**POPULATION DYNAMICS
AND THE ECONOMIC
LIFE CYCLE:**

**AN ANALYSIS OF
NATIONAL TRANSFER
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POPULATION DYNAMICS AND THE ECONOMIC LIFE CYCLE: AN ANALYSIS OF NATIONAL TRANSFER ACCOUNTS FOR SRI LANKA

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EXECUTIVE SUMMARY

Sri Lanka is currently experiencing major population changes including significant transformations in its age structure associated with the youth bulge as well as population ageing. These novel population trends create many developmental challenges as well as opportunities that have crucial implications for social, economic and environmental development. These emerging population trends shape and are shaped by public policy in the form of policies and related programmes that are being used to balance population change, economic growth, social transformation and environmental sustainability. These population dynamics impact development at the national and sub-national levels. Therefore, the challenge of this century is to unravel the problem of meeting the growing needs and expectations of different population groups while at the same time adjusting the current production and consumption patterns to accomplish a more sustainable development model and address the links between sustainable development and population dynamics resulting from age-sex structure changes of the population.

There is a strong link between the changing age structure of the population and the economic life cycle, which is an important characteristic of all economies. The economic life cycle cannot occur without economic mechanisms and social institutions that facilitate the reallocation of resources across age. Two economic mechanisms lead to reallocations. First, transfer systems within families, non-profit institutions and government channel resources across age. Second, assets offer a store of value that allows economic resources to be transferred over time and across age.

National Transfer Accounts (NTA) organize all economic flows by the age group of the individual. Therefore, the NTA methodology is used to introduce the age dimension into national accounting by having estimates of the economic life cycle and the reallocations accounts by age group. This aspect has not been captured in the usual national accounting framework of a country, including Sri Lanka and thus is very important for the allocation of funds, especially in the social services sector that includes both education and health.

Life cycle surplus at the aggregate level is observed only between age 30 years and 69 years i.e., it is only during these 39 years of life that people earn more than they consume. This suggests that the labour force in Sri Lanka does not end at age 60 but goes beyond it, which is healthy for the Sri Lankan economy, especially with a shrinking labour force expected in future decades. It also reveals the generational effects of those who benefited from free education and free health service, especially after the mid-1940s.

Consumption is greater at childhood ages at both per capita and aggregate levels due to the expenditure on education and health. That is because Sri Lanka has a high proportion of the child population. However, estimation of the spending requirement of the government till 2037 show an increase in the fiscal needs mainly driven by the growth in the older population.

Reallocation of resources among age groups can occur through a variety of mechanisms: private transfers, public transfers, asset income and savings. This study shows that majority of transfers are drawn from private transfers in comparison with public transfers. It is shown that asset-based reallocation component constitutes a larger proportion of older persons who finance the life cycle deficit. This reveals that older people who are over 70 years of age are heavily dependent on assets rather than transfers. For younger people, there is a significant amount of net transfers which finance their consumption.

This study reveals that older people have accumulated real assets that can be used later in life or they have accumulated pension funds or personal savings during their working years and now rely on asset income or on dissaving those assets after retirement. They can also borrow to finance their current consumption and reduce consumption in later periods to repay the loans.

It is essential to make adjustments as the age and sex structure of the population changes over time in order to keep the economy in balance. Although Sri Lanka has concluded its first demographic dividend phase and gradually stepped into its second demographic dividend stage, the country has to bear a double burden of dependence occurring from a larger proportion of children and older people. Therefore, there are more receivers than givers in the population. It is predicted that this situation will shift when the additional children born due to recent fertility increase start entering the labour force ages.

Sri Lanka needs to concentrate more on older population in the future to reap the benefits of the second dividend. If older persons can hold lots of assets and if it grows, then there will be an increase in assets per capita, which might depress rates of interest or boost labour productivity. As the share of children in the population declines, it becomes easier for society to invest more in each child.

It is important to raise productivity for sound equitable economic growth but raising labour productivity requires resources. It is also essential to invest in education and health to improve health and productivity of the labour force. This study presents the implied spending requirement for the government as a result of the projected population age structure change in Sri Lanka between 2022 and 2037, which is a 15-year time period. It was found that the country needs additional LKR 76 billion for public consumption by 2037. Although public consumption on education will decline, health and other goods will increase. This is mainly because of future growth of the older population who require social protection measures and additional funds for healthcare.

The analysis revealed that Sri Lanka can no longer depend on its first demographic dividend to finance the required investments to enhance productivity through human capital as well as other necessary investments. The demographic window of opportunity in Sri Lanka closed in 2018 although we observe a rebound after mid-2020s. Sri Lanka has not reaped the full benefits of this demographic window to enhance economic growth like most East Asian countries did during their respective years of first demographic dividend. This study provides information to planners for accelerating planning and targeted investments in order to take advantage of the second demographic divided and to reduce the burden of the inevitable old age population structure of the country which will be available during the mid-2030s.

In order to show the potential benefits arising from the second demographic dividend, we simulated the contribution of increasing labour productivity on the aggregate labour income. In our estimation procedure, we set changes in the age structure as the base scenario while keeping per capita labour income at the same level throughout the projected period. It is seen that with only demographic change, aggregate labour income is projected to increase to LKR 4,572 billion in 2037 from to LKR 4,199 billion in 2016.

It is important to note that when labour productivity growth is introduced, it would increase aggregate labour income by LKR 872 billion, relative to the aggregate labour income in the demographic change-only scenario in 2037. Therefore, Sri Lanka must rely on possible sources of funding to finance the needed investments necessary to benefit from the second demographic dividend.

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01
INTRODUCTION

Sri Lanka was amongst the 193 countries who committed to adopting the Sustainable Development Goals (SDGs), the most ambitious attempt to date to achieve a more sustainable future for all. To reach these goals, it is crucial to promote evidence-based policies. Creating reliable and comparable data, combining population change and equitable socio-economic development, is essential for analytical work to promote and sustain the SDGs.

National Transfer Accounts (NTA) is an accounting methodology that describes the age dimension of an economy, showing how populations at each age produce, consume, save and share resources. By offering a framework for recognizing the impact of changing age structures, the NTA permit us to completely integrate population dynamics into sustainable development planning, which is key to the SDGs, as well as the regional development agendas such as the Montevideo Consensus on Population and Development, Agenda 2063,[1] and the Asian and Pacific Ministerial Declaration on Population and Development.[2]

Furthermore, the NTA presents plentiful evidence on the first and second demographic dividends. Many countries have experienced this unique opportunity to achieve higher standards of living and lower rates of poverty. It is important to understand this process in Sri Lanka because it will relieve the pressure generated by, first, its young population and then the older population. This provides a unique opportunity for national planners to understand how age structure will be favourable for achieving the SDGs.

Adopting forward-looking policies that take account of population dynamics is crucial for Sri Lanka to recover and build back better from the effects of the COVID-19 pandemic, which has worsened existing inequalities and setback the progress made towards achieving the SDGs. Executing policies to promote economic growth and address the social protection needs of a changing population are also vital to tackling high levels of economic inequality. Therefore, the accomplishment of the 2030 Agenda for Sustainable Development, which pledges to ensure that no one will be left behind, is deeply bound to foreseeing and planning for the effects of the demographic transition that will unfold during the SDG period.

Sri Lanka is experiencing significant transformations in its age structure associated with the youth bulge as well as population ageing. These population trends create many challenges and opportunities that have crucial implications for not just economic growth, but most importantly for equitable social, economic and environmental development.

[1] www.unfpa.org/pcm/node/9587
[2] asiapacific.unfpa.org/en/events/midterm-review-asian-and-pacific-declaration-population-and-development

These emerging population trends shape and are shaped by public policies and related programmes that are being used to balance population change, economic growth, social transformation and environmental sustainability. Demography alone cannot be regarded as destiny, but it is essential that Sri Lanka understands the changing nature of population dynamics over the next decades, and whether these trends will become developmental challenges or help facilitate a resolution. It is only when Sri Lanka pro-actively addresses issues, rather than simply responding to varying population dynamics, that it can create an effective policy environment and capitalize on the dividends offered by these population trends. Most importantly, all these depend on whether effective policies employed are necessarily rights-based, evidence-informed and gender-responsive.

According to the trends in the age structure, Sri Lanka is currently experiencing the first demographic dividend with a large working age population, which could produce sustained period of economic growth, if productively employed. This period of demographic dividend will end in 2037 (Dissanayake, 2017).[3] Sri Lanka still has 16 years, which is a considerable time for the country to benefit from this historically produced demographic bonus. The benefits of the demographic dividend are not automatic but policy dependent. Hence, the window of opportunity to reap the benefits of a low dependency burden needs to be made use of productively.

This report presents the NTA for Sri Lanka and aims to strengthen the evidence base for developing effective government policies and programmes to address changing population dynamics, including population ageing. The NTA has an established methodology to estimate economic flows from one age group or generation to another, thereby giving valuable information for policymakers to design national frameworks on public policy on pensions, retirement age, health care, education, reproductive health, social institutions, the full economic contribution of women, and the social, political, and economic implications of population ageing.

In this report, we describe the economic life cycle in Sri Lanka using the NTA and present the key findings, conclusions and policy implications. We also attempt to quantify the potentials of the demographic change. A limitation of this NTA analysis is the absence of gender disaggregation due to a lack of data. This limitation can be addressed by estimating the National Time Transfer Accounts (NTTA). The NTTA counts all the contributions of work, either market or non-market activities. It measures the production and consumption of household production or unpaid care work across the life cycle and the transfers across age groups implied by the patterns of these two flows. If the age profiles of household production can be constructed for Sri Lanka across the life cycle and by gender using time-use data, the gender dimension of NTA can be secured. By applying an appropriate wage to the time spent in these activities, it is possible to combine these profiles with gender-disaggregated NTA profiles, which will allow the construction of a more complete picture of total production and consumption across the life cycle for males and females.

In this way, it is possible to explore the implications of these results for the demographic dividends in Sri Lanka. Specifically, this will allow us to understand how the demographic transition in Sri Lanka has also created favourable conditions for another powerful dividend, which is known as the gender dividend.

This results from the increase in female labour-force participation, which implies overcoming discriminatory barriers against women that exist both inside and outside of the labour market. In addition, it will allow measuring changes in gender specialization in economies over time, the hidden care economy and progress toward gender equality related to achieving SDG – Goal 5.

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[3] This determination of the terminal year of the first demographic dividend is based on the calculation made by Dissanayake using a different approach. The NTA calculations showed that the terminal year of the first demographic dividend is 2018 although there is an upsurge afterwards until 2037.

02
KEY DEMOGRAPHIC, ECONOMIC AND POLICY FEATURES OF SRI LANKA

2.1. Population

Size and Growth:

According to the latest Census of Population and Housing (CPH) conducted in 2012, the total population of Sri Lanka was 20,359,439 indicating that the annual average growth rate of the population had declined to 0.71 per cent during the intercensal period of 2001 to 2012 from 1.2 per cent during the intercensal period of 1981 to 2001. The average annual growth rate of the population between two complete censuses of 1981 and 2012 is 1.1 per cent per annum. This is mainly attributed to declining birth rate, low death rate and an increase in out migration, reflecting the demographic transition of the population. The changes in age structure in the recent years are observed due to the demographic transition which involves a shift from young to old age.

According to the CPH 2012, a significant change in the age structure of the population has occurred compared to the Census 1981, reflecting that population ageing has taken place in Sri Lanka over the last 30 years. Population ageing is a common feature of many developed and developing countries in the world today. This phenomenon is occurring mainly due to the decline in fertility over the years and the decline in mortality resulting in the increase in life expectancy which were accompanied by the socio-economic developments of the country.

In Sri Lanka, the total population has been growing in an exponential manner. However, the annual rate of growth of the population has started to decline from the 1960s coinciding with the onset of the fertility transition that occurred in the 1960 decade. Nonetheless, further analysis with the use of recent census data shows that Sri Lanka's population has grown exponentially until 2001 but a slight change of its speed is seen in 2012.

This may be the first sign that the country's population is entering into a logistic growth model by deviating from its former exponential growth pattern. It is also reasonable to argue that Sri Lanka's population has been responding to resource constraints in the system itself during the last few decades of the 20th century. Logistic growth assumes that systems grow exponentially until an upper limit or "carrying capacity" inherent in the system approaches, at which point the growth rate slows and eventually saturates, producing the characteristic S-shape curve.

As the effects of limited resources become important, the population growth slows and approaches a limiting value, the equilibrium population or carrying capacity. Carrying capacity is the maximum population size of a species that an ecosystem can support indefinitely. This natural evolution of the population allows us to reasonably assume that the carrying capacity of the Sri Lankan population would be 25 million. Hence total population will stabilize at 25 million during the second half of this century.

Age and Sex Structure of the Population:

Age and sex are the most basic characteristics of a population. Every population has a different age and sex composition—the number and proportion of males and females in each age group—and this structure can have considerable impact on the population's current and future social and economic situation.

Population pyramids show the distribution of the population by sex and by five-year age groups. Each bar corresponds to the share of the given sex and age group in the total population (men and women combined). It is important to understand that age-sex structure of a population and demographic trends are closely intertwined. In other words, age and sex structure of a population is a result of a combined effect of the changes in fertility, mortality and migration.

With the use of the population pyramid, we can trace the history of a population. In particular, one can infer the potential for population growth from a population pyramid. Figure 1 shows the evolution of the age-sex structure of the projected population from 2012 to 2037. It reveals that the Sri Lankan population will grow until 2037, but at a much slower rate. It is interesting to identify that the age group 30-34 in 2012 is larger than all preceding ages and the two subsequent age groups. This age group belongs to the 1978-82 birth cohort. The large size of this age group is a result of the high fertility that prevailed during that period. Total Fertility Rate (TFR) as reported in the World Fertility Survey of 1975 and Contraceptive Prevalence Survey of 1982 was 3.4 and 3.7 respectively. This suggests that the fertility remained stable during the 1978-82 period to produce a larger cohort who were observed later in the 30-34 age group in 2012.

Since the survival chances of the Sri Lankan population are improving, this cohort will carry its size upward in the age structure. It will reach age 55-59 in 2037 and thereafter it will contribute substantially to the increase in the size of the older population. After 1982 TFR declined significantly till late 1990s and took an upward trend thereafter. This decline is reflected in the smaller size of the age groups of 20-24 and 25-29 observed in 2012. However, this trend has been reversed because of the fertility upsurge observed after 1998.

Broadly, we can identify four groups of population: children (0-14 years), youth ages (15-29 years), labour force ages (15-59 years) and older persons (60 years and above). They are of special significance because children less than 15 years of age and older persons are generally regarded as dependents of those who are engaged in the labour force. Changes in the relative size of these groups are of vital importance to the socio-economic planners of any country. As fertility rates fall during the demographic transition, the age structure starts moving upward by creating a youth bulge in the labour force ages.

If the right kind of education, health and economic policies which can make the labour force productive are in place, a special window opens up for faster economic growth and human development. This progression is called demographic dividend. Demographic dividend played a key role in the augment of the economies of Thailand, Hong Kong, Singapore, South Korea and Taiwan. Declining fertility enhanced their economic growth and development since their comparatively superior numbers of workers had less dependents to consume their income. Greater savings and investment rates were in turn generated, jointly with per capita output.

Figure 1.

