the analysis in Chapter 5, it is clear that there are a number of potential ways in which to define sub-populations that are useful from an analytical or policy perspective. For example, quantiles of the income or consumption distribution, however defined, would be useful in tracking changes in patterns of transfers, even though this type of categorisation does not lend itself as strongly to the analysis of the demographic dividend. Alternatively, with the availability of population projections by educational attainment, educationally-defined sub-populations suggest an interesting way forward in bringing expected improvements in human capital more concretely into estimates of the demographic dividends.

Chapter 8

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Appendices

Appendix A

The NTA Flow Account

The flows comprising the NTA flow account are listed below. However, depending on data availability, country NTAs may not model all flows separately.

Lifecycle deficit (LCD)

1. Consumption (C)
    - (a) Public Consumption (CG)
        - i. Public consumption, education (CGE)
        - ii. Public consumption, health (CGH)
        - iii. Public consumption, other than health and education (CGX)
    - (b) Private Consumption (CF)
        - i. Private consumption, education (CFE)
        - ii. Private consumption, health (CFH)
        - iii. Private consumption, other than health and education (CFX)
2. Labour income (YL)
    - (a) Earnings (YLE)
    - (b) Self-employment labour income (YLS)

Age reallocations (R)

1. Transfers (T)
    - (a) Public transfers (TG)
        - i. Public transfers, inflows (TGI)
            - A. Public transfers, education, inflows (TGEI)
            - B. Public transfers, health, inflows (TGHI)
            - C. Public transfers, pensions, inflows (TGSOAI)
            - D. Public transfers, other in-kind, inflows (TGXI)
            - E. Public transfers, other cash, inflows (TGXCI)

- ii. Public transfers, outflows (TGO)
  - A. Public transfers, education, outflows (TGEO)
  - B. Public transfers, health, outflows (TGHO)
  - C. Public transfers, pensions, outflows (TGSOAO)
  - D. Public transfers, other in-kind, outflows (TGXO)
  - E. Public transfers, other cash, outflows (TGXCO)
- (b) Private transfers (TF)
  - i. Private transfers, inflows (TFI)
    - A. Inter-household transfers, inflows (TFBI)
    - B. Intra-household transfers, inflows (TFWI)
      - Intra-household transfers, consumption, inflows (TFWCI)
        - Intra-household transfers, consumption of education, inflows (TFWEI)
        - Intra-household transfers, consumption of health, inflows (TFWHI)
        - Intra-household transfers, consumption other than health and education, inflows (TFWXI)
      - Intra-household transfers, savings, inflows (TFWSI)
  - ii. Private transfers, outflows (TFO)
    - A. Inter-household transfers, outflows (TFBO)
    - B. Intra-household transfers, outflows (TFWO)
      - Intra-household transfers, consumption, outflows (TFWCO)
        - Intra-household transfers, consumption of education, outflows (TFWEO)
        - Intra-household transfers, consumption of health, outflows (TFWHO)
        - Intra-household transfers, consumption other than health and education, outflows (TFWXO)
      - Intra-household transfers, savings, outflows (TFWSO)

2. Asset-based reallocations (RA)
   - (a) Public asset-based reallocations (RAG)
     - i. Public asset income (YAG)
     - ii. Public saving (SG)
   - (b) Private asset-based reallocations (RAF)
     - i. Private asset income (YAF)
       - Private asset income, property income (YPF)
       - Private asset income, capital income (YKF)
         - Private capital income, business and non-profits (YKFB)
         - Private capital income, owner-occupied housing (YKFH)
     - ii. Private saving (SF)

The following tax profiles are constructed in order to construct the public transfer outflow profiles. However, these tax profiles do not form part of the NTA flow account.

1. Taxes (TGF)
   (a) Taxes on income, profits and capital gains (TGFK)
   (b) Taxes on payroll and workforce (TGFW)
   (c) Taxes on property (TGFP)
   (d) Taxes on goods and services (TGFG)
   (e) Taxes on international trade and transactions (TGFF)
   (f) Other taxes (TGFX)
2. Social contributions (TGP)
   (a) Social security contributions (TGPS)
   (b) Other social contributions (TGPX)
3. Grants (TGG)
   (a) Grants from foreign governments (TGGG)
   (b) Grants from international organisations (TGGF)
4. Other revenue (TGX)

Appendix B

South Africa's Demographic Dividend

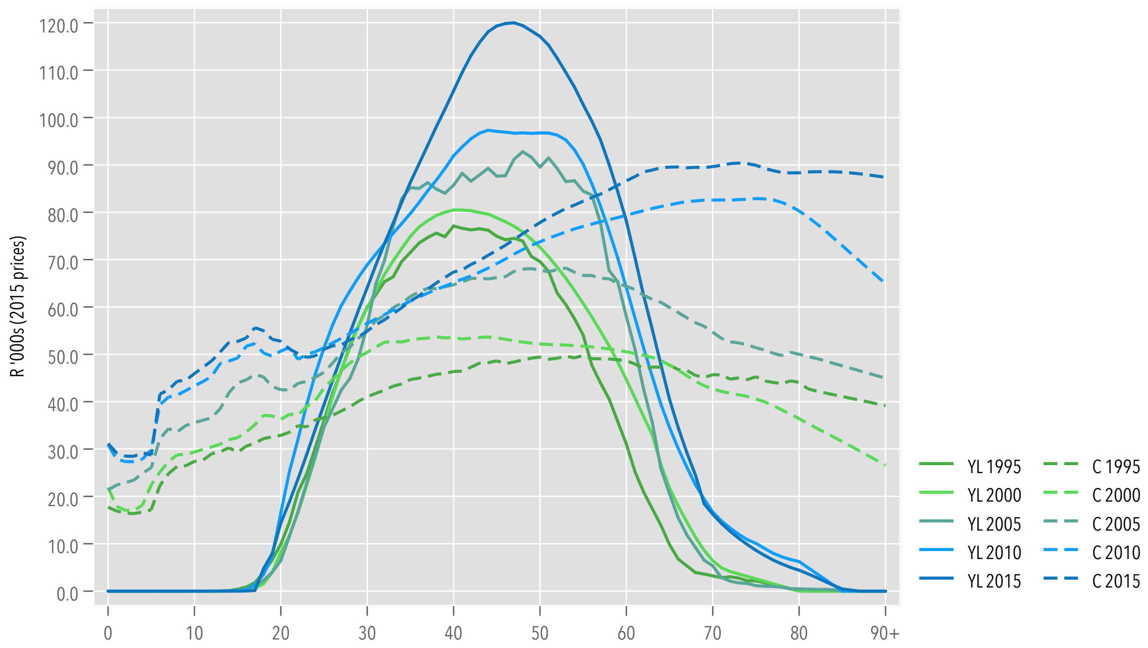

Figure B.1. South African Labour Income and Consumption Profiles, 1995-2015

Notes: Profiles are expressed in constant 2015 Rands.

Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c, 2019a); UNESCO (2018); United Nations (2017); World Bank (2018b).

TABLE B.1. SELECTED POPULATION INDICATORS FOR SOUTH AFRICA, 1965-2100

	Unit	**1965-1970**	**1995-2000**	**2015-2020**	**2065-2070**	**2095-2100**	**Change ('15-'65)**
Medium variant projections							
Population (in first year of period)							
Total	'000s	19 942	42 088	55 291	76 287	77 008	20 996
0-19 years	'000s	10 297	19 751	21 363	19 635	17 157	-1 728
20-64 years	'000s	8 900	20 764	31 119	45 340	43 033	14 221
65+ years	'000s	745	1 573	2 809	11 312	16 819	8 503
Population growth							
Total	% p.a.	2.75	1.67	1.21	0.18	-0.14	-1.03
0-19 years	% p.a.	2.92	0.58	0.43	-0.48	-0.45	-0.91
20-64 years	% p.a.	2.58	2.56	1.50	0.10	-0.33	-1.40
65+ years	% p.a.	2.40	3.19	3.70	1.57	0.66	-2.13
Dependency ratios							
Total		1.26	0.98	0.76	0.69	0.80	-0.08
Child (0-19)		1.17	0.91	0.67	0.43	0.40	-0.24
Old age (65+)		0.08	0.08	0.10	0.26	0.40	0.16
Low variant projections							
Population (in first year of period)							
Total	'000s			55 291	61 666	49 524	6 375
0-19 years	'000s			21 363	11 815	7 539	-9 548
20-64 years	'000s			31 119	38 539	27 161	7 420
65+ years	'000s			2 809	11 312	14 824	8 503
Population growth							
Total	% p.a.			1.01	-0.47	-1.04	-1.47
0-19 years	% p.a.			-0.12	-1.56	-1.51	-1.45
20-64 years	% p.a.			1.50	-0.76	-1.33	-2.26
65+ years	% p.a.			3.70	1.57	-0.29	-2.13
Dependency ratios							
Total				0.76	0.61	0.83	-0.15
Child (0-19)				0.66	0.30	0.28	-0.36
Old age (65+)				0.09	0.31	0.56	0.21
High variant projections							
Population (in first year of period)							
Total	'000s			55 291	93 094	114 340	37 803
0-19 years	'000s			21 363	29 419	32 716	8 056
20-64 years	'000s			31 119	52 364	62 810	21 245
65+ years	'000s			2 809	11 312	18 814	8 503
Population growth							
Total	% p.a.			1.41	0.76	0.59	-0.66
0-19 years	% p.a.			0.96	0.31	0.35	-0.65
20-64 years	% p.a.			1.50	0.82	0.47	-0.68
65+ years	% p.a.			3.70	1.57	1.39	-2.13
Dependency ratios							
Total				0.77	0.77	0.83	0.00
Child (0-19)				0.68	0.56	0.52	-0.12
Old age (65+)				0.09	0.22	0.31	0.12

Source: Own calculations, United Nations (2017).

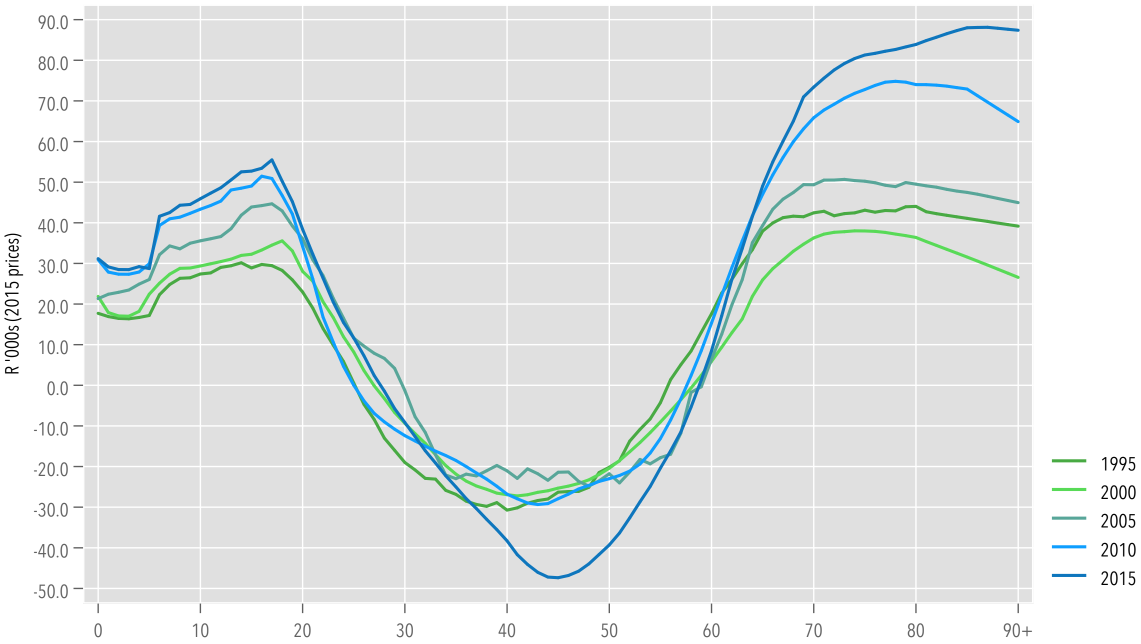

FIGURE B.2. SOUTH AFRICAN LIFECYCLE DEFICIT, 1995-2015

Notes: Profiles are expressed in constant 2015 Rands.
Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c, 2019a); UNESCO (2018); United Nations (2017); World Bank (2018b).