Age – Sex Structure of Population, Sri Lanka, 2012 – 2037

Age - sex structure, 2012

Age - sex structure, 2017

Age - sex structure, 2022

Age - sex structure, 2027

Age - sex structure, 2032

Age - sex structure, 2037
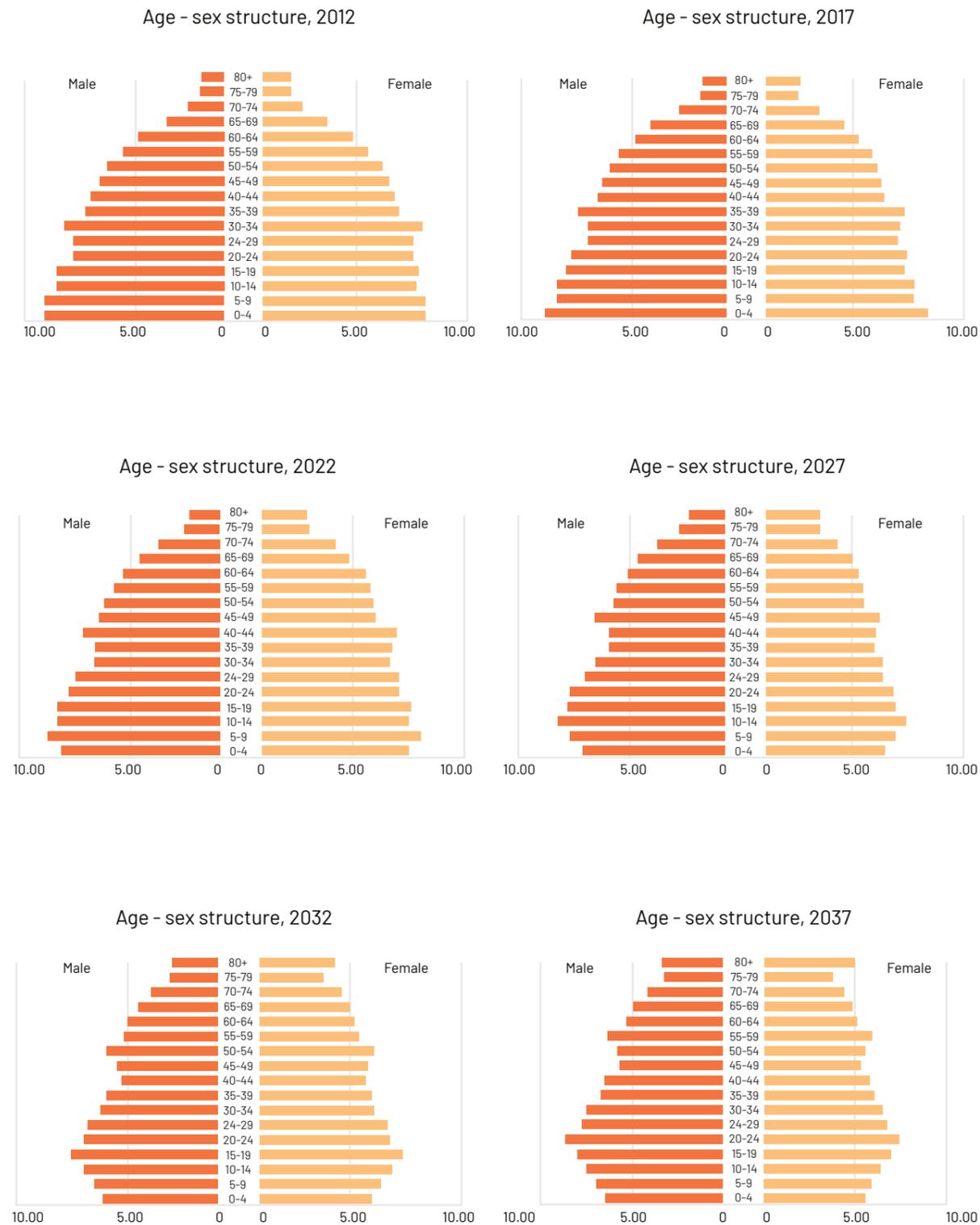
Source: Medium-Term Population Projection for Sri Lanka: 2012 to 2037. 2016. United Nations Population Fund, ISBN: 978-955-8375-13-6.

According to the standard projection (Dissanayake, 2016), number of children below 15 years of age decline from 5.13 million in 2012 to 4.41 million in 2037, which is a 14 per cent decrease during the 25 year projection period. The proportion of children below 15 years of age was 25.2 per cent in 2012 while it will be 19.1 per cent in 2037. Percentage changes in the child population below 15 years of age coincide mainly with fertility changes observed during the 2012 to 2037 period because stability observed until 2017 is the result of stability observed in the TFR and thereafter decline of fertility to replacement level in 2022. Decline below replacement level is reflected in the percentage change of the child population from 2022 to 2037. From a policy perspective, there needs to be greater attention to providing more facilities in the education sphere until 2022 as the child population shows growth and stability during the period 2012 to 2022. However, the pressure on resources will be relieved after 2022 with a significant decline of child population.

Adolescence is an important time to acquire skills, health, social networks and other attributes that form the social capital needed for a fulfilling life. The fact that the human capital formed during adolescence and youth is an important determinant of long-term growth makes a strong macro-economic argument to support more young people. Youth in this discussion includes population aged 15 to 29 years. The projection data reveals that the number of youth will show a gradual increase up to 2037 although the percentage of the youth population remains almost stable during the period 2012 to 2037. This is a reflection of the upsurge of fertility till 2017 and then decline of fertility to replacement level fertility in 2022. Therefore, Sri Lanka will have a great opportunity to benefit from the expected changes in fertility in order to retain its labour force in large numbers until 2037 and get them actively engaged in the country's development.

Sri Lankan labour force will continuously increase from 12.7 million in 2012 to 13.6 million in 2037 although the percentage of the working age population fluctuates between 59 and 62 percentage points. The fluctuations of the proportion of the labour force can be attributed to the historical changes in fertility as well as international migration trends of Sri Lanka.

The rising size of the workforce presents an opportunity to drive economic expansion and increase gross domestic product (GDP), but it also presents many challenges because most often developing countries like Sri Lanka will face the challenge of expanding their labor markets to provide jobs for a growing workforce. A vital labor force is an asset, but low wages and unemployment can make it a risk. However, innovative governments and societies can mitigate that risk by fostering sustainable jobs which offer good wages and working conditions. This is easier to accomplish where rights-based population policies encourage balanced age distributions, and sound health and education policies improve employment potential. During the recent past, overall unemployment rates in the country have come down progressively. At present, globalization and technological change have fueled the demand for better-skilled workers in information technology (IT) and IT-enabled services both internationally and locally. Similarly, demand for skilled migrant workers is growing globally. To capitalize on these emerging opportunities, Sri Lanka needs to develop a skilled, globally competitive workforce.

According to the standard projection, the older population (60 years and above) will increase in the future in an extraordinary manner. In 2012, the number of older persons was 2,520,573 and it is expected to increase to 5,118,094 in 2037, which is a 103 per cent increase during the 25-year time period. Sri Lankan data suggests that the proportion of children outnumber the proportion of older person until 2032 and then a reverse is observed. The two proportions equilibrate at 20.8 per cent. This suggests that the percentage difference would begin to favour older persons after 2032. This transformation in population age structure also creates a second demographic dividend that depends on how the accumulation of wealth is related to population ageing. Sri Lanka is likely to commence its second demographic dividend from 2037 since the country also would have achieved its later part of the low stationary fertility status by that time.

2.2. Macro-economic trend

During the past few years, the Sri Lankan economy experienced below potential growth. This situation has been further aggravated by the outbreak of COVID-19 in early 2020 which is still continuing. With the effects of the spread of COVID-19 locally, the introduction of lockdown measures, the slowdown in global economic activity and the hostile weather conditions, the Sri Lankan economy grew only by 1.6 per cent in the first quarter of 2020. However, in 2019, Sri Lanka graduated to the upper middle income country status in terms of per capita Gross National Income (GNI), as per the World Bank's country classification. The Sri Lankan economy recorded a restrained growth of 2.3 per cent in 2019, compared to the growth of 3.3 per cent in 2018. Sri Lanka took 21 years to graduate from the lower middle-income category to the upper income level, which is a longer period than some other emerging market economies. In this context, it is essential that Sri Lanka introduces the necessary structural reforms in a timely manner to ensure that a strong growth momentum is maintained in the period ahead and to avoid probable stagnation in the middle income levels for a longer period, i.e., the middle income trap.

Figure 2.
Growth Pattern of Sri Lanka
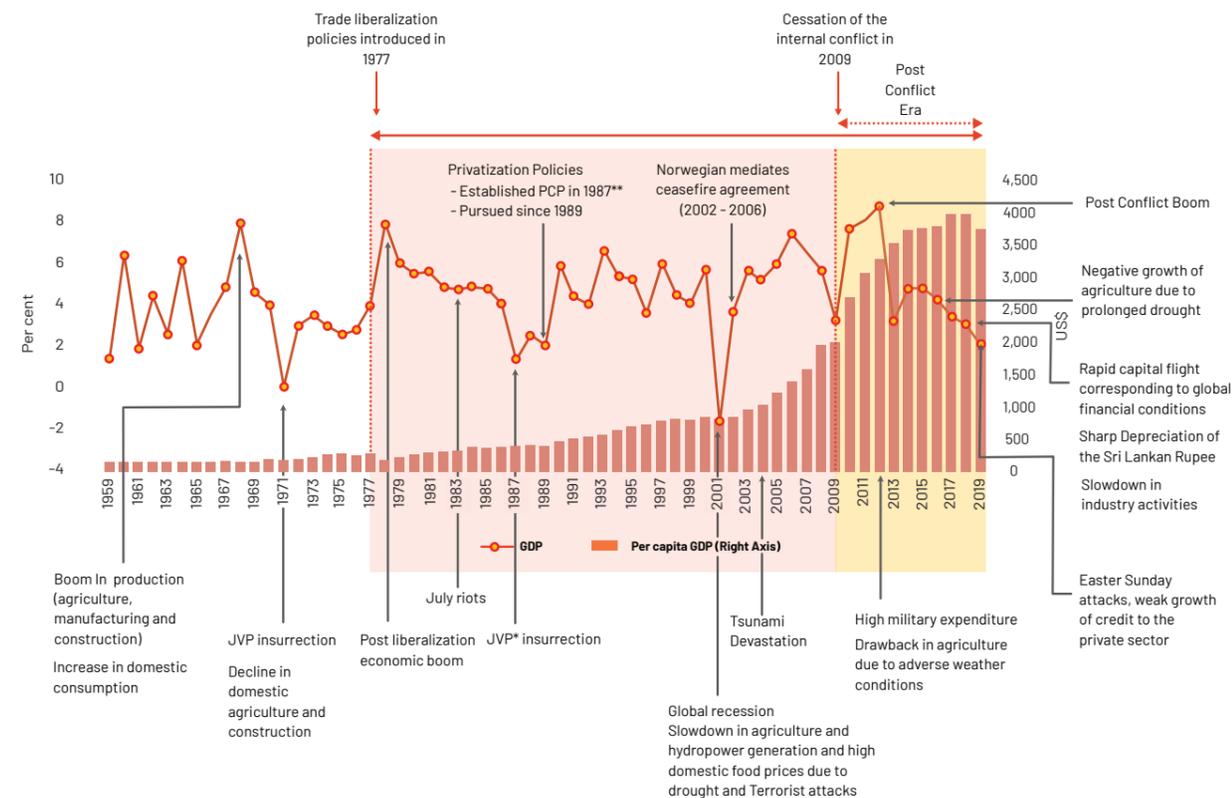
* Janatha Vimukthi Peramuna - JVP
** Presidential Commission on privatization

Source : Extracted from Central Bank of Sri Lanka, (2020), Annual Report 2019, Central Bank of Sri Lanka

According to GDP estimates based on the expenditure approach, the growth in 2019 was driven by consumption growth and the progress in the external balance of goods and services. The share of consumption expenditure in GDP at current prices rose to 78.7 per cent in 2019 from 77.0 per cent in 2018. Consumption expenditure grew by 3.5 per cent in real terms during the year, as a combined outcome of household consumption expenditure and government consumption expenditure growing by 2.9 per cent and 9.6 per cent, respectively.

Domestic savings as a percentage of GDP at current prices declined to 21.3 per cent in 2019 from 23.0 per cent in 2018, while national savings as a percentage of GDP also declined to 25.3 per cent in 2019 from 27.3 per cent in 2018 because of the constant decline in net primary income from the rest of the world. Nevertheless, due to the higher contraction in investment expenditure, both the domestic savings-investment gap as well as the national savings-investment gap narrowed in 2019 to 6.1 per cent and 2.1 per cent of GDP, respectively, from 7.4 per cent and 3.1 per cent of GDP in 2018 (Central Bank of Sri Lanka, 2020).

2.3. Human development

It is important to look at the status of human development in order to gauge social development. The Human Development Index (HDI) measures the long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. A long and healthy life is measured by life expectancy. The knowledge level is measured by mean years of schooling among the adult population, which is the average number of years of schooling received in a lifetime by people aged 25 years and older; and access to learning and knowledge by expected years of schooling for children of school entry age, which is the total number of years of schooling a child of school entry age can expect to receive if prevailing patterns of age specific enrolment rates stay the same throughout the child's life. Standard of living is measured by Gross National Income (GNI) per capita expressed in constant 2011 international dollars converted using purchasing power parity (PPP) conversion rates (UNDP, 2019).

During 1990-2018 period, HDI value grew from 0.625 to 0.780, which was an increase of 24.9 per cent. During this period, life expectancy at birth increased by 7.3 years, mean years of schooling increased by 2.7 years and expected years of schooling increased by 2.7 years. GNI per capita also increased by about 223.7 per cent in the same period. HDI of 0.780 for Sri Lanka was above the average of 0.750 for countries in the high human development group and certainly above the average of 0.642 for countries in South Asia.

In the Gender Inequality Index (GII), Sri Lanka was ranked 86th out of 162 countries with a GII value of 0.380 in 2018. This is because the share of seats held by women in parliament was 5.2 percent; the percentage of the population with at least some secondary education was 82.6 per cent for females and 83.1 per cent for males; maternal mortality ratio was 30 per 100,000 live births; adolescent birth rate was 20.9 births per 1,000 women of ages 15-19; and the labour force participation rate for women was 34.9 percent and 72.2 per cent for men.

As per the 2016 Household Income and Expenditure Survey (HIES) data the poverty headcount index for 2016 has decreased to 4.1 per cent from 6.7 in 2012/13. In 2016, 843,913 people were in poverty. The total poor households were 3.1 per cent of the total households, approximately 169,392 households. In 2016 the HIES collected information on 13 social protection programmes launched by the government mainly under the social assistance and social insurance. It revealed that the total social protection transfer (sum of total social insurance and social assistance transfers) reduced poverty from 6.7 per cent to 4.1 per cent. The most significant contributory factor was the pension scheme.

It is expected that in the absence of pension, the poverty headcount index would increase to 5.7 per cent and the poverty gap index would increase to 1.6 percent. Although the social protection programmes in Sri Lanka has been progressing, further developments are needed to reduce poverty as a substantial proportion of people in the labour force ages are in the informal sector, which lacks proper social protection programmes.

According to the Labour Force Survey (LFS) conducted in 2019, the labour force participation rate (LFPR) for Sri Lanka was 52.3 per cent. It was 73.0 per cent for men and 34.5 per cent for women. About 8.2 million persons were employed in 2019, out of which about 5.4 million (65.6 per cent) were males and 2.8 million (34.4 per cent) were females. These indicators show that women are in a disadvantaged position. The survey also revealed that about 42.1 per cent of people were self-employed while 78.9 per cent of contributing family workers[4] were women. Further, the unemployment rate reported for the year 2019 was 4.8 at the national level. The unemployment rate for females (7.4 per cent) is more than two times higher than that of the male unemployment rate (3.3 per cent).

Women and girls are responsible for an unequal volume of unpaid or underpaid care work. Therefore, women have less time to engage in paid work, to network, to participate in activities for societal change or even to rest.[5] Women's time poverty weakens well-being, create insecurities, raises financial dependence and limits options for decent work, even to the point of restricting women to low status, part-time jobs in the informal sector.

As per the HIES the estimated average household income per month was LKR 62,237 and the median household income was LKR 43,511 in 2016 in Sri Lanka. The mean and median estimated household income increased by 35.7 per cent and 41.2 per cent respectively in 2016 compared to the survey year 2012/13.[6]

The survey data further shows that the estimated average monthly household expenditure was LKR 54,999 and estimated median household expenditure was LKR40,186 in 2016 and increased by 32.7 per cent and 30.9 per cent, respectively compared to previous survey year 2012/13. Among the major categories of household consumption expenditure, the estimated average monthly expenditure on food was LKR 19,114 and non-food expenditure was LKR 35, 885 (Table 1).

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[4] When a household member is engaging in a family business or farming and the other members who engage in this activity without any payment are identified as contributing family workers

[5] www.oecd.org/dac/gender-development/47565971.pdf

[6] Department of Census and Statistics, 2017

Table 1.
Growth Pattern of Sri Lanka
(LKR)

Non-food expenditure group	Survey Period								
	2016	2012/13	2009/10	2006/07	2005	2002	1995/96	1990/91	1985/86
Housing	6,873	4,667	3,446	2,639	2,054	1,661	825	340	148
Fuel and Light	1,757	1,755	1,278	1,042	811	552	294	180	104
Clothing and Footware	1,581	1,194	903	694	588	388	282	159	95
Personal Care and health	2,529	2,181	1,429	980	1,106	581	309	148	80
Transport and Communication	5,548	4,315	3,072	2,401	1,733	929	382	192	105
Education	2,066	1,448	1,018	632	473	315	128	66	29
Cultural & Entertainment	908	515	402	260	255	149	69	33	-
Non-durable household goods	362	318	264	301	315	142	87	59	-
Consumer Durables	2,261	1,018	780	786	713	318	121	53	39
Other non-consumer expenditure	10,945	7678	4,807	4,083	3,033	1,957	256	153	202
Liquor and Tobacco	1,056	705	665	492	479	306	219	144	79

Source: Department of Census and Statistics, 2017

2.4. Policy Features

The present government, as revealed in its policy manifesto called "Vistas of Prosperity and Splendour",[7] has prioritized 10 key policy areas:

1. Priority to national security
2. Friendly, non-aligned, foreign policy
3. An administration free from corruption
4. New constitution that fulfils the people's wishes
5. Productive citizenry and a vibrant human resource
6. People-centric economic development
7. Technology based society
8. Development of physical resources
9. Sustainable environmental management
10. Disciplined, law abiding and values based society.

The government is aiming at people-centric economic development; thus, a participatory approach is assured in all the development spheres. The growth model will be focused on promoting agriculture and fisheries to become global players. This will be done through incentivizing entrepreneurs and infusing new technology to enhance production and productivity. The government recognizes that Sri Lanka's progress is dependent upon its peoples' knowledge, skills and capabilities. Hence, it is anticipated that Sri Lanka will develop its peoples' knowledge, skills and competencies to compete at a global level. In this regard, the government is planning to invest in education at all levels by focusing on the employability of students whose skills will match with the demands created by the local as well as the global economy.

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[7] https://gota.lk/sri-lanka-podujana-peramuna-manifesto-english.pdf

In human capital development, the government has recognized that health is of paramount importance. It is expected that healthcare will be delivered throughout the country in accordance with the National Health Policy. The government policy agenda also recognizes the critical role women play in the development of the country and aims at building on the high levels of literacy and education of women in Sri Lanka to not only provide opportunities for women to be equal partners in development but also to harness their skills to prepare the next generation to face the challenges ahead.

03
DATA SOURCES AND METHODS

The NTA age profile is an estimated per capita age schedule of an economic flow, adjusted to the aggregate amount measured in the national accounts. Therefore, three types of data were used to construct the NTA:

- Population data (CPH 2012)
- National account data (from UNSNA data, the Central Bank of Sri Lanka[8] and the Department of Census and Statistics)
- Data on economic flows by age (derived from HIES 2016 and constructed with the use of NTA methodology as it was the latest survey available for Sri Lanka on household income and expenditure at national level)

Table 2.
Economic Life cycle Input Parameters for the National Transfer Accounts.

Consumption

Public Consumption	**Private Consumption**
• Public consumption, education	• Private consumption, education
• Public consumption, health	• Private consumption, health
• Public Consumption, goods other than education and health	• Private Consumption, goods other than education and health

Labour income

- Labour earnings
- Self-employment labour income

The NTA is formed around the economic life cycle, which is an important characteristic of all economies. The economic life cycle cannot occur without economic mechanisms and social institutions that facilitate the reallocation of resources across age. Two economic mechanisms lead to reallocations. First, transfer systems represented in families, non-profit institutions and government channel resources across age. Second, assets offer a store of value that allows economic resources to be transferred over time and across age. The NTA organize all flows by the age group of the individual. The categorization of economic flows by age is a key feature of the NTA and vital to its purpose of supplying the basic economic data to study the generational economy.

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[8] www.cbsl.gov.lk/en/statistics/statistical-tables/real-sector/national-accounts

The NTA differentiate three types of institutions or sectors (United Nations, 2013):

- the private sector
- the public sector and
- the rest of the world

The private sector consists of corporations, households, including household enterprises and non-profit institutions serving households (NPISH), whereas the public sector comprises the government. It is important to note that all institutions are considered intermediaries between individuals. All economic flows are assigned to age groups, including flows to non-household institutions. Firms are considered the agents for the individuals who own them and governments the agents of taxpayers and beneficiaries of public programmes. The institutional structure of the flows is constructed by distinguishing flows to and from the rest of the world—individuals or institutions that are not resident in the country of study. The total economy is then defined as the flows to and from residents or age groups. Flows to and from the rest of the world are not part of the total economy, but they are included in total flow account. An important feature of the NTA is that the individual rather than the household serves as the unit of analysis.

Most of the concepts and definitions used in the NTA are largely coherent with those in the System of National Accounts (SNA). The consistency observed between NTA and SNA facilitates macroeconomic analysis that draws on both sources of information. In NTA construction, SNA values are used as macro controls for many important NTA components, which means that the NTA flows are adjusted to match aggregate flows as measured in the SNA.

The NTA framework begins with the understanding that total income is equal to total expenditures in an economy. Income is divided into three components: labour income, asset income and transfers received. Expenditure equals consumption, outward transfers and savings. This is shown in the equation below:

$$\underbrace{YL_t + YA_t + T_t^+}_{\text{Income}} = \underbrace{C_t + T_t^- + S_t}_{\text{Expenditure}}$$

Where,

YL_t is total labour income at time t,

YA_t is asset income at time t,

T_t^+ is transfers received at time t,

C_t is consumption at time t,

T_t^- is transferred outwards at time t,

S_t is savings at time t,

Note: The flow of resources in the economy are made by economic agents, including households, governments, corporations, and non-profit organizations.

The NTA methodology elaborates this further and rearranges to construct the life cycle account. The life cycle account is the difference between consumption and labour income. Life cycle income is equivalent to asset-based reallocations and transfers, which is named as reallocations account as depicted in the following equation:

$$\underbrace{C_t - YL_t}_{\text{Life cycle Account}} = \underbrace{\underbrace{YA_t - S_t}_{\substack{\text{Asset-based}\\\text{reallocations}}} + \underbrace{T_t^+ - T_t^-}_{\text{Transfers}}}_{\text{Reallocations Account}}$$

It is important to recognize that NTA differs from the SNA. The primary economic agents in the NTA are the different cohorts drawn from different age categories to represent different generations in an economy. In NTA calculations, similar to the SNA, the public sector represented by the government and the private sector represented by households, corporations and non-profit organizations, are also important agents and show the flow of resources from one to another between different generations. The most important aspect of NTA is that it introduces an age dimension into national accounting by having estimates of the life cycle and the reallocations accounts by age group, a:

$$\underbrace{C_t(a) - YL_t(a)}_{\text{Life cycle Account}} = \underbrace{\underbrace{\left[YA_t(a) - S_t(a)\right]}_{\substack{\text{Asset-based}\\\text{reallocations}}} + \underbrace{\left[T_t^+(a) - T_t^-(a)\right]}_{\text{Transfers}}}_{\text{Reallocations Account}}$$

The NTA framework captures the age dimension of intra-household transfers, i.e., transfers within households, which is an important resource to fulfill the life cycle deficit among children and older persons, especially in developing economies such as Sri Lanka, where public transfer systems, which include public pension, social health insurance, etc., are not well developed. This aspect is not captured in the usual national accounting framework of a country, including Sri Lanka, and thus this study becomes very important for allocation of funds, especially in the social services sector that includes both education and health.

The NTA calculation procedure involves two steps: First, calculating the macro benchmark, i.e., aggregate amounts for the total economy (consumption, labour income, public and private age reallocations) derived from national accounts or equivalent data sources and second, calculating an age pattern against which the macro benchmark is distributed. This is calculated using a combination of sample survey and administrative data. When data is available for households rather than for individuals, allocations are made from the household data to individual members to generate the age profile.

The NTA and Generational Economy

Understanding of the relationship between the age of individuals and their economic activities is crucial in the evaluation of the economic consequences of population dynamics. NTA provides age group averages of income, transfer payments and benefits, consumption and saving for the whole population. An overview of NTA for a wide range of countries is given in Lee and Mason (2011). There is a considerable individual variation in age specific economic behaviour due to differences in preferences and life circumstances. Two important factors which are influencing age specific economic behaviour are education and health in relation to consumption of other goods.

The NTA examines the private consumption of education, health and other goods by children, workers and older people. It also looks at how the government spends its fund for public consumption of education, health and other goods. The total consumption of a population of various age groups adds these two consumption patterns together to produce the age-specific consumption pattern of a population. When age-specific labour income is calculated using the NTA methodology, which group earns income and how income is transferred between generations can be examined within and between households. The difference between labour income and consumption provides an understanding of the life cycle deficit.

Table 3 :
Procedure used for estimating basic NTA age profiles

Account	Data Sources	Age Profile Calculation
Life cycle deficit (LCD)		LCD = C – YL
Consumption (C)		**C = CF + CG**
Private Consumption (CF)		**CF = CFE+CFH+CFX**
• Education (CFE)	HIES 2016	School level-specific expenditure allocated equally among those in the household reporting attending school at the same education level
• Health (CFH)	HIES 2016	Allocated to individuals using regression approach and age-specific health facility utilization rates from HIES
• Others (CFX)	HIES 2016	Allocated using age-specific weights described in UN NTA Manual (2013)
Public Consumption (CG)		**CG = CGE + CGH + CGX**
• Education (CGE)	HIES 2016	Enrollment by age level are proxied by enrollment rate by age of general population
• Health (CGH)	CBSL, 2019; IHP, 2007	Public health facility utilization rates are proxied by utilization rates calculated from IHP, 2007
• Others (CGX)	CBSL, 2019	Allocated equally across the resident population
Labour income (YL)		
• Labour earnings (YLE)	HIES 2016	Tabulated directly from individual-level data
• Share of labour in self-employment income (YLS)	HIES 2016	Allocated to those reporting self-employed using average compensation by age of those reporting as wage earners

Main Concepts in NTA

Consumption

Consumption describes the goods and services that satisfy the needs and requirements of households.[9] In NTA calculations, we explored both public and private consumption on items such as education, health and other goods.

Labour income

The value of the work effort of employees, the self-employed and unpaid family workers.[10] In the NTA framework, labour income is comprised of labour earnings inclusive of fringe benefits, and self-employed labour income.

Life Cycle Deficit

Life cycle deficit is the difference between consumption and labour income.

Funding the life cycle deficit:

In the NTA framework, life cycle deficits are funded by reallocations. Reallocation of resources among age groups can arise through a variety of mechanisms such as private transfers (for example, parents buying goods and services for their children), public transfers (for example, public age pensions and publicly provided education and health services), asset income and savings.

[9] National Transfer Accounts Manual: Measuring and Analyzing the Generational Economy, United Nations, New York.

[10] Ibid.

04
ECONOMIC LIFE CYCLE

4.1. Labour Income

When calculating labour income, we need to include all compensation that is a return to work effort, including labour earnings, employer-provided benefits, taxes paid to the government on behalf of employees and the portion of entrepreneurial income which is a return to labour. Compensation of employees includes the value of social benefits provided to workers, including payments to retirees. It also includes compensation to those on paid leave (vacation and sick leave), who are thus excluded from labour income calculations. The value of other activities, such as child rearing and other in-home activities, which do not produce market goods or services, is also excluded from labour income calculations.

Labour income includes the percentage of entrepreneurial income which is a return to labour. The remaining share of entrepreneurial income is regarded as a return to capital, with the share of entrepreneurial income allocated to capital assumed to be the same for each age of worker. In the absence of information, we assume that two-thirds of the operating surplus of unincorporated enterprises is labour income. The simple method of allocating two-thirds of mixed income to labour is consistent with the best available evidence on this issue.

The age profile of employee compensation is estimated using HIES 2016 survey data which reports individual earnings. In general, surveys provide information about wages and salaries of each household member, but do not provide information about employers' social contributions. In the absence of information, we assume that employers' social contribution is a constant proportion of wages and salaries.

Self-employment income is usually reported for households rather than individuals although data can be derived for each individual member of the household. In cases where values are reported for individuals, we may expect that a high percentage is assigned to the household head. Often children or the spouse of the household head are reported as receiving no income and are classified as unpaid family workers.

This may lead to under-reporting of the labour income of younger and often older household members. To correct this issue, self-employment income is allocated to family members who are reported as self-employed or as unpaid family workers. The self-employment income of the household is allocated to the members using the age profile of the mean earnings of employees. That is the self-employment income accruing to ith individual in household j (YLSij(x)) is,

$$YLS_{ij}(x) = YLS_j \gamma(x)$$

$$\gamma(x) = w(x) SE_j(x) / \sum_x w(x) SE_j(a)$$

Where,

x is the age of the ith household member,

$SE_j(x)$ is the number of people in household j who are self-employed or unpaid family workers of age x,

$w(x)$ is the average earnings of employees.

Therefore, the share of total household self-employment labour income allocated to each household self-employed or unpaid family member of age x is determined. By applying this procedure, the total self-employment labour income generated at age x in each household can be estimated and then summing across all households the total self-employment labour income generated at age x is found.

Once we have estimates of the population, macro controls and age patterns, we calculate a scaling factor θ which is the macro control divided by the unadjusted aggregate value of the flow in the country for that year. The macro control for self-employment income is two-thirds of SNA gross mixed income. The macro control for labour earnings is based on the SNA value for compensation of employees, adjusted to include taxes less subsidies on other production allocated to labour.

Labour income by single years of age calculated with the use of above procedure is given below. The final values obtained for labour income data were smoothed with the use of Friedman's Super Smoother.