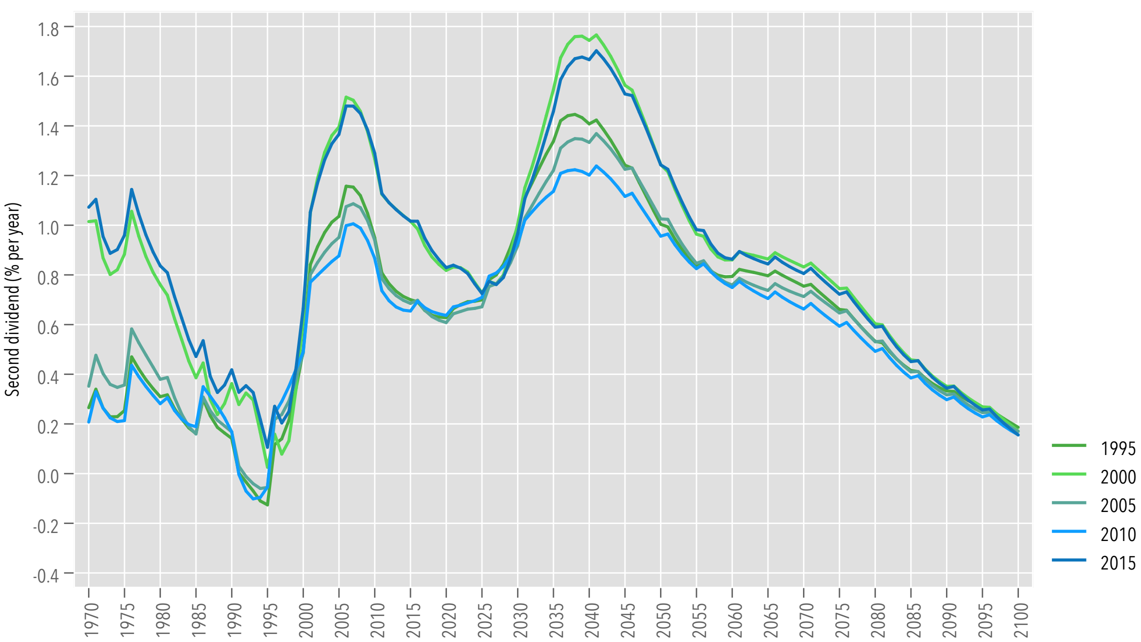

FIGURE B.3. SECOND DEMOGRAPHIC DIVIDEND USING VARIOUS NTA ESTIMATES, 1970-2100

Notes: Estimates using the 2015 NTA profiles are the baseline estimates.
Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c); UNESCO (2018); United Nations (2017); World Bank (2018b).

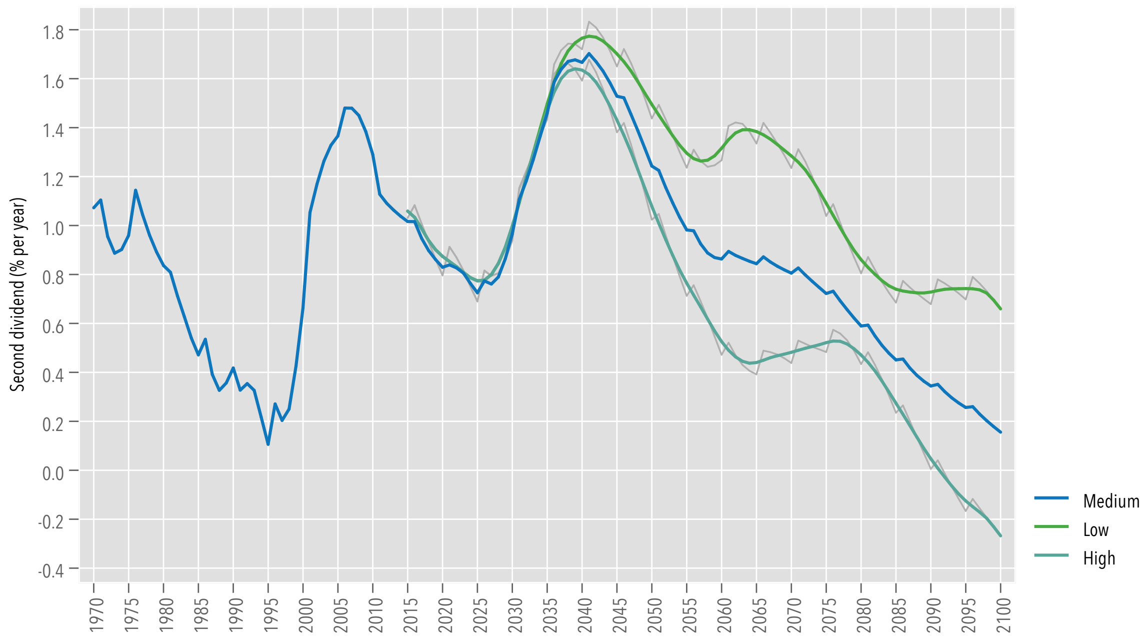

FIGURE B.4. SECOND DEMOGRAPHIC DIVIDEND USING VARIOUS DIFFERENT FERTILITY ASSUMPTIONS, 1970-2100

Notes: The second demographic dividend is estimated based on the 2015 labour income and consumption profiles for South Africa. The constant fertility variant differs from the low, medium and high fertility variants only in that fertility is assumed to be constant as of 2010-2015. Each of these variants assume normal migration. The medium fertility estimates are the baseline estimates. The thin grey lines are the unsmoothed estimates of the dividend; these are smoothed using locally weighted regressions (Lowess smoothing with bandwidth=0.1).
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c); United Nations (2017); World Bank (2018b).

TABLE B.2. FINANCING THE LIFECYCLE DEFICIT

	1995 Estimates			**2005 Estimates**			**2015 Estimates**		
	65+ years	65-74 years	75+ years	65+ years	65-74 years	75+ years	65+ years	65-74 years	75+ years
Financing of the aggregate lifecycle deficit (percent share)									
Age reallocations	89.4	79.7	109.3	73.2	65.5	88.9	78.9	64.9	102.2
Transfers	-10.6	-20.3	9.3	-26.8	-34.5	-11.1	-21.1	-35.1	2.2
Public transfers	-1.6	-5.2	5.8	-0.3	-4.6	8.3	-11.9	-15.6	-5.7
Private transfers	-9.0	-15.1	3.5	-26.5	-30.0	-19.3	-9.3	-19.5	7.9
Asset-based reallocations	110.6	120.3	90.7	126.8	134.5	111.1	121.1	135.1	97.8
Share of the population (percent)									
2015	5.1	3.5	1.6	5.1	3.5	1.6	5.1	3.5	1.6
2035	7.8	5.0	2.8	7.8	5.0	2.8	7.8	5.0	2.8
2065	14.8	8.6	6.3	14.8	8.6	6.3	14.8	8.6	6.3

Source: Own calculations, Department of Finance (1997, 1998, 1999); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2005a,b, 2006a,b, 2015b, 2017a,c); United Nations (2017); World Bank (2018b).