Table 4.
Labour income, per capita, 2016
(LKR)

Age	Labour income	Self-employment	Earnings	Age	Labour income	Self-employment	Earnings
0	0	0	0	12	0	0	0
1	0	0	0	13	0	0	0
2	0	0	0	14	0	0	0
3	0	0	0	15	0	0	0
4	0	0	0	16	21,477	1,647	19,830
5	0	0	0	17	57,075	3,660	53,416
6	0	0	0	18	97,654	7,021	90,633
7	0	0	0	19	143,654	11,561	132,093
8	0	0	0	20	195,377	17,227	178,151
9	0	0	0	21	250,956	23,719	227,237
10	0	0	0	22	307,297	29,862	277,435
11	0	0	0	23	361,117	34,869	326,249

Table 4.
Labour income, per capita, 2016
(LKR)

Age	Labour income	Self-employment	Earnings	Age	Labour income	Self-employment	Earnings
24	412,817	39,639	373,178	66	474,883	80,321	394,562
25	463,355	44,319	419,036	67	441,407	75,440	365,968
26	513,977	48,437	465,540	68	411,576	70,563	341,013
27	562,591	53,247	509,344	69	382,294	65,695	316,599
28	611,218	60,283	550,935	70	351,269	60,810	290,459
29	662,103	67,567	594,536	71	322,402	55,828	266,575
30	712,655	77,163	635,493	72	293,279	50,935	242,343
31	760,450	87,555	672,896	73	258,070	46,258	211,812
32	806,797	98,453	708,344	74	227,148	41,837	185,311
33	850,852	108,570	742,282	75	198,437	37,478	160,958
34	892,097	118,708	773,389	76	166,615	33,252	133,363
35	933,991	126,333	807,658	77	135,952	28,969	106,983
36	974,035	133,208	840,828	78	112,576	24,288	88,288
37	1,010,469	139,685	870,783	79	89,701	19,336	70,365
38	1,044,355	145,001	899,354	80	69,615	14,510	55,105
39	1,072,766	150,389	922,378	81	60,428	10,248	50,181
40	1,092,311	153,257	939,054	82	59,693	6,743	52,950
41	1,109,063	156,136	952,927	83	53,324	4,099	49,224
42	1,120,871	157,307	963,564	84	48,363	2,150	46,213
43	1,123,886	157,424	966,462	85	43,402	200	43,202
44	1,121,226	155,263	965,962	86	38,441	0	38,441
45	1,105,335	155,260	950,075	87	33,480	0	33,480
46	1,068,159	154,695	913,464	88	28,519	0	28,519
47	1,023,197	153,193	870,004	89	23,558	0	23,558
48	976,740	151,727	825,013	90	18,598	0	18,598
49	921,209	148,164	773,045				
50	872,373	143,449	728,924				
51	845,712	137,619	708,093				
52	837,375	132,183	705,192				
53	849,207	126,523	722,684				
54	867,077	123,199	743,878				
55	879,871	119,842	760,030				
56	873,918	116,719	757,199				
57	842,205	113,716	728,489				
58	783,304	110,892	672,412				
59	727,146	108,123	619,023				
60	673,831	105,008	568,823				
61	630,009	101,800	528,208				
62	598,114	98,243	499,871				
63	571,133	94,193	476,940				
64	538,554	89,755	448,799				
65	507,521	85,192	422,330				

Table 5
Labour income, aggregate, 2016
(LKR in Millions)

Age	Labour income	Self-employment	Earnings	Age	Labour income	Self-employment	Earnings
0	0	0	0	45	292,454	41,079	251,375
1	0	0	0	46	280,377	40,605	239,772
2	0	0	0	47	266,855	39,953	226,901
3	0	0	0	48	253,184	39,330	213,855
4	0	0	0	49	237,223	38,154	199,069
5	0	0	0	50	222,547	36,595	185,952
6	0	0	0	51	213,349	34,717	178,632
7	0	0	0	52	208,353	32,889	175,464
8	0	0	0	53	207,908	30,976	176,932
9	0	0	0	54	208,829	29,671	179,157
10	0	0	0	55	208,461	28,393	180,068
11	0	0	0	56	202,993	27,111	175,881
12	0	0	0	57	191,865	25,906	165,959
13	0	0	0	58	174,680	24,729	149,951
14	0	0	0	59	158,410	23,555	134,855
15	0	0	0	60	142,896	22,269	120,628
16	7,105	545	6,560	61	129,836	20,980	108,856
17	18,738	1,201	17,536	62	119,035	19,552	99,483
18	31,833	2,289	29,544	63	109,644	18,083	91,561
19	46,494	3,742	42,753	64	99,118	16,519	82,599
20	62,762	5,534	57,228	65	89,125	14,960	74,165
21	79,903	7,552	72,351	66	79,093	13,378	65,716
22	96,989	9,425	87,564	67	69,460	11,871	57,588
23	112,958	10,907	102,051	68	60,745	10,414	50,330
24	128,007	12,291	115,716	69	52,860	9,084	43,777
25	142,585	13,638	128,947	70	44,962	7,784	37,178
26	157,442	14,837	142,604	71	38,108	6,599	31,509
27	171,871	16,267	155,604	72	31,891	5,539	26,352
28	186,478	18,392	168,086	73	25,771	4,619	21,152
29	202,207	20,635	181,572	74	20,806	3,832	16,974
30	217,940	23,597	194,343	75	16,547	3,125	13,422
31	232,856	26,810	206,046	76	12,558	2,506	10,052
32	246,820	30,119	216,700	77	9,323	1,987	7,336
33	259,935	33,168	226,767	78	6,987	1,507	5,479
34	271,782	36,165	235,617	79	5,033	1,085	3,948
35	283,965	38,410	245,555	80	3,493	728	2,765
36	293,836	40,185	253,651	81	2,689	456	2,233
37	301,866	41,729	260,136	82	2,358	266	2,091
38	307,807	42,737	265,070	83	1,857	143	1,714
39	311,945	43,731	268,214	84	1,472	65	1,407
40	311,989	43,774	268,215	85	1,140	5	1,135
41	310,781	43,752	267,029	86	856	0	856
42	308,043	43,232	264,811	87	631	0	631
43	304,189	42,608	261,581	88	448	0	448
44	299,371	41,456	257,915	89	306	0	306
				90	197	0	197

4.2. Private Consumption

The NTA methodology differentiates three components of private consumption: education, health and other goods. Private consumption is usually referred to as personal consumption, consumer expenditure or personal consumption expenditures. Private consumption measures consumer spending on goods and services. It contains all purchases made by consumers, but not households' purchases of dwellings, which are counted as household investment.[11] In the NTA methodology, private consumption is recognized as the value of goods and services consumed by individuals and households. It is also assumed that all consumption can be assigned to individuals.

The present analysis uses the HIES of 2016 conducted by the Department of Census and Statistics with a total sample of 25,640 housing units, covering all districts of the country. The HIES is a year-long sample survey which is steered in 12 consecutive monthly rounds and an island wide representative sample of equal size is enumerated in each monthly round to capture seasonal and regional variations of income, expenditure and consumption patterns.[12] The HIES series which started in 1980 was conducted once in every five years until 2006/07. Subsequently, it was decided to conduct the HIES once in every three years in Sri Lanka and the HIES 2016 is the ninth in the HIES series.

Sample design of the survey is two stage stratified and the urban, rural and estate sectors in each district of the country are the selection domains thus the district is the main domain used for the stratification. The sampling frame is the list of housing units prepared for the CPH 2012.

Constructing Macro Control and adjusting expenditure figures deriving from the survey

Following procedure is used to adjust private consumption expenditure for education, health and other goods with the use of macro control:

The definition is presented below algebraically to show exactly how the macro adjustment is done: one scaling factor is found that adjusts the age pattern up or down by the same factor at each age. In mathematical notation:

- a **= age a in single years**
- $N(a)$ **= Population count at age a**
- x **= Macro Control (i.e. National total, all ages combined).**
  This was derived from data of Central Bank of Sri Lanka for the year 2016.[13]
- $x(a)$ **= per capita age pattern, age a**
  This can be derived from: (total expenditure at age a) / (number of persons at age a)
- **Scaling factor** $\quad \Theta = X / \Sigma\, x(a) * N(a)$
  $$\bar{x}\,(a) = \Theta * x(a)$$
  $$\bar{x}\,(a) = \bar{x}\,(a) * N(a)$$

Once we have estimates of population, macro controls and age patterns, we calculate a scaling factor θ which is the macro control divided by the unadjusted aggregate value of the flow in the country for that year.

[11] https://www.focus-economics.com/economic-indicator/consumption
[12] http://www.statistics.gov.lk/HIES/HIES2016/HIES2016_FinalReport.pdf
[13] Central Bank of Sri Lanka, 2017

Private Consumption – Education

Private education consumption comprises tuition, books, fees and school supplies for all school levels, including pre-school and tutoring expenses. In addition, we have included expenditure related to universities/vocational/technical and any other educational institution. We also included other expenditure incurred by households on the education of their family members such as school supplies and transportation, which are obtained from the HIES 2016. This covers all the expenditure related to private education in Sri Lanka.

The HIES 2016 collected information on household educational expenditure for the following categories:

- Pre-school
- School
- University
- Vocational and Technical institution
- Other educational institution

HIES 2016 has collected following expenditure on education:

- Education
- Exercise books and stationeries
- Educational newspapers and magazines
- School text books
- School facility fees (government)
- School fees (private)
- School fees (International)
- Tuition fees
- Boarding fees
- Higher education course fees
- Vocational training course fees
- Pre-school fees
- Examination fees
- Other education expenses

All the private education expenses related to these categories were given at household level but they could be classified by age when controlled for the above categories.

The STATA Package was used for the private education consumption calculations. Since HIES data contains expenditure for preschool enrolment level, the ages were identified as 3, 4 and up to 5 years whereas school ages ranged from 5 to 20 years, non-school education level, including private tuition covered the ages from 4 to 49 years.

We used the same standard procedure suggested by the NTA Manual to construct private education consumption. In this exercise, we allocate education for each age using a regression model. The household consumption of education *(CFEj)* is,

$$CFE_j = \sum_a \alpha\,(a)E_j\,(a) + \sum_a \beta\,(a)NE_j\,(a) + \varepsilon_j$$

Where,

Ej is the number of enrolled household members aged a in household *j*
NEj is the number of not enrolled household members aged a in household *j*

Both enrolled household members and non-enrolled household members were distinguished by single year of age. As suggested by the NTA Manual, the above equation is estimated in homogeneous form (without an intercept) to ensure that household consumption is fully allocated.

The regression model is used to allocate the education expenditure for each household j, $CFEj$ to household member i. The private education expenditure for each member of household j, $CFEij$, is proportional to the predicted value for that member ($x\ddot{}ij$) calculated as:

$$\hat{x}_{ij} = \sum_a \tilde{\alpha}(a) D_{ij} [a, E] + \sum_a \tilde{\beta}(a) D_{ij} [a, NE]$$

$$CFE_{ij} = CFE_j \left(\hat{x}_{ij} \Big/ \sum_i \hat{x}_{ij} \right)$$

Where,

$D_{ij}[a,E]$ is a dummy variable that equals 1 for an enrolled household member of age a and zero otherwise.

$D_{ij}[a,NE]$ is a dummy variable that equals 1 for a not-enrolled household member of age a and zero otherwise.

The tables constructed for per capita and aggregates are given below. They are adjusted by macro controls.

Table 6.
Private consumption of education by age, per capita, 2016
(LKR)

Age	Consumption, education	Age	Consumption, education	Age	Consumption, education
3	3,507	21	10,434	39	27
4	6,929	22	4,842	40	343
5	11,443	23	4,243	41	0
6	11,841	24	2,220	42	0
7	15,543	25	1,064	43	0
8	14,346	26	180	44	0
9	13,920	27	364	45	0
10	15,603	28	238	46	0
11	19,298	29	31	47	34
12	18,517	30	243	48	0
13	21,872	31	45	49	20
14	22,248	32	279		
15	25,268	33	120		
16	16,243	34	77		
17	18,689	35	85		
18	15,228	36	10		
19	13,033	37	127		
20	7,468	38	425		

Table 7.
Private consumption of education by age, aggregate, 2016
(LKR in Millions)

Age	Consumption, education	Age	Consumption, education	Age	Consumption, education
3	1,260	21	3,322	39	8
4	2,476	22	1,528	40	98
5	4,064	23	1,327	41	0
6	4,181	24	689	42	0
7	5,456	25	327	43	0
8	5,006	26	55	44	0
9	4,830	27	111	45	0
10	5,385	28	73	46	0
11	6,622	29	10	47	9
12	6,311	30	74	48	0
13	7,402	31	14	49	5
14	7,474	32	85		
15	8,424	33	37		
16	5,373	34	24		
17	6,135	35	26		
18	4,964	36	3		
19	4,218	37	38		
20	2,399	38	125		

Private Consumption – Health

Private health expenditure in this computation includes fees for private medical practitioners, Ayurveda consultation fees, consultation fees to specialists, payments to medical laboratories for test analysis etc., payment to private hospitals and nursing home, purchase of medical and pharmaceutical products, hearing aids, Scan / C.T., Ultra-sounds, X-Ray and other relevant costs, which were obtained from the HIES 2016.

The HIES 2016 collected information on household health expenditure for the following categories:

- Fees for private medical practitioners
- Ayurveda consultation fees
- Consultation fees to specialist
- Payments to medical laboratories for test analysis etc.
- Payment to private hospitals and nursing home
- Purchase of medical and pharmaceutical products
- Hearing aids
- Scan / C.T., Ultra-sounds
- X-Ray and Other relevant costs

All the private health expenses related to these categories were given at household level. In our exercise, household health expenditure was regressed on the number of members using outpatient services in each age and the number of members using inpatient services in each. In other words, the household consumption of health (CFHj) is regressed on the number of inpatients and outpatients aged a in each household:

$$CFH_j = \sum_a \alpha(a)\,IN_j(a) + \sum_a \beta(a)\,OUT_j(a) + \varepsilon_j$$

The tables constructed per capita and aggregate values for health are given below. The final values obtained for health consumption data (both per capita and aggregate values) were smoothed with the use of Friedman's Super Smoother.

Table 8.
Private consumption of health by age, per capita, 2016
(LKR)

Age	Consumption, health	Age	Consumption, health	Age	Consumption, health
0	12,044	30	10,402	60	13,185
1	11,645	31	10,487	61	13,366
2	11,245	32	10,577	62	13,533
3	10,835	33	10,753	63	13,673
4	10,377	34	10,888	64	13,764
5	9,771	35	11,005	65	13,854
6	9,147	36	11,087	66	13,940
7	8,670	37	11,098	67	14,014
8	8,268	38	11,016	68	14,074
9	8,010	39	10,913	69	14,215
10	8,011	40	10,771	70	14,356
11	7,972	41	10,590	71	14,499
12	8,012	42	10,501	72	14,658
13	8,055	43	10,402	73	14,831
14	8,349	44	10,300	74	14,988
15	8,648	45	10,030	75	15,141
16	9,162	46	9,772	76	15,298
17	9,547	47	9,575	77	15,447
18	9,933	48	9,501	78	15,599
19	10,089	49	9,511	79	15,751
20	10,239	50	9,803	80	15,907
21	10,281	51	10,130	81	16,058
22	10,435	52	10,463	82	16,210
23	10,568	53	10,784	83	16,361
24	10,638	54	11,131	84	16,509
25	10,658	55	11,461	85	16,657
26	10,621	56	11,876	86	16,808
27	10,559	57	12,245	87	16,959
28	10,466	58	12,608	88	17,111
29	10,418	59	12,911	89	17,264
				90	17,418

Table 9.
Private consumption of health by age, aggregate, 2016
(LKR in Millions)

Age	Consumption, health	Age	Consumption, health	Age	Consumption, health
0	4,402	43	2,933	86	355
1	4,235	44	2,896	87	285
2	4,067	45	2,861	88	233
3	3,897	46	2,826	89	197
4	3,712	47	2,801	90	161
5	3,476	48	2,767		
6	3,235	49	2,732		
7	3,049	50	2,676		
8	2,889	51	2,637		
9	2,780	52	2,604		
10	2,763	53	2,579		
11	2,732	54	2,570		
12	2,724	55	2,583		
13	2,716	56	2,608		
14	2,794	57	2,621		
15	2,873	58	2,628		
16	3,028	59	2,635		
17	3,143	60	2,643		
18	3,255	61	2,614		
19	3,281	62	2,569		
20	3,305	63	2,523		
21	3,290	64	2,457		
22	3,313	65	2,378		
23	3,335	66	2,298		
24	3,343	67	2,230		
25	3,334	68	2,143		
26	3,306	69	2,055		
27	3,267	70	1,966		
28	3,217	71	1,857		
29	3,177	72	1,745		
30	3,140	73	1,634		
31	3,122	74	1,520		
32	3,101	75	1,401		
33	3,095	76	1,303		
34	3,083	77	1,200		
35	3,078	78	1,101		
36	3,073	79	1,004		
37	3,072	80	915		
38	3,070	81	822		
39	3,064	82	730		
40	3,040	83	633		
41	3,007	84	528		
42	2,967	85	437		

Private Consumption other than Education and Health

Following the NTA standard methodology, all other household consumption is allocated to individuals using an equivalence scale based on an extensive review of the literature on household consumption. Consumption of individuals living within any household j is assumed to be proportional to an equivalence scale that is constant at 0.4 for those age 4 or younger, increases linearly from age 4 to age 20, and is equal to 1 for adults age 20 and older. A formula for the scale is:

$$\alpha(a) = 1 - 0.6 * D(4 < a < 20) * ((20 - a)/16 - 0.6 * D(a \leq 4)$$

Where $D(x)$ is a dummy variable equal to 1 when condition x is met and otherwise zero. Again, this scale is used to allocate the expenditure for each household j to household member i.

$$CFX_{ij}(x) = CFX_j\, \alpha(x) / \sum_a \alpha(a) M_j(a)$$

Where $CFXij(x)$ is private consumption other than education and health by household member i in household j, $CFXj$ is total private consumption other than education and health for household j, and $Mj(a)$ is the number of members of age a in household j.