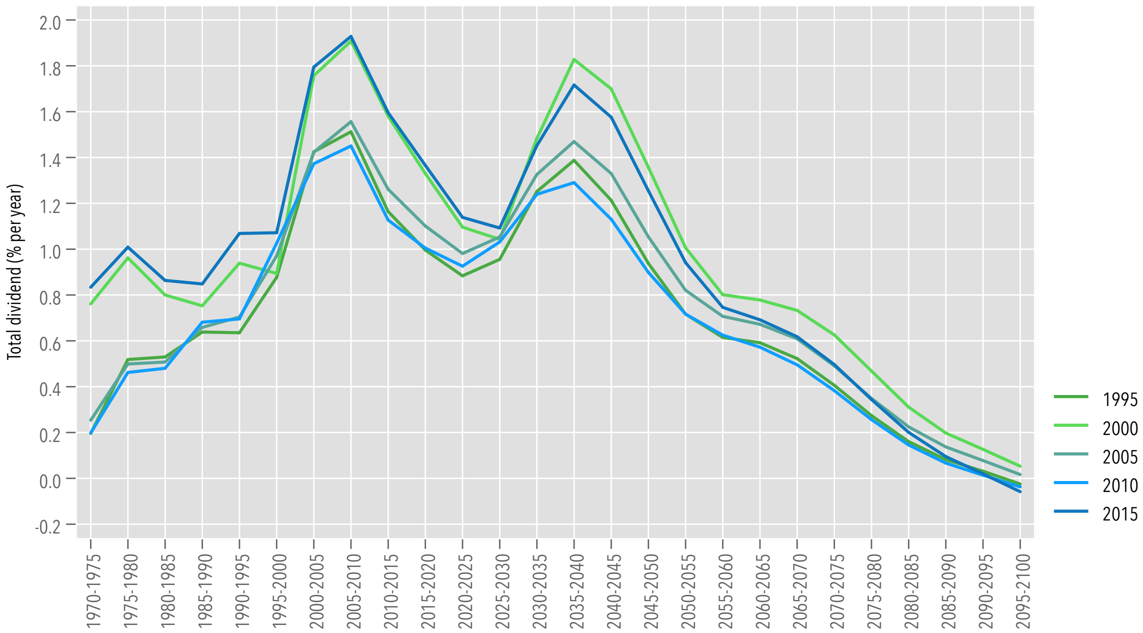

Figure B.5. Total Demographic Dividend using Various NTA Estimates, 1970-2100

Notes: Estimates based on 2015 NTA profiles. Estimates assume medium fertility projections, productivity growth (ρ) of 3.0 per cent, and static population post-2100.
Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c); UNESCO (2018); United Nations (2017); World Bank (2018b).

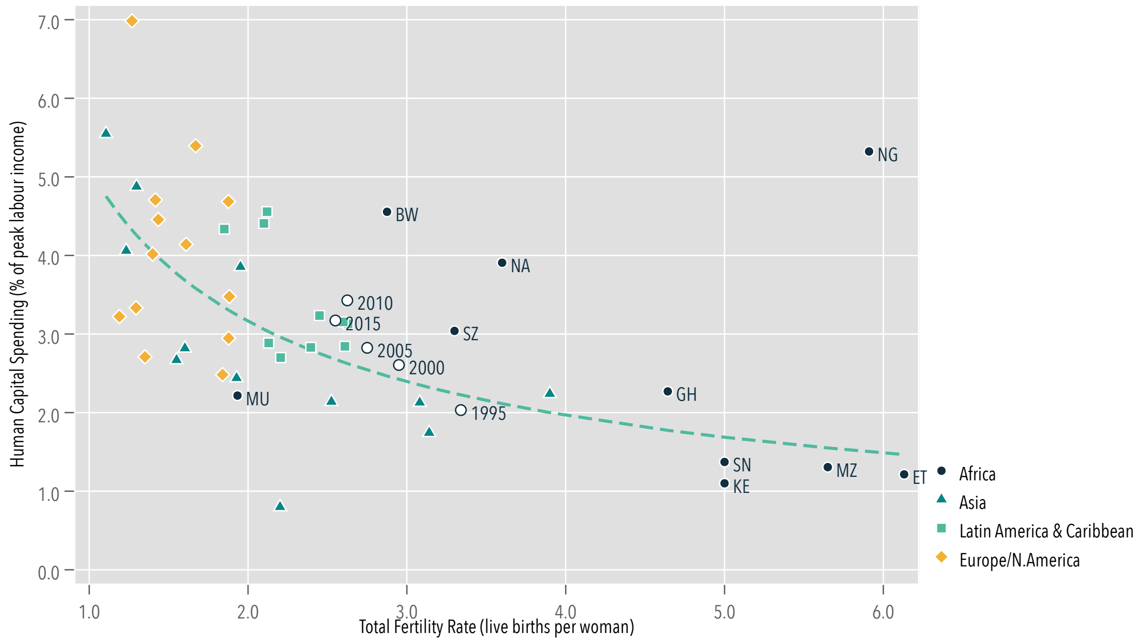

Figure B.6. Lifetime Human Capital Spending and Fertility

Notes: Fertility rates are averages for the five-year periods corresponding with the year of each country's estimates.
Source: Own calculations, Department of Finance (1997, 1998, 1999); Department of Health and Medical Research Council (1998); Kerr *et al.* (2016); National Transfer Accounts Project (2019); National Treasury (2007, 2008, 2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (1995a,b, 2000, 2002, 2005a,b, 2006a,b, 2010a, 2011, 2013a, 2015b, 2017a,c); UNESCO (2018); United Nations (2017); World Bank (2018b).

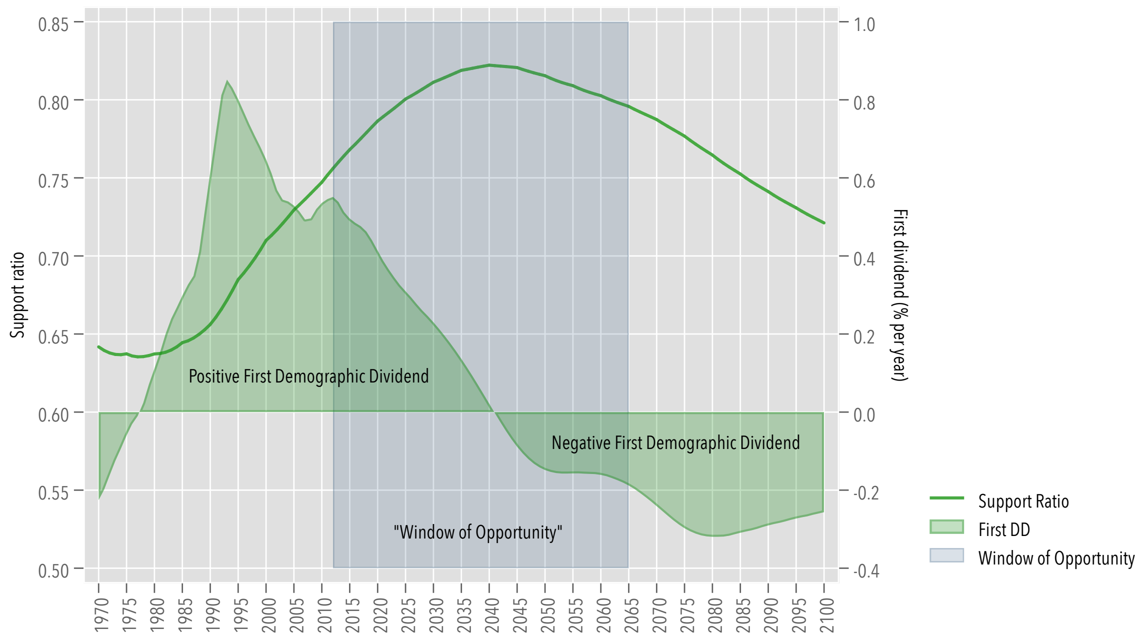

Figure B.7. The "Window of Opportunity" and the First Demographic Dividend

Notes: The window of opportunity is deemed to be open when those under 15 years account for less than 30 percent of the population, and the share of those aged 65 years and above is less than 15 per cent.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c); United Nations (2017); World Bank (2018b).

Appendix C

Inequality and the Generational Economy

TABLE C.1. AGGREGATE CONTROLS BY AGE, 2015

Flow		**Overall** R bil	**0-18 yrs** R bil	**19-39 yrs** R bils	**40-59 yrs** R bil	**60+ yrs** R bil
Labour income	**YL**	**2 166.5**	**4.5**	**978.2**	**1 047.3**	**136.5**
Employment earnings	YLE	1 945.8	1.1	871.8	961.7	111.2
Self-employment earnings	YLS	220.7	3.4	106.4	85.6	25.3
Consumption	**C**	**2 820.5**	**767.4**	**984.5**	**715.3**	**353.3**
Private consumption	CF	1 991.6	395.7	731.2	577.9	286.7
- Education	*CFE*	*69.9*	*42.6*	*24.7*	*2.3*	*0.3*
- Health	*CFH*	*135.0*	*25.9*	*30.6*	*49.6*	*28.9*
- Other	*CFX*	*1 786.7*	*327.3*	*675.9*	*526.0*	*257.5*
Public consumption	CG	828.9	371.6	253.3	137.4	66.6
- Education	*CGE*	*204.6*	*157.7*	*42.4*	*4.4*	*0.1*
- Health	*CGH*	*120.8*	*28.8*	*29.4*	*36.6*	*26.0*
- Other	*CGX*	*503.5*	*185.2*	*181.4*	*96.4*	*40.5*
Lifecycle deficit	**LCD**	**654.0**	**762.9**	**6.3**	**-332.0**	**216.8**
Reallocations	**R**	**654.0**	**762.9**	**6.3**	**-332.0**	**216.8**
Transfers	**T**	**-33.5**	**766.1**	**-88.6**	**-612.5**	**-98.5**
Private transfers	TF	12.8	432.6	-9.8	-358.1	-51.9
- Inflows	*TFI*	*1 346.5*	*438.4*	*449.7*	*285.1*	*173.4*
- Outflows	*TFO*	*1 333.8*	*5.8*	*459.5*	*643.2*	*225.3*
Public transfers	TG	-46.3	333.5	-78.8	-254.5	-46.5
- Inflows	*TGI*	*1 034.7*	*447.2*	*289.8*	*170.8*	*126.9*
- Outflows	*TGO*	*1 081.0*	*113.6*	*368.7*	*425.3*	*173.4*
Asset-based reallocations	**RA**	**687.6**	**-3.2**	**95.0**	**280.5**	**315.3**
Private ABR	RAF	746.9	3.1	115.1	303.8	324.9
- Private asset income	*YAF*	*902.2*	*2.2*	*162.6*	*403.3*	*334.1*
- Private saving	*SF*	*155.3*	*-1.0*	*47.5*	*99.5*	*9.3*
Public ABR	RAG	-59.3	-6.3	-20.1	-23.3	-9.6
- Public asset income	*YAG*	*-109.9*	*-11.7*	*-37.3*	*-43.1*	*-17.8*
- Public saving	*SG*	*-50.6*	*-5.4*	*-17.2*	*-19.8*	*-8.2*