Figure 3.
Equivalence scale for allocating private consumption other than education and health
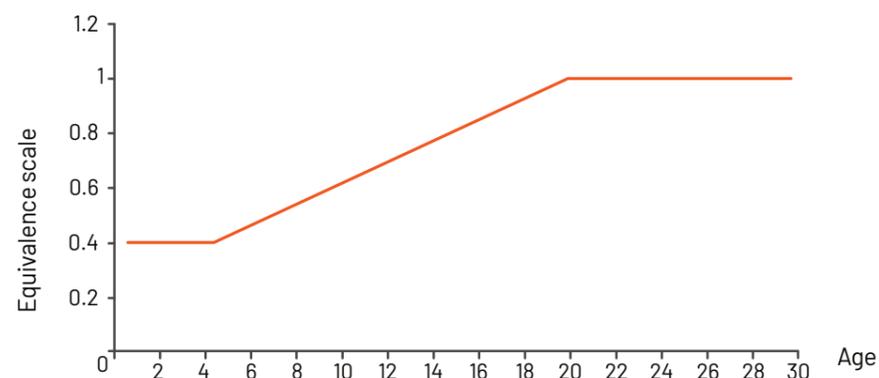
Source: NTA Manual, UN, 2013, p 101

The estimated age profile of consumption produced in this way does not show household-level decisions about allocating consumption within each household. It is important to note that the age profile of consumption will vary by age. Private consumption other than education and health is comparatively low for children in our calculations.

In our calculations, consumption of food and drink was included but consumption of liquor, drugs and tobacco was allocated only for those who were above 21 years of age. This was done because National Authority on Tobacco and Alcohol Act (2017) prohibits the sale of any tobacco product or alcohol product to persons under 21 years of age.

It is important to note that housing, health expenses and education consumption were excluded. Fuel and light, personal care expenses, transport, communication, recreation, entertainment, cultural and religious activities, non-durable household goods, household services, clothing and textiles (given for the last six months; therefore, the values were divided by 6 in order to get monthly expenditure as the HIES gives us monthly expenditure. However, in our final calculations, we adjust this to a year), footwear and other personal things (given for the last six months; therefore, the values were divided by 6), durable household goods (type 1) (given for the last six months; therefore the values were divided by 6), durable household goods (type 2) (given for the last 12 months; therefore the values were divided by 12), other expenses and other ad hoc expenses (given for the last 12 months; therefore the values were divided by 12) were included. Expenditure on housing, fuel and light, non-durable goods, services and consumer durables for boarders and domestic servants were excluded.

The tables constructed in this manner are given below:

Table 10.
Private consumption of other than education and health, per capita, 2016 (LKR)

Age	Consumption other than health and education	Age	Consumption other than health and education	Age	Consumption other than health and education
0	151,803	30	412,182	60	437,813
1	155,098	31	415,404	61	439,236
2	158,394	32	417,563	62	441,599
3	162,511	33	419,431	63	442,178
4	168,498	34	419,152	64	441,983
5	176,061	35	419,253	65	441,570
6	185,318	36	419,531	66	441,593
7	195,928	37	420,321	67	440,514
8	207,507	38	419,750	68	440,132
9	218,833	39	420,657	69	439,277
10	230,477	40	422,195	70	438,290
11	242,190	41	422,430	71	437,010
12	253,250	42	421,110	72	434,930
13	263,194	43	420,377	73	432,569
14	273,345	44	417,889	74	429,380
15	283,143	45	413,244	75	426,408
16	293,185	46	409,956	76	424,416
17	303,544	47	407,426	77	423,528
18	315,745	48	405,522	78	423,143
19	327,510	49	403,793	79	422,476
20	338,746	50	403,884	80	420,871
21	347,562	51	403,877	81	416,919
22	356,253	52	405,613	82	411,920
23	362,774	53	407,646	83	410,508
24	368,572	54	411,444	84	413,329
25	374,938	55	416,852	85	419,066
26	383,460	56	422,447	86	429,218
27	390,960	57	426,647	87	442,062
28	398,499	58	430,918	88	452,633
29	406,542	59	435,419	89	462,789
				90	472,944

Table 11.

Private consumption of other than education and health, aggregate, 2016 (LKR in Millions)

Age	Consumption other than health and education	Age	Consumption other than health and education	Age	Consumption other than health and education
0	55,507	43	113,779	86	9,558
1	56,387	44	111,578	87	8,330
2	57,253	45	109,338	88	7,118
3	58,401	46	107,608	89	6,015
4	60,199	47	106,259	90	5,021
5	62,534	48	105,117		
6	65,436	49	103,982		
7	68,777	50	103,033		
8	72,414	51	101,887		
9	75,939	52	100,923		
10	79,544	53	99,802		
11	83,103	54	99,093		
12	86,318	55	98,762		
13	89,073	56	98,125		
14	91,824	57	97,196		
15	94,393	58	96,096		
16	96,986	59	94,857		
17	99,651	60	92,845		
18	102,925	61	90,520		
19	106,000	62	87,886		
20	108,817	63	84,887		
21	110,661	64	81,345		
22	112,440	65	77,544		
23	113,476	66	73,549		
24	114,287	67	69,319		
25	115,377	68	64,959		
26	117,462	69	60,740		
27	119,438	70	56,101		
28	121,579	71	51,655		
29	124,158	72	47,294		
30	126,051	73	43,197		
31	127,200	74	39,330		
32	127,743	75	35,557		
33	128,136	76	31,988		
34	127,697	77	29,043		
35	127,467	78	26,262		
36	126,559	79	23,702		
37	125,566	80	21,120		
38	123,714	81	18,554		
39	122,321	82	16,270		
40	120,589	83	14,295		
41	118,373	84	12,584		
42	115,731	85	11,009		

4.3. Public Consumption

Public consumption is the value of goods and services individuals receive through the public sector. Public consumption is allocated to individuals based on administrative records and, in some instances, survey data. Like private consumption, public consumption distinguishes education, health and other public consumption.[14] Data for estimating the age profile of public consumption was obtained from various secondary sources such as reports from the Central Bank of Sri Lanka and the UNSNA data website.

Public Education Consumption

Public education consumption consists of two parts: formal and informal education consumption. Formal education consumption is government spending on education for children and young adults attending school and universities.The Sri Lankan education system has primary, secondary and tertiary education levels. Both cost and enrollment data must be available for each level of schooling identified.

According to the NTA manual, informal education consumption refers to spending on cultural and other types of general and adult education. These are not targeted at particular age groups. Since separate data is not available on informal education, only formal education data was taken for calculating public education consumption. Public education expenditure at primary, secondary and tertiary levels was taken from the World Bank database[15] and used to estimate public education consumption. Further, private spending paid to public school and other materials by households was not included.

Public formal education consumption by age, which can be defined as: $E_g^F(a)$ is estimated by summing unit cost per student per c_l weighted by the number of students by age in each level $e_l(a)$

i.e,
$$E_g^F = \sum_l e_l(a) c_l$$
where l is a school level.

The unit cost per student at each level of education is estimated by dividing public spending on education at that level by the reported number of students. The unit cost of education within each level is assumed not to vary by age. The number of students by age in each level $e_l(a)$ is available from administrative records or, if necessary, tabulated from a census or a household survey.

In addition to public formal education, public informal education consumption by age $E_g^{nF}(a)$ is estimated by dividing total public informal education consumption by the total population by age. Public informal education consumption is not age-targeted, so it is allocated equally to everyone. Public education consumption by age is computed by summing public formal education consumption by age and public informal education consumption by age.

[14] https://ntaccounts.org/web/nta/show/Methodology/

[15] PRIM.PC.ZS_DS2_en_excel_ edu prima per studnt .SECO.PC.ZS_DS2_en_excel_v2_722450 educ WB TERT.PC.ZS_DS2_en_excel_ edu Tert secondary,

Table 12.
Public consumption of education, per capita, 2016 (LKR)

Age	Consumption, education
0	0
1	0
2	0
3	0
4	0
5	0
6	63,929
7	63,929
8	63,929
9	63,929
10	63,929
11	63,151
12	63,151
13	63,151
14	58,379
15	58,379
16	31,961
17	31,961
18	31,961
19	7,579
20	7,579
21	7,579
22	7,579
23	7,579
24	7,579

Table 13.
Public consumption of education, aggregate, 2016 (LKR in Millions)

Age	Consumption, education
0	0
1	0
2	0
3	0
4	0
5	0
6	22,316
7	22,333
8	21,648
9	21,758
10	22,966
11	22,621
12	22,264
13	20,321
14	19,322
15	19,775
16	10,411
17	10,335
18	10,372
19	2,469
20	2,578
21	2,406
22	2,435
23	2,356
24	2,360

Public Health Consumption

Public health consumption consists of health care provided directly to individuals by government clinics and hospitals, and collective services, e.g., health education and preventative programmes that are provided to the public at large. Health care purchased by individuals and reimbursed through public programmes is also included.

Health care provided directly by government programmes must be allocated using administrative records, e.g., patient information; and information about the kinds of health care services being provided, e.g., child and maternal health. Health care costs associated with pregnancy and birth are assigned to the mother.

Health care purchased by individuals and reimbursed through public programmes is captured in household expenditure surveys. Therefore, these age profiles can be estimated using the methods described in the section on private health spending. Collective health services are allocated on a per capita basis, assuming that each individual consumes the same amount of these services.

Public health consumption expenditure in Sri Lanka consists of two categories: inpatients and outpatients. Total public health expenditure in 2016 was LKR 162,481 million.[16] By using data available from the Institute for Health Policy (IHP), public health expenditure was estimated for four different age groups: age 0-14, 15 – 59, 60 – 74 and 75 + by deriving weights for those age categories. The IHP weights were employed to estimate age reallocation. As mentioned earlier, the calculation was done assuming that everyone consumes the same amount of these services within those age groups. Although it is understandable that four broad age groups selected for the analysis has some limitations, we did not have any other options available as IHP, which is the only data source available for this purpose provided the required information to do the calculations.

Table 14.
Public consumption of health, per capita, 2016 (LKR)

Age	Consumption, health	Age	Consumption, health	Age	Consumption, health
0	6,766	30	7,240	60	8,955
1	6,766	31	7,240	61	8,955
2	6,766	32	7,240	62	8,955
3	6,766	33	7,240	63	8,955
4	6,766	34	7,240	64	8,955
5	6,766	35	7,240	65	8,955
6	6,766	36	7,240	66	8,955
7	6,766	37	7,240	67	8,955
8	6,766	38	7,240	68	8,955
9	6,766	39	7,240	69	8,955
10	6,766	40	7,240	70	8,955
11	6,766	41	7,240	71	8,955
12	6,766	42	7,240	72	8,955
13	6,766	43	7,240	73	8,955
14	6,766	44	7,240	74	8,955
15	7,240	45	7,240	75	8,933
16	7,240	46	7,240	76	8,933
17	7,240	47	7,240	77	8,933
18	7,240	48	7,240	78	8,933
19	7,240	49	7,240	79	8,933
20	7,240	50	7,240	80	8,933
21	7,240	51	7,240	81	8,933
22	7,240	52	7,240	82	8,933
23	7,240	53	7,240	83	8,933
24	7,240	54	7,240	84	8,933
25	7,240	55	7,240	85	8,933
26	7,240	56	7,240	86	8,933
27	7,240	57	7,240	87	8,933
28	7,240	58	7,240	88	8,933
29	7,240	59	7,240	89	8,933
				90	8,933

[16] Sri Lanka Health Account, 2016

Table 15.

Public consumption of health, aggregate, 2016 (LKR in Millions)

Age	Consumption, health	Age	Consumption, health	Age	Consumption, health
0	2,451	43	1,966	86	168
1	2,271	44	1,816	87	165
2	2,339	45	1,947	88	113
3	2,587	46	1,892	89	107
4	2,599	47	1,858	90	86
5	2,436	48	1,910		
6	2,362	49	1,888		
7	2,364	50	1,895		
8	2,291	51	1,839		
9	2,303	52	1,891		
10	2,431	53	1,691		
11	2,424	54	1,679		
12	2,385	55	1,818		
13	2,177	56	1,610		
14	2,239	57	1,672		
15	2,452	58	1,642		
16	2,358	59	1,645		
17	2,341	60	1,846		
18	2,350	61	1,884		
19	2,358	62	1,818		
20	2,463	63	1,724		
21	2,298	64	1,642		
22	2,326	65	1,637		
23	2,250	66	1,452		
24	2,254	67	1,515		
25	2,030	68	1,214		
26	2,158	69	1,398		
27	2,150	70	1,068		
28	2,196	71	994		
29	2,263	72	972		
30	2,253	73	809		
31	2,341	74	933		
32	2,181	75	739		
33	2,194	76	558		
34	2,018	77	619		
35	2,381	78	493		
36	2,218	79	560		
37	2,231	80	433		
38	2,117	81	374		
39	2,241	82	351		
40	2,069	83	257		
41	1,962	84	296		
42	1,917	85	235		

Public Other Consumption

Other public consumption consists of public goods and services, such as defense, justice and police, that are not targeted at particular age groups. The per capita age profile of other public consumption is assumed to be constant, i.e., these goods and services are allocated equally to all members of the population.

Other public consumption expenditure was LKR 1,423,061 million in 2016.[17] Other public expenditure was allocated equally to all members of the population.

Table 16.

Public consumption of other than education and health, per capita, 2016 (LKR)

Age	Consumption other than education and health	Age	Consumption other than education and health	Age	Consumption other than education and health
0	67,428	30	67,428	60	67,428
1	67,428	31	67,428	61	67,428
2	67,428	32	67,428	62	67,428
3	67,428	33	67,428	63	67,428
4	67,428	34	67,428	64	67,428
5	67,428	35	67,428	65	67,428
6	67,428	36	67,428	66	67,428
7	67,428	37	67,428	67	67,428
8	67,428	38	67,428	68	67,428
9	67,428	39	67,428	69	67,428
10	67,428	40	67,428	70	67,428
11	67,428	41	67,428	71	67,428
12	67,428	42	67,428	72	67,428
13	67,428	43	67,428	73	67,428
14	67,428	44	67,428	74	67,428
15	67,428	45	67,428	75	67,428
16	67,428	46	67,428	76	67,428
17	67,428	47	67,428	77	67,428
18	67,428	48	67,428	78	67,428
19	67,428	49	67,428	79	67,428
20	67,428	50	67,428	80	67,428
21	67,428	51	67,428	81	67,428
22	67,428	52	67,428	82	67,428
23	67,428	53	67,428	83	67,428
24	67,428	54	67,428	84	67,428
25	67,428	55	67,428	85	67,428
26	67,428	56	67,428	86	67,428
27	67,428	57	67,428	87	67,428
28	67,428	58	67,428	88	67,428
29	67,428	59	67,428	89	67,428
				90	67,428

[17] Annual Report 2016, Ministry of Finance

Table 17.
Public consumption of other than education and health, aggregate, 2016
(LKR in Millions)

Age	Consumption other than education and health	Age	Consumption other than education and health	Age	Consumption other than education and health
0	24,655	43	18,250	86	1,502
1	24,514	44	18,004	87	1,271
2	24,373	45	17,840	88	1,060
3	24,231	46	17,699	89	876
4	24,090	47	17,586	90	716
5	23,949	48	17,478		
6	23,809	49	17,364		
7	23,670	50	17,201		
8	23,530	51	17,010		
9	23,399	52	16,777		
10	23,271	53	16,508		
11	23,137	54	16,240		
12	22,982	55	15,975		
13	22,820	56	15,662		
14	22,651	57	15,361		
15	22,479	58	15,037		
16	22,305	59	14,689		
17	22,136	60	14,299		
18	21,980	61	13,896		
19	21,823	62	13,419		
20	21,660	63	12,945		
21	21,469	64	12,410		
22	21,282	65	11,841		
23	21,092	66	11,230		
24	20,908	67	10,610		
25	20,749	68	9,952		
26	20,655	69	9,323		
27	20,599	70	8,631		
28	20,572	71	7,970		
29	20,593	72	7,332		
30	20,621	73	6,733		
31	20,647	74	6,176		
32	20,628	75	5,623		
33	20,599	76	5,082		
34	20,542	77	4,624		
35	20,500	78	4,185		
36	20,341	79	3,783		
37	20,143	80	3,384		
38	19,873	81	3,001		
39	19,607	82	2,663		
40	19,259	83	2,348		
41	18,895	84	2,053		
42	18,531	85	1,771		

4.4. Economic Deficit

Table 18 provides a summary of the national transfer life cycle account estimates for Sri Lanka in 2016, constructed using the calculations described in the previous section. The account items are summarized by some important age group classifications in order to detect the behavioural patterns of income and consumption of different groups of people in the society.

The life cycle account is composed of consumption and labour income. Consumption is characterized by the type of intermediary, i.e., public (general government) or private (households, corporations and non-profit institutions) and by type of consumption, i.e., education, health, and others. Labour income is disaggregated by type of worker, i.e., wage employees or self-employed.

Table 18.
National Transfer Account, Sri Lanka, 2016

Age Group	0-14	15-29	30-59	60-69	70+
A. Per capita (LKR), average value					
Life cycle deficit	348,132	147,155	−434,748	7,080	409,465
Consumption	348,132	457,866	501,874	530,012	549,083
Private consumption	226,648	363,224	427,206	453,629	468,898
• Education	14,589	2,597	27	0	0
• Health	9,232	10,531	10,781	13,039	16,678
• Others	202,827	350,096	416,398	440,590	452,220
Public consumption	121,484	94,642	74,668	76,383	80,185
• Education	47,290	19,974	0	0	0
• Health	6,766	7,240	7,240	8,955	9,385
• Others	67,428	67,428	67,428	67,428	70,800
Labour income	0	310,711	936,622	522,932	139,618
• Earnings	0	281,174	804,630	436,311	109,796
• Self employment	0	29,537	131,992	86,621	29,822
B. Aggregate (in LKR Million), total value					
Life cycle deficit	1,758,454	721,247	−3,534,771	−5,446	393,632
Consumption	1,758,454	2,166,616	4,055,837	946,367	624,783
Private consumption	1,171,996	1,746,565	3,452,466	810,514	533,305
• Education	60,468	38,955	545	0	0
• Health	48,821	49,959	87,341	26,920	19,302
• Others	1,062,707	1,657,651	3,364,580	783,594	514,003
Public consumption	586,458	420,051	603,371	135,853	91,478
• Education	195,749	65,359	0	0	0
• Health	35,629	34,391	58,503	15,927	10,714
• Others	355,080	320,301	544,868	119,926	80,764
Labour consumption	0	1,445,369	7,590,608	951,813	231,151
• Earnings	0	1,308,114	6,525,472	794,703	187,188
• Self employment	0	137,255	1,065,136	157,110	43,963

When we examine the average consumption per person at each age group, the Sri Lankan NTA estimates show that those who are in the school age group (5-14 years of age) consume more per person, on average, relative to other age groups. The gap is mainly due to the consumption of education while the impact of health care is small. In the case of the older population, private health consumption per capita is greater than all other age categories.

Labour income is an important resource to finance consumption. In 2016, the Sri Lankan economy generated LKR 10,219 billion in labour income. A large proportion of this (86 per cent) was earned through earnings of wage employees. Labour income from self-employment is also substantial as it consists of about 14 per cent of total labour income.

The difference between consumption and labour income is called the life cycle deficit. It represents the value of consumption that is not financed by labour income, but through other resources, including asset-based reallocations (e.g. dissaving and capita income) and transfers (e.g. public pensions and gift-giving among families and friends). As shown in table 18, life cycle deficit becomes negative at the aggregate level only after age 30 years and concludes by age 69 years In other words, life cycle surpluses, i.e., labour income in excess of consumption, are observed between age 30 to 69 years, which is 39 years during one's life-cycle. This suggests that the labour force in Sri Lanka does not end at age 60 but goes beyond it, which is healthy for the Sri Lankan economy, especially with a shrinking labour force expected in future decades. This also reveals the generational effects of those who benefited from free education and free health services, especially after mid-1940s (Dissanayake, 1995).

05

GRAPHICAL PRESENTATION OF THE ECONOMIC LIFE CYCLE

Labour Per capita values and aggregate values for consumption and labour income are shown in Figure 4 and 5.

Figure 4.
Consumption and labour income, per capita values, 2016
(LKR in Thousands)
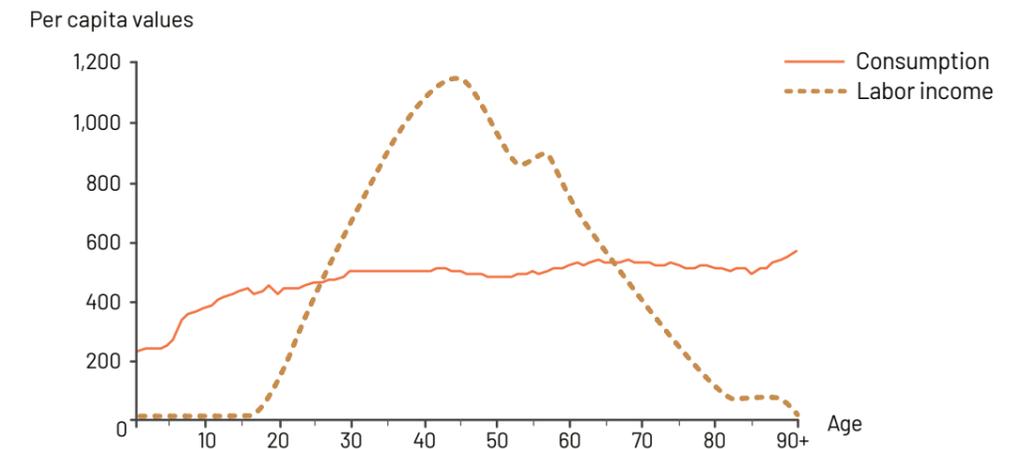
As per figure 4, labour income is higher not only in prime working ages but beyond that. Consumption is higher, especially in older age groups. A somewhat different picture is discernible with aggregate values shown in figure 5. It is clear from figure 5 that life cycle surplus is generated because of the declining nature of consumption as age advances from the children ages.

Figure 5.
Consumption and labour income, aggregate values
**(LKR in Billions)**
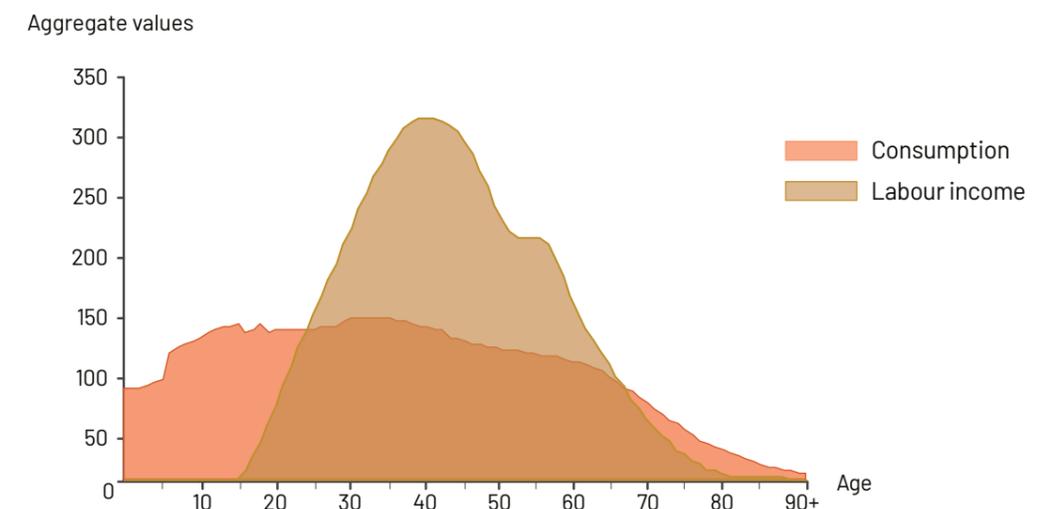
Figure 6.
Private consumption, public consumption and labour income, per capita values, 2016
**(LKR in Thousands)**
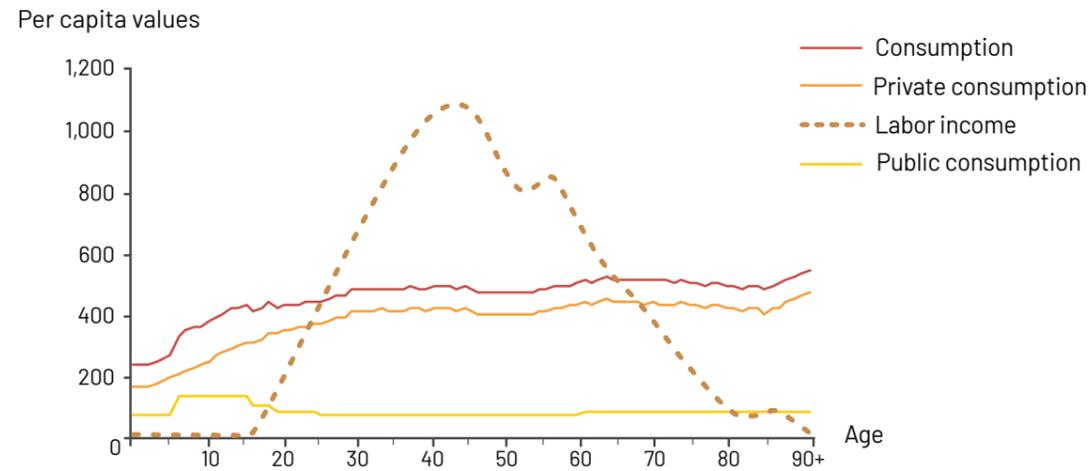
Figure 6 shows the disaggregation of consumption at per capita value by public consumption and private consumption. Public consumption is greater during the early ages due to education, health and other service requirements.

Figure 7.
Labour income, per capita values, 2016
(LKR in Thousands)

Figure 7 shows disaggregation of labour income by earning through wages and self-employment income. It is clear that labour income (per capita) is mainly derived through earnings. A much lower level is observed for self-employment income. The peak in both cases is found around 40 years of age.

Figure 8.
Labour income, aggregate values, 2016
(LKR in Billions)

Aggregate values
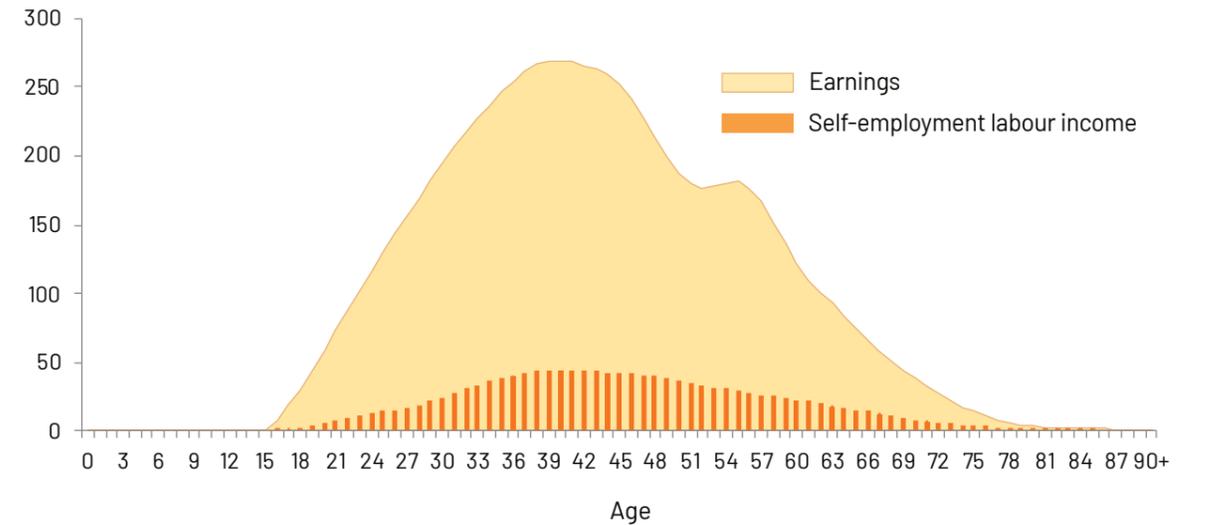
Figure 8 shows both earnings and self-employment income at aggregate level. It is interesting to note that a substantial amount of income at aggregate level is generated through self-employment. The pattern of income generation has a similar pattern for both components.

Figure 9.
Decomposition of private consumption by education, health and other goods, per capita values 2016
(LKR in Thousands)

Aggregate values
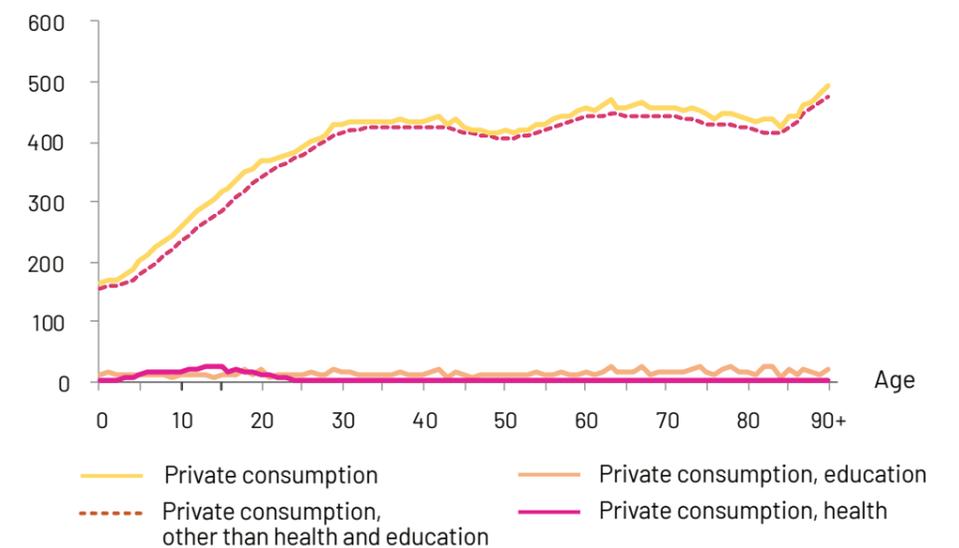
As shown in figure 9, private consumption (per capita level) is almost a reflection of private consumption of goods and services other than education and health. Health consumption is more visible at the older ages.