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

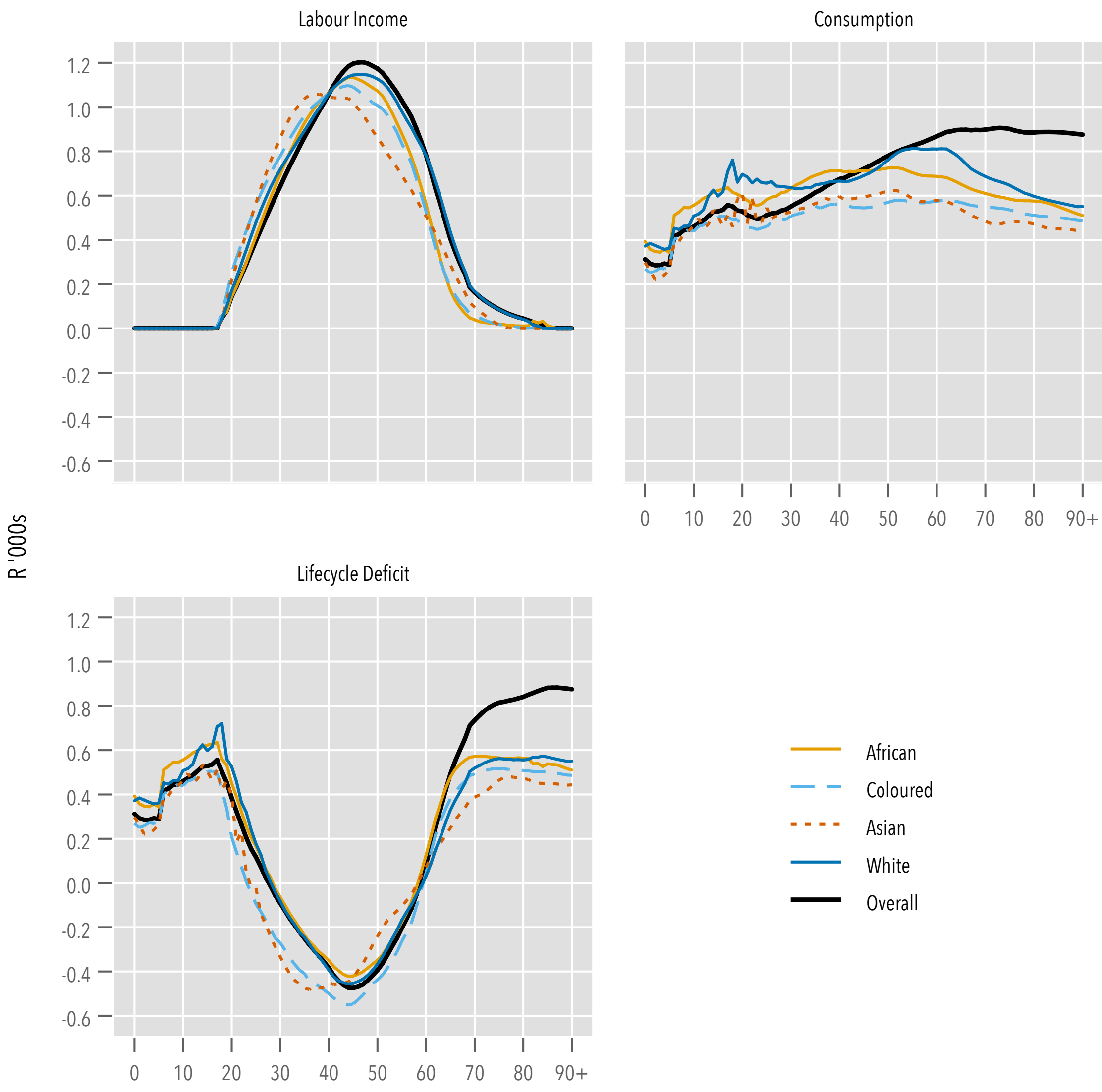

FIGURE C.1. COMPONENTS OF THE LIFECYCLE DEFICIT BY RACE (SELF-NORMALISED), 2015

Notes: Profiles are normalised by dividing by group-specific mean per capita labour income for 30-49 year olds.
Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

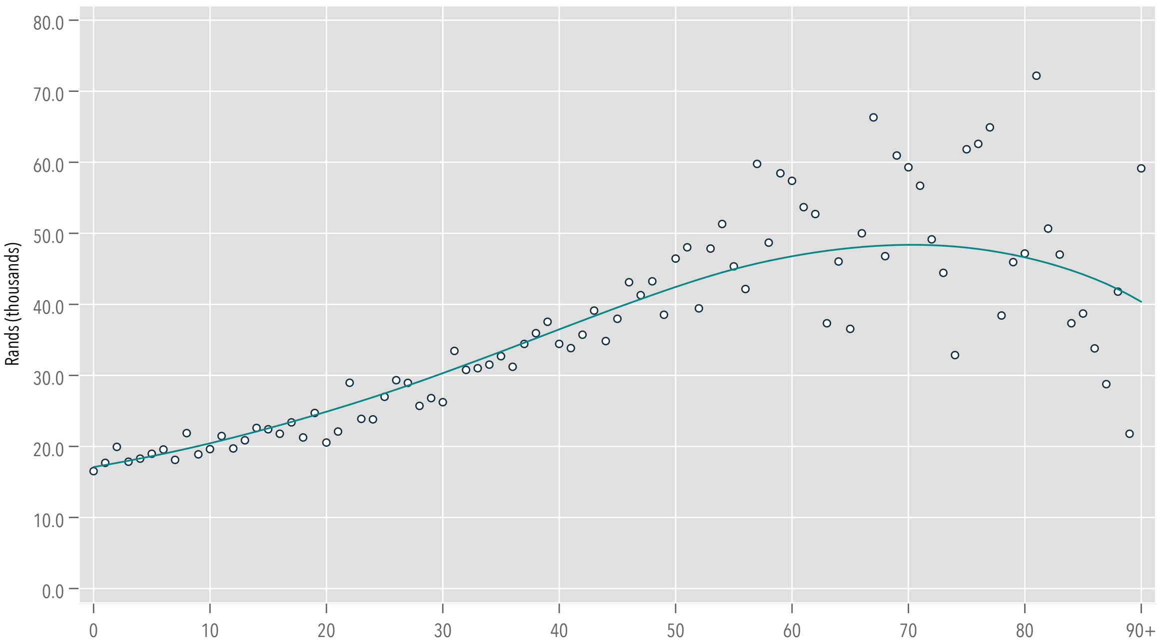

Figure C.2. Private Other Consumption Allocated on a Per Capita Basis, 2015

Notes: Instead of using the adult equivalence scale, private other consumption is allocated on a per capita basis within households; these values are then averaged across all individuals at each age.

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

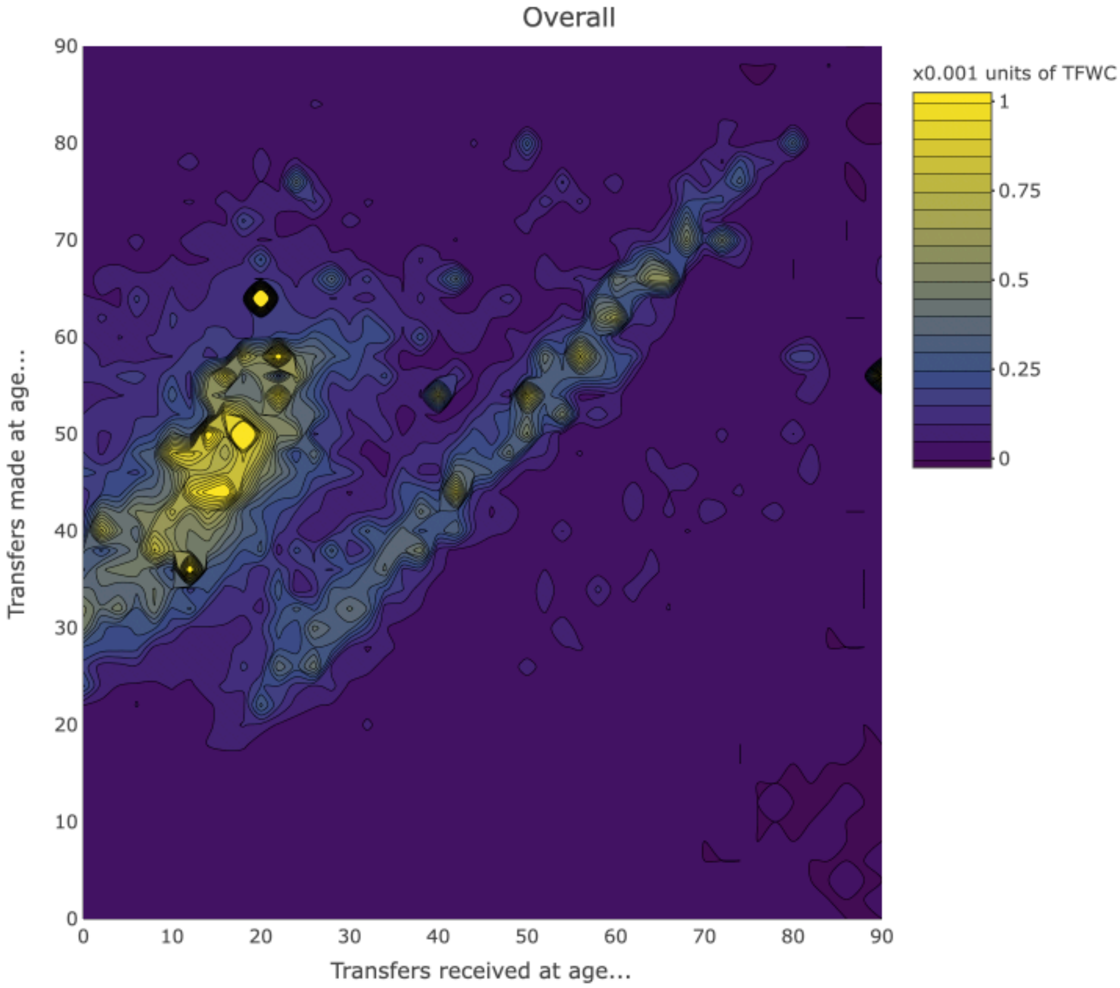

Figure C.3. Aggregate Intra-Household Transfers across Age, 2015

Notes: Flows are aggregated for the population and expressed relative to total consumption-related intra-household transfers (TFWC). Flows are aggregated at two-year intervals (i.e. 46 intervals).

Source: Own calculations, National Treasury (2014, 2018); Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2015b, 2017a,c, 2018b); United Nations (2017); World Bank (2018b).

Appendix D

Gender, Household Production and the Generational Economy

D.1 Data Cleaning

The TUS distinguishes between care for household members and care for non-household members, and separates care for children from care for adults. There are, however, childless households that report spending time in intra-household care (i.e. care for household members under 18 years) and, as a result, this production of childcare cannot be allocated for consumption. I take the position that the respondent was indeed engaging in childcare, but that the recipient of the care is in fact not a household member. Thus, all intra-household childcare that took place in childless households is converted to care of children outside the household. Out of 50 754 respondents who report engaging in intra-household childcare, this affects 308 who spent, on average, 98 minutes on the activity. There are also a few instances of child respondents who claim to have cared for other child members of the household, but who are the only child in their household; in these instances, intra-household childcare is converted to care of children outside the household. This affects 9 observations, who average 32 minutes on the activity.

Similar problems exist for intra-household care of adults in households with either no adults or with no other adults apart from the adult respondent reporting intra-household care of adults. Here, the numbers are significantly smaller: only one child respondent reports intra-household adultcare (30 minutes) despite the fact that there are no adults in the household; and 27 adult respondents report intra-household adultcare (average of 85 minutes) but are the only adults within their households. As with childcare, these times are converted to care of adults outside the household.

Finally, it is possible to report caring for household members but not specifying whether the recipient is a child or an adult. Here, where the respondent is the only member of the household, there is again nobody to whom can be allocated the production of care for consumption. This is the case for four respondents (out of 45 283), who average 60 minutes in care for unspecified household members, and the time is recategorised as volunteering/community work.

D.2 Wage Data

The TUS 2010 asks respondents about their individual monthly income totalled across all sources, requiring them to answer in income bands. Since it is impossible to extract the value of salaries and wages from this aggregate, the analysis relies on wage data from the Labour Market Dynamics Survey (LMDS). This dataset combines the four Quarterly Labour Force Surveys (QLFS) from a given calendar year and includes the wage data that is collected, but not released, in the QLFSs. This gives this nationally representative dataset a sample size of over 340 000 individuals in 2010.

The QLFS collects earnings data from the employed related to their main job by asking first for a point estimate and, if the individual refuses to provide the information, they are asked to identify the relevant income band. Statistics South Africa has imputed wages for individuals reporting income bands so that all individuals who were willing to provide information on earnings have a point estimate. Using data on the usual number of hours worked per week in the main job, monthly earnings are converted into hourly earnings (weekly hours are converted to monthly hours by multiplying by 52 weeks and dividing by 12 months).

The resulting hourly earnings variable has a number of extreme outliers. Outlier values are identified as those above a cutoff of three standard deviations above the mean (R1 262 in 2010 Rands) and are set to missing. This affects 45 observations with hourly rates of between R1 269 and R54 945. The impact of removing these outliers is illustrated in Table D.1 and is substantial. Mean hourly earnings falls by 15 percent from R39.08 to R33.39, while the standard deviation is much reduced.

Table D.1. Hourly wage rates from LMDS 2010 with and without outliers

Variable	**Obs**	**Weight**	**Mean**	**Std.Dev.**	**Min**	**Max**
hourlyrate_orig	81 088	13 676 091	39.082	407.836	0	54 945.05
hourlyrate	81 043	13 667 170	33.390	58.651	0	1 260.00

Source: Own calculations, Statistics South Africa (2010b).

Table D.2. Heckman Two-Stage Estimates of Mincerian Wage Equation, 2010

Dependent Variable:	**Selection Equation (1)** Employed			**Wage Equation (2)** ln(Hourly Wage)		
Coloured				0.207	***	-0.013
Asian				0.600	***	-0.022
White				0.704	***	-0.013
Age	0.004	***	0.000	0.022	***	-0.002
Age squared				0.000	***	0.000
Incomplete Secondary	0.127	***	-0.010	0.207	***	-0.012
Complete Secondary	0.537	***	-0.011	0.491	***	-0.014
Certificate/Diploma	1.087	***	-0.017	0.930	***	-0.020
Degree	1.086	***	-0.022	1.139	***	-0.023
Other Education	0.449	***	-0.042	0.069		-0.043
Western Cape				-0.091	***	-0.014
Eastern Cape				-0.144	***	-0.015
Northern Cape				-0.140	***	-0.016
Free State				-0.309	***	-0.014
KwaZulu-Natal				-0.095	***	-0.013
North West				0.070	***	-0.015
Mpumalanga				-0.018		-0.015
Limpopo				-0.192	***	-0.017
Urban	0.321	***	-0.008	0.150	***	-0.011
No. of children under 15 in household	-0.019	***	-0.001			
Female	-0.404	***	-0.007			
Married or living with partner	0.545	***	-0.008			
Constant	-0.887	***	-0.015	2.180	***	-0.056
/athrho	-0.725					
/lnsigma	-0.0125					
rho	-0.62					
sigma	0.988					
lambda	-0.612					
Observations	234 136					
Wald χ^2	9884					
Prob < χ^2	0.000					

Robust standard errors in parentheses; maximum likelihood estimates. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.10. Referrent categories are: African, primary education, Gauteng, rural, male, not married. Due to very small sample sizes at old ages, the age variable is recoded to equal 75 for all individuals over the age of 75 years. The age-squared variable is calculated from this new variable.