Figure 10.
Decomposition of private consumption, aggregate values, 2016
(LKR in Billions)

Per capita values
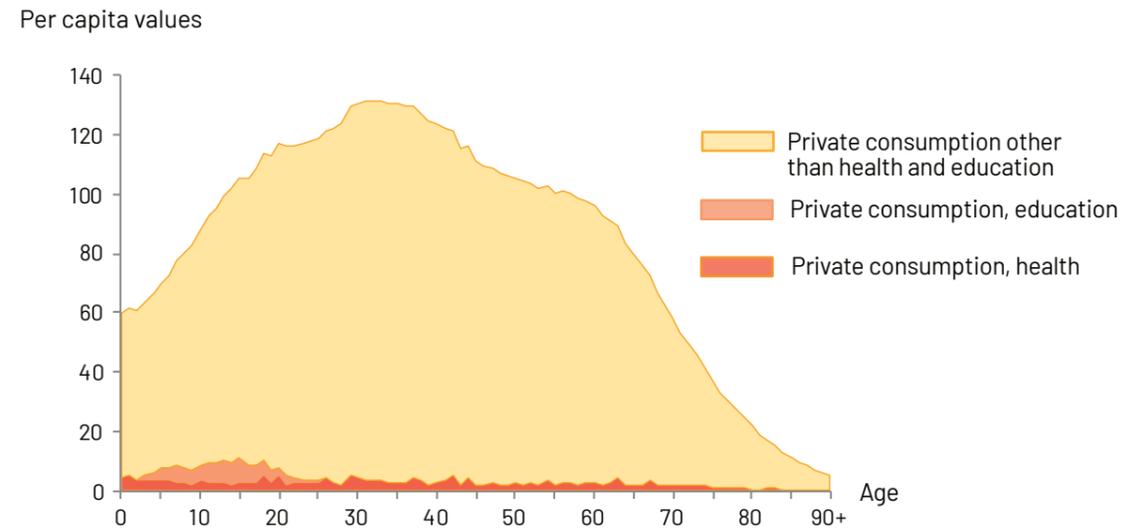
In Sri Lanka, it appears that private consumption at aggregate level is mainly a reflection of consumption of goods and services other than health and education as depicted in figure 10.

Figure 11.
Decomposition of public consumption, per capita values, 2016
**(LKR in Thousands)**

Per capita values
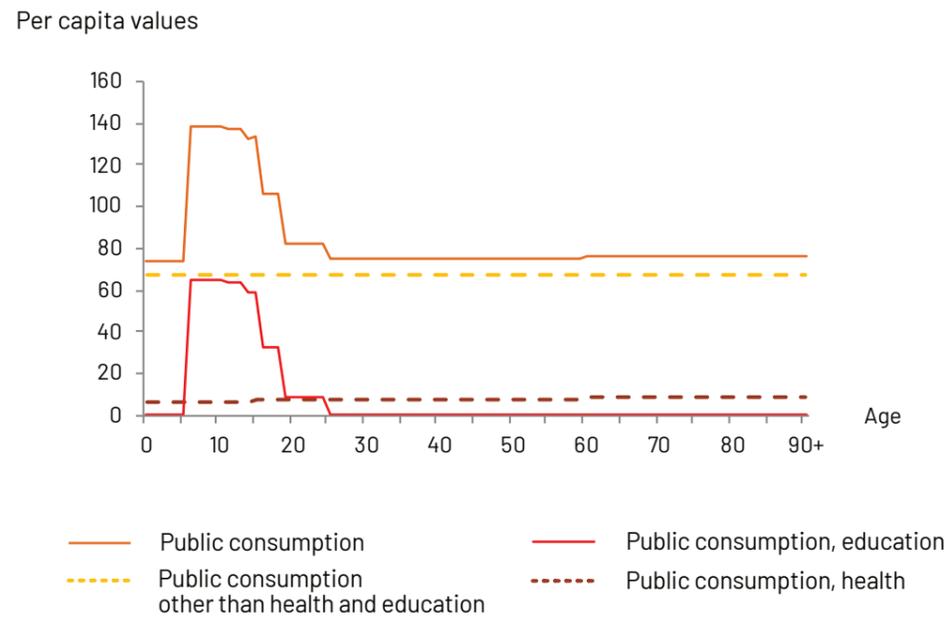
Figure 11 shows public consumption of education, health, and other than health and education. It is found that public consumption of education is highly reflected in total consumption. At the same time, consumption of other than health and education also showed a relatively high distribution across all ages.

Figure 12.
Decomposition of public consumption, aggregate values, 2016
(LKR in Billions)

Aggregate values
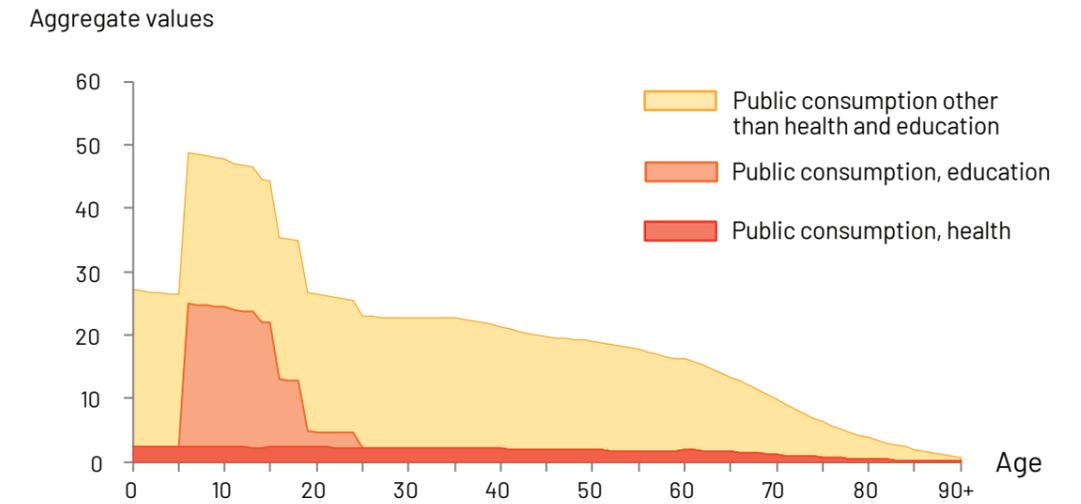
As per figure 12, public consumption is highest at childhood ages and then declines as age advances. As mentioned previously, this is mainly due to the skewed age structure distribution of the population. It is also seen that the increased cost of consumption, especially when children start schooling, is not only for education but also for health and other goods and services.

Figure 13.
Life cylce deficit, aggregate values, Sri Lanka, 2016
(LKR in Billions)

Aggregate values
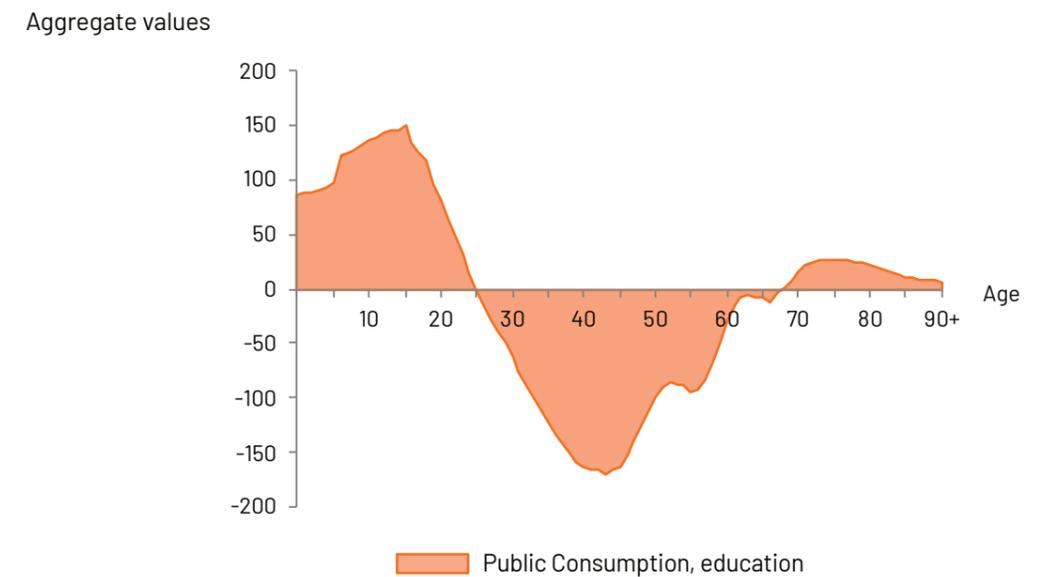
As per figure 13, the life cycle deficit attributable to the younger age groups is significantly larger than the deficit attributable to older people. The life cycle deficit becomes negative at the aggregate level only after age 30 and concludes by age 69 years.

06

FUNDING THE LIFE CYCLE DEFICIT

The existence of life cycle deficits among younger and older Sri Lankans raises the question of how consumption is funded when labour income is less than consumption in these age groups. These deficits are funded through the reallocation of resources using the surplus of resources generated by working-age adults. The reallocation of resources among age groups occurs through a variety of mechanisms: private transfers (e.g., parents purchasing goods and services for their children), public transfers (e.g., public age pensions and publicly provided education and health services), asset income and savings. It is important to note that these transfer systems are themselves in transition, as familial support systems are weakened by economic and demographic forces, and public welfare programmes progressively support the provision of education, old age income and health care.

In this section, we present the age disaggregation of the major components of national accounts as well as estimates of public and private transfers. A constraint we faced during this study was the lack of information on public and private systems for reallocating/transferring income from some ages and generations to others.

Economic flows across age are facilitated by both the public and private sectors. The public sector reallocates resources depending on social obligations symbolized in laws and regulations and implemented by local, regional and national governments. Education, public pensions and health care programmes are important examples of public reallocation programmes. Private sector reallocations are governed by voluntary contracts, social conventions and deeply ingrained behavioral patterns that are mediated by markets, households, families, charitable organizations and other private institutions. Important examples of private reallocations are private saving, credit transactions and familial support to children and older persons.

NTA has the capacity of measuring the economic life cycle and the associated economic support systems. In the NTA framework, consumption and labor income age profiles and economic flows from one age group to another are referred to as age reallocation or intergenerational transfers (Lee and Mason, 2005; Mason et. al. ,2005; Mason, 2005 and Mason, et. al., 2009). In the absence of secondary distribution of income account data, especially asset-based data and its reallocations, this study is confined only to the decomposition of life cycle deficit into two components: net private transfers and net public transfers at the aggregate level. However, public and private net transfers are derived from public account data and HIES data, respectively.

Public transfer inflows were derived from data classified by function in sectors such as education, health, pensions, other social protection schemes and other. The principle followed for estimating the age profile of inflows is that inflows are assigned to the age groups of the intended beneficiaries of the public programmes. For example, education is for ages 3–24 years, pensions for ages 60 and above, health for all the age groups and so on, indicating who receives these public transfers.

In principle, public transfer outflows must equal public transfer inflows. Public transfer outflows were derived from data on taxes on products, subsidies, income and wealth, social contributions and other current transfers. To construct the age profile of public transfer outflows, first, we identified the outflow source for each public sector function. Second, we estimated the age profile of each type of outflow source. We then used this information to estimate the age profile of public-transfer outflows for each public transfer sector.

Private transfers include inter-household transfers and intra-household transfers. Inter-household transfers consist of transfers between resident households, including transfers mediated by non-profit institutions serving households (NPISH). It also includes transfers from households to the rest of the world (ROW) and transfers to households from ROW irrespective of the ROW institution involved. NTA assumes that all inter-household transfer inflows are to the household head and outflows are from the household head. Intra-household transfers are transfers between individuals living in the same household.

Macro adjustment factor for inter-household transfers are done by using population data with the survey estimates of per capita inflows and outflows to calculate aggregate estimates of inflows (TFBIs) and outflows (TFBOs). Total private transfers based on survey estimates are given by TFs =TFBIs–TFBOs where the subscript s is used to indicate values based on the survey (or micro-level database). Four methods can be used to adjust the inflows and outflows to ensure that the difference equals net transfers from the rest of the world TF:

$$\text{Adjustment Factor} = TF/\ (TFBIs\ +\ TFBOs)$$

In the intra-household transfer methodology, we first consider that each household has only one household head. We treat all the consumption values to be positive. Thereafter, all unsmoothed input variables, were adjusted with aggregate controls. For this calculation, the necessary input variables are age profiles of labour income, sector-specific current and durable consumption, public cash transfer inflows, and taxes paid including indirect taxes on consumption (or equivalently public transfer outflows and public asset income and saving).

Computing transfer for current consumption proceeds has four steps: computing the current surplus or deficit for each household member, including the household head, and for the household; calculating a household specific "tax rate"; calculating intra-household outflows for current consumption; and calculating the intra-household inflows and outflows for current consumption by purpose. Once the transfer variables were constructed, the calculations were checked to see if whether total intra-household transfer inflows are equal to total outflows for each sector for each household and in aggregate. After all the checks were completed, we constructed the age profiles. Smoothing was accomplished in the same way that we smoothed all other profiles.

The governing equation for the flow account which must be satisfied for any individual, household and age group is:

Life cycle deficit = Asset reallocations + Net private transfers + Net public transfers

Since

Life cycle deficit = Consumption – Labour income,

We can also have the following relationship:

Consumption = Labour income + Net private transfers + Net public transfers + Asset reallocation

This suggests that consumption (aggregate level) can be decomposed into four components: labour income, net private transfers, net public transfers and asset reallocations.

Transfers in the NTA methodology can be categorized into two components: public, $\tau^g(x)$ and private transfers, $\tau^f(x)$. They can also be inflow, $\tau^+(x)$ and outflows, $\tau^-(x)$. Therefore, net transfer flows can be presented as given in the following equation:

$$\tau(x) = \tau^g(x) + \tau^f(x) = \underbrace{\tau^{+,g}(x) - \tau^{-,g}(x)}_{\text{Public Transfer}} + \underbrace{\tau^{+,fg}(x) - \tau^{-,f}(x)}_{\text{Private Transfer}}$$

Public transfer is carried out by the government as inflows and outflows. Public transfer inflows are the transfers received by the individual from the government as cash, $\tau_c^{+,g}(x)$ and in kind, $\tau_i^{+,g}(x)$. The transfers received in kind are mainly public consumption expenditure on education, health and others, $\tau_{TC}^{+,g}(x)$. Public transfer outflows include taxes $\tau_T^{-,g}(x)$, paid by the individuals to the governments and social contributions, $\tau_s^{+,g}(x)$.

Public transfer inflows can be presented as follows:

$$\tau^{+,g}(x) = \tau_{TC}^g(x) + \tau_i^g(x) + \tau_c^g(x)$$

Public transfer outflows are as follows:

$$\tau^{-,g}(x) = \tau_T^g(x) + \tau_S^g(x)$$

As mentioned before, private transfers consist of (1) inter-household transfers (that is between the households and all other sectors other than the government) and (2) intra-household transfers (that is within the households). Intra-household transfers are the residual of private consumption and disposable income for individuals.

The savings (positive balance between consumption and disposable income) of the working-age adults distributed to children and older persons to meet their deficits. In this case, the calculations are based on two assumptions. First, every individual equally pays taxes on products. Second, only working age individual pays taxes on income and wealth. Disposable income was calculated by adding labour income and public cash transfer inflows to net inter-household transfer and subtracting tax outflows. Public transfer outflows were calculated by adding taxes, social contribution and other cash transfers.

The per capita and aggregate age profile for labour income and consumption are shown in figure 4 and figure 5 and the aggregate life cycle deficit is shown in figure 13. The population age structure magnifies the life cycle deficit attributable to the younger age groups, becoming significantly larger than the deficit attributable to older persons. The life cycle surplus shown for the ages 30-69 years is not sufficient to cover the deficits, emphasizing the burden of raising and sustaining a very young population as well as supporting the older population.

The funding components of the life cycle deficit, i.e., public and private transfers, are shown at the per capita level in figure 14 and at the aggregate level in figure 15. It shows that major transfers are drawn from private transfers in comparison to public transfers.