Source: Own calculations, Statistics South Africa (2010b).

D.3 Additional Figures and Tables

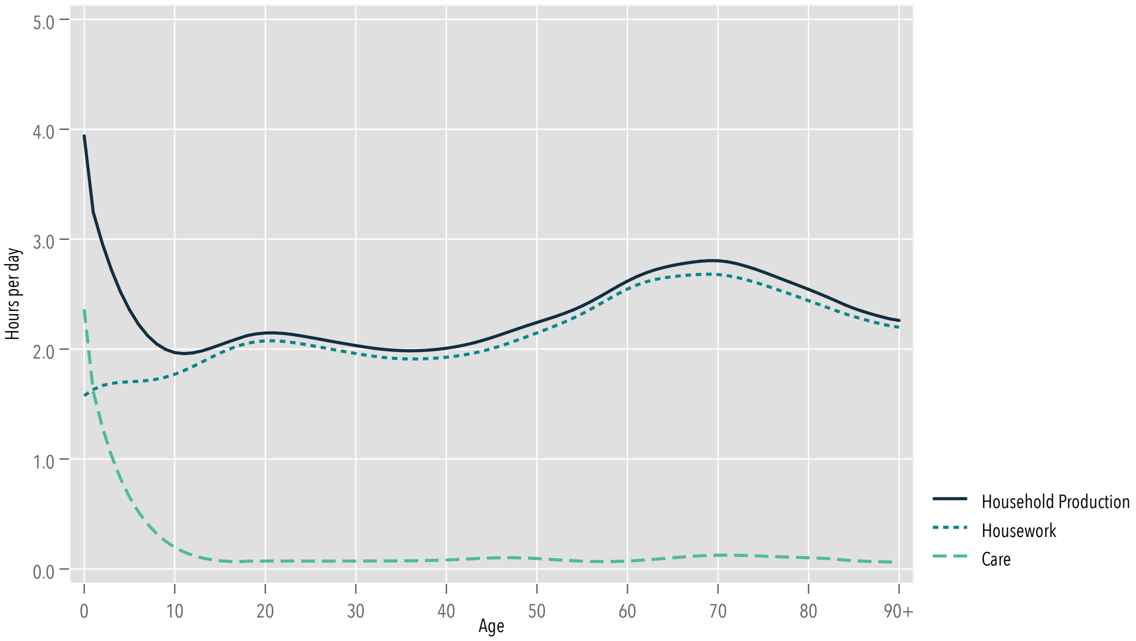

FIGURE D.1. CONSUMPTION OF NON-MARKET WORK ACROSS THE LIFECYCLE, 2010
Source: Own calculations, Statistics South Africa (2010c).

Table D.3. Value of Aggregate Household Production relative to GDP, 2010

	Under 18 yrs	**18-29 yrs**	**30-49 yrs**	**50-59 yrs**	**60 yrs plus**	**Male**	**Female**	**TOTAL**
Total Time (millions of hours per annum)								
Housework	4 755	12 084	12 782	4 055	3 678	11 213	26 140	37 353
Care	327	2 001	1 915	369	322	927	4 008	4 934
For HH members	253	1 696	1 462	218	207	429	3 407	3 835
For non-members	74	305	454	151	115	498	601	1 099
Household Production	5 082	14 085	14 697	4 423	3 999	12 140	30 148	42 287
Market Production	899	11 882	22 384	5 367	2 014	26 443	16 103	42 546
Total	5 981	25 967	37 081	9 790	6 014	38 583	46 250	84 833
Share of Time (%)								
Housework	12.7	32.4	34.2	10.9	9.8	30.0	70.0	100.0
Care	6.6	40.6	38.8	7.5	6.5	18.8	81.2	100.0
For HH members	6.6	44.2	38.1	5.7	5.4	11.2	88.8	100.0
For non-members	6.7	27.8	41.3	13.7	10.5	45.3	54.7	100.0
Household Production	12.0	33.3	34.8	10.5	9.5	28.7	71.3	100.0
Market Production	2.1	27.9	52.6	12.6	4.7	62.2	37.8	100.0
Total	7.0	30.6	43.7	11.5	7.1	45.5	54.5	100.0
Total Value (Rs billions per annum)								
Housework	70.8	182.2	195.4	61.6	55.3	169.5	395.8	565.3
Care	12.0	79.1	70.5	12.3	10.7	27.3	157.3	184.6
For HH members	10.5	71.4	61.0	8.9	8.0	16.9	142.8	159.7
For non-members	1.6	7.6	9.5	3.4	2.7	10.4	14.4	24.8
Household Production	82.9	261.3	265.9	73.9	66.0	196.8	553.1	749.9
Labour Income	1.3	317.6	771.0	241.4	73.7	783.4	621.8	1 405.2
Total	84.2	578.9	1 036.9	315.3	139.7	980.1	1 174.9	2 155.0
Share of Value (%)								
Housework	12.5	32.2	34.6	10.9	9.8	30.0	70.0	100.0
Care	6.5	42.8	38.2	6.6	5.8	14.8	85.2	100.0
For HH members	6.5	44.7	38.2	5.6	5.0	10.6	89.4	100.0
For non-members	6.3	30.7	38.4	13.6	11.0	41.9	58.1	100.0
Household Production	11.0	34.8	35.5	9.9	8.8	26.2	73.8	100.0
Labour Income	0.1	22.6	54.9	17.2	5.2	55.7	44.3	100.0
Total	3.9	26.9	48.1	14.6	6.5	45.5	54.5	100.0
Value Relative to GDP (% of GDP)								
Housework	2.6	6.6	7.1	2.2	2.0	6.2	14.4	20.6
Care	0.4	2.9	2.6	0.4	0.4	1.0	5.7	6.7
For HH members	0.4	2.6	2.2	0.3	0.3	0.6	5.2	5.8
For non-members	0.1	0.3	0.3	0.1	0.1	0.4	0.5	0.9
Household Production	3.0	9.5	9.7	2.7	2.4	7.2	20.1	27.3
Labour Income	0.0	11.6	28.1	8.8	2.7	28.5	22.6	51.1
Population share (%)	*36.4*	*23.4*	*25.4*	*7.6*	*7.2*	*49.1*	*50.9*	*100.0*

Notes: Figures expressed as share of GDP, which was R946.3 billion in 2000 current prices. Rand values of household production are in 2000 current prices. For household production activities, the age group "Under 18 yrs" refers to 10 to 18 year olds; for market production and population shares, it refers to 0 to 18 year olds.
Source: Own calculations, Saldru (2015); South African Reserve Bank (2018b); Statistics South Africa (2010a,b,c, 2011, 2013a); UNESCO (2018); United Nations (2017); World Bank (2018b).