Figure 14.
Funding the per capita life cycle deficit by public and private transfers, Sri Lanka (LKR in Thousands)

Per capita values
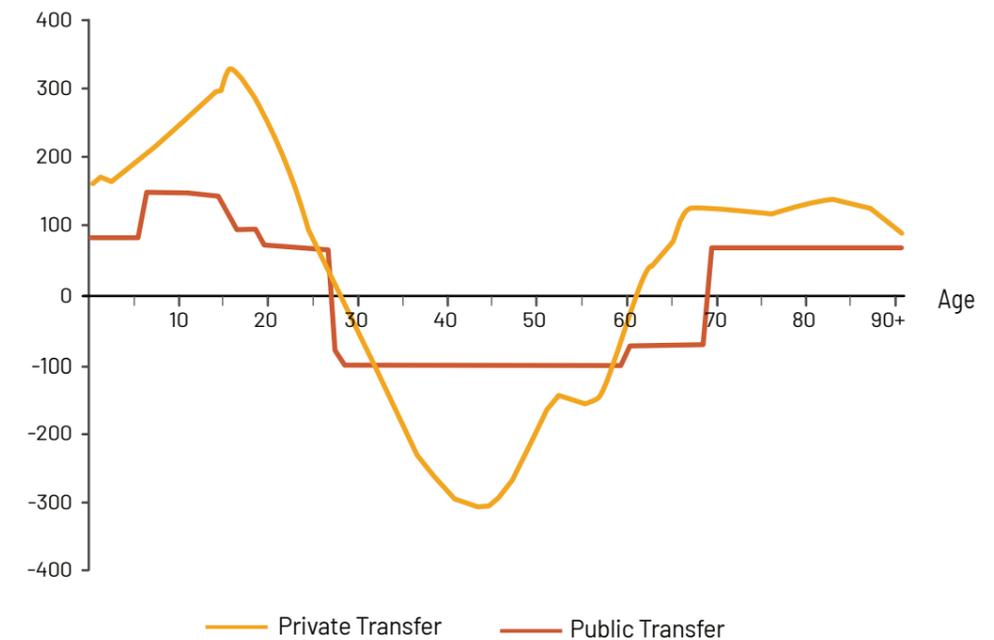
Figure 15.
Funding the aggregate life cycle deficit by public and private transfers, Sri Lanka (LKR in Billions)
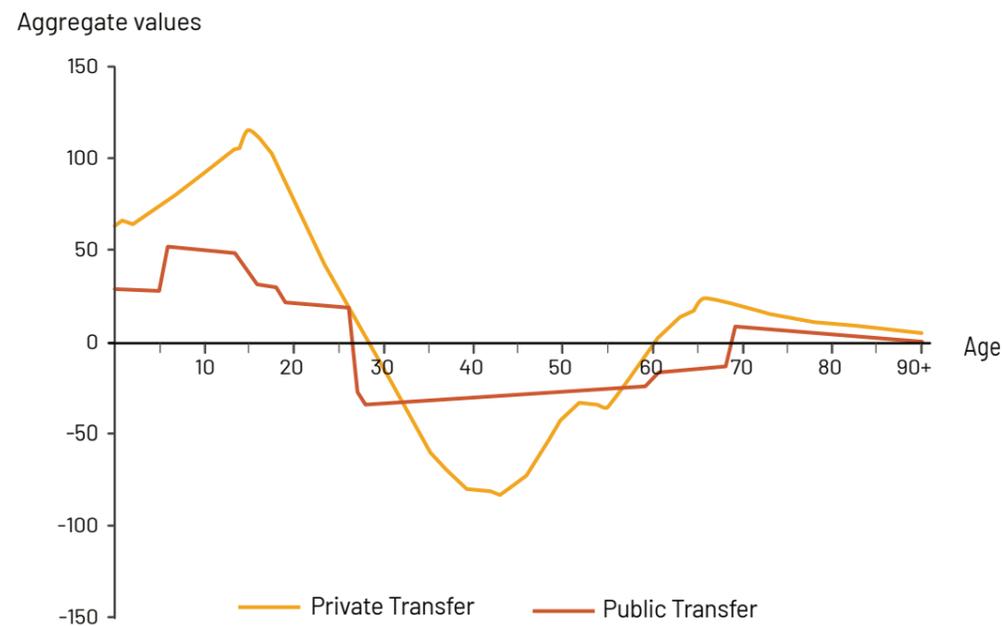
The life cycle deficit can also be filled using asset-based reallocations, i.e., the difference between asset income and savings. Table 19 shows the classification and examples of asset-based reallocations as well as transfers.

Table 19.
Classification and examples of NTA age reallocations

Public

Capital income	Property income	Transfers
• Negligible	• Public debt	• Public education
	• Student loan programs	• Public health care
	• Sovergin wealth funds	• Unfunded pension plans

Private

• Housing	• Consumer debt	• Familial support of
• Consumer durables	• Land	children and parents
• Structure, production	• Subsoil minerals	• Charitable contributions
facilities, vehicles, other		• Remittances
machinery		

Source: Adapted from United Nations, 2013

As per figure 16 per capita asset-based reallocation constitutes a larger proportion of older persons who finance the Life cycle deficit. This reveals that older people over 70 years are heavily dependent on assets rather than transfers. This phenomenon is still present when the aggregate level picture is analyzed as depicted in (figure 16). For younger people, there is a significant amount of net transfers to finance their consumption. For older people, reliance is on assets rather than transfers. This analysis reveals that older people have accumulated assets that can be used later in life or they have accumulated pension funds or personal savings during their working years and now rely on asset income or on dissaving those assets after retirement. They can also borrow to finance their current consumption and reduce consumption in later periods to repay the loans. These are the possible scenarios reflected in figure 16.

Figure 16.
Per capita aggregate life cycle deficit, transfers and asset-based reallocations, Sri Lanka
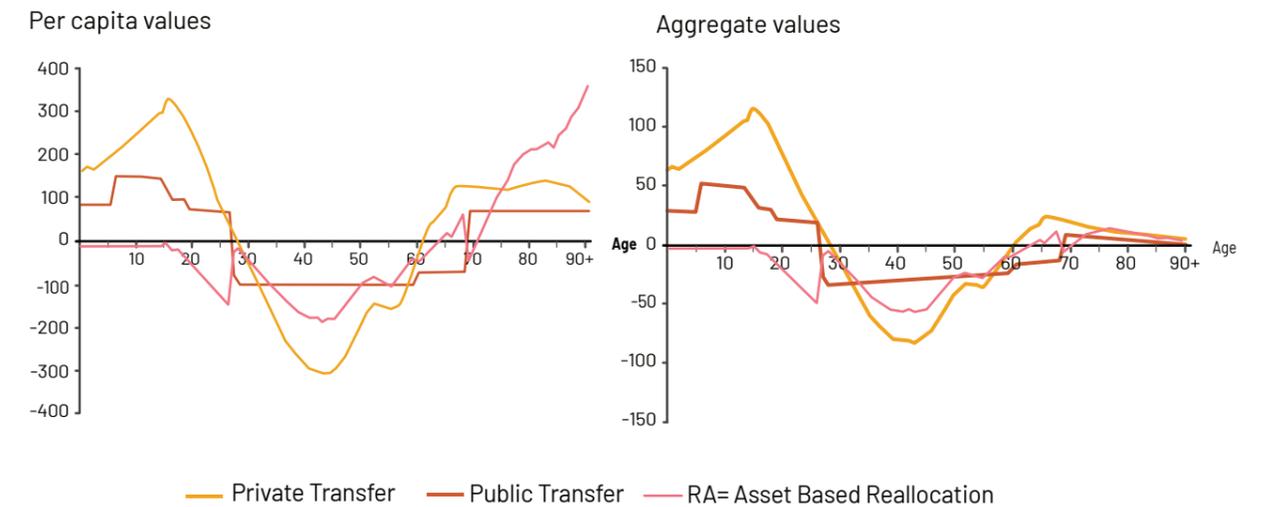
As the age structure of the population changes over time, it is essential to make adjustments to keep the economy in balance. As discussed earlier, Sri Lanka has a substantial child population because of the upsurge in fertility in the last decade. Although Sri Lanka has concluded its first demographic dividend phase and has gradually stepped into its second demographic stage, the country has to bear a double burden of dependence occurring from a large proportion of children and older persons.

Therefore, there are more receivers than givers in the population. It is predicted that this situation will disappear when the extra number of children, born due to recent fertility increase, start entering the labour force ages. This has already started. Hence, Sri Lanka needs to concentrate more on the older population in the future to reap the benefits of the second dividend. When the older generations hold lots of assets and it grows, there will be an increase in assets per capita. This can depress interest rates or boost labour productivity. As the share of children in the population declines, it becomes easier for society to invest more in each child.

The increase in life expectancy and the associated increase in the duration of retirement lead to an upward shift in the age profile of wealth. This takes place because as people comprehend that they will live longer, they will be motivated to accumulate wealth that they can use to support themselves in old age. As people's wealth increases, it is reasonable to hypothesize that they are more likely to invest in the health and education of each of their children. With fewer children to care for, it becomes possible for parents to invest more resources in each child.

The relationship between demographic dividends and income growth is policy dependent. The second dividend comes into operation in part because prime age adults save more to provide for their retirement. However, their ability or willingness to save may be undermined by poorly developed financial markets or overly generous publicly funded pension programmes. This suggests that the changes in age structure define possibilities but, by themselves, do not decide the outcome. In this context, it is important to note that the current labour force will gradually move from working age to old age. As longevity increases continuously, life expectancy after age 60 and over will lengthen more than before. Therefore, it is important for the government to focus on the current labour force and generate decent employment opportunities to create a healthy and productive labour force. Such an effort will improve the saving capacity and the asset base that can be used during retirement.

07
DEMOGRAPHIC CHANGE AND FISCAL REQUIREMENTS

Improving labour productivity reflects the effectiveness of national and regional economies and production efficiency. It exemplifies the use of the labour force in the production process, which can ultimately improve the standard of living. Higher the labour productivity, higher the economic growth. Therefore, increasing labour productivity should be made a priority national development goal.

Raising labour productivity requires resources. Investments in education and health are needed to create a healthy and productive labour force. However, government spending on education and health will be substantial as education and health are free for everyone in Sri Lanka.

Even without these additional investments, the projected change in the population age structure of Sri Lanka will impact both household and government budgets in a significant way. In table 20, we present the projected government spending requirement between 2022 and 2037. The project was done using available population projection estimates (Dissanayake, 2017). In these projections, the age profiles of public consumption are kept constant at its 2016 level. Only the population at each age group are allowed to change.

The country needs an additional LKR 76 billion (total LKR 1,091billion) for public consumption by 2037. Although public consumption on education will be declining, health and other goods will be increasing. This is because of the future growth of the older population who require social protection measures and additional funds for healthcare (Dissanayake, 2017).

Table 20.
Projected public sector spending requirement, 2022 to 2037
(LKR in Billions)

|	**2016**	**2022**	**2027**	**2032**	**2037**
Public Consumption	1015	1066	1089	1096	1091
Education	144.2	150.0	150.2	143.7	133.8
Health	85.7	90.8	93.5	95.3	96.1
Other	785.0	825.5	845.3	857.2	860.9

08

DEMOGRAPHIC DIVIDENDS

First Demographic Dividend:

Figure 17 exhibits that Sri Lanka can no longer depend on its first demographic dividend to finance the required investments to enhance productivity through human capital as well as other necessary investments. Regrettably, the demographic window of opportunity in Sri Lanka closed in 2018, although we observe a rebound after the mid-2020s. This rebound is the result of the upsurge of fertility, which took place around the year 2000 due to the increase of fertility of older women.[18] This sudden upsurge in fertility, which has remained for about 15 years has produced an additional number of children and they will enter the labour force as effective workers around the mid-2020s. It is also important to note that the decline in the support ratio after the year 2000 was also due to the enhanced base of the age-structure pyramid caused by the increase of fertility.

In figure 17, the support ratio based on NTA estimates depicts the number of workers available to support a consumer in an economy. The growth in the support ratio is the first demographic dividend, which measures the accounting effect of demographic change on income per person, taking productivity and consumption patterns as constants throughout the projection period. The NTA-based support ratio shows that there are generally only 7 effective workers for every ten effective consumers in the economy. This ratio is projected to remain relatively the same from 2016 to 2037.

Figure 17.
Support ratio and first demographic dividend, Sri Lanka

Support Ratio — **Demographic Dividend**
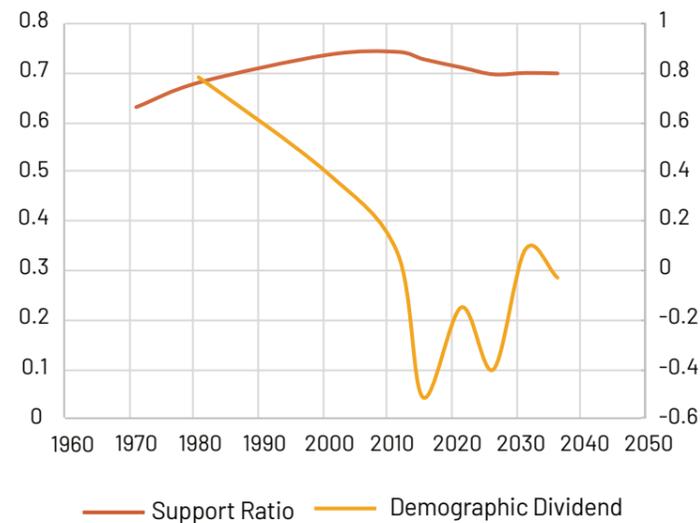
[18] Dissanayake, Lakshman, (2017), Illogicalities between Contraceptive Use and Recent Fertility Dynamics in Sri Lanka, *ColomboArts*, University of Colombo, Sri Lanka

Second Demographic Dividend:

The second dividend is achieved if demographic change leads to a growth in the productivity of workers. There is a strong association between the first and second demographic dividends. If the skills and health of the current labour force are improved, then labour productivity will improve. This can lead to growth in assets (capital), which can fund the consumption of older persons. Therefore, the government must seek appropriate ways of improving the productivity of its labour force by having the right education together with skill development policies to suit the current market demand. An increase in assets (capital) leads to higher productivity. As a consequence, changing demography generates the potential for more rapid economic growth.

Policy and behaviour, however, play a critical role in determining whether that potential is realized.[19] Most often, policy planners envision the older population as a liability, but in reality, it is an important element in the process of economic growth. The second dividend comes in sequence to the first dividend and is linked to the creation of wealth that arises in response to population ageing. Unfortunately, the demographic dividends are not automatic and depend on institutions and policies to reflect changes in population age structure in economic growth.[20] Therefore, Sri Lanka must create an atmosphere, especially related to its human capital development policy, in order to minimize the burden that population ageing will have on public expenditure.

To show the potential benefits of the second demographic dividend, we simulated the contribution of increasing labour productivity by 0.5 per cent per year on the aggregate labour income. This rate was selected because it's a substantially lower value compared to estimates of the historical average labour productivity growth around the world.[21] Hence, it is assumed this will provide a low-ball estimate of the potentials of the second demographic dividend. The projected change in population age distribution was done in order to assess the implied aggregate labour income until 2037.

In our estimation procedure, we set changes in the age structure as the base scenario while keeping per capita labour income at the same level throughout the projected period. As show in table 21, with only demographic change, aggregate labour income is projected to increase from LKR 4,199.25 billion in 2016 to LKR 4,571.84 in 2037, which is an increase of LKR 373 billion. When labour productivity growth is introduced, it would increase aggregate labour income by LKR 872 billion, relative to the aggregate labour income in the demographic change-only scenario in 2037. Therefore, Sri Lanka must rely on possible sources of funding to finance the investments necessary to benefit from the second demographic dividend.

Table 21.
Simulated aggregate labour income
(LKR in Billions)

	2022	2027	2032	2037
Demographic change only	4361.4	4434.9	4494.9	4571.8
… with labour productivity growth	4492.2	4682.1	4864.1	5071.1

[19] https://www.un.org/en/development/desa/population/publications/pdf/technical/TP2017-1.pdf

[20] Mason, A. and R. Lee (2006). 'Reform and support systems for the elderly in developing countries: capturing the second demographic dividend', Genus, 11–35.

[21] Feenstra, R.C., R. Inklaar, and M.P. Timmer (2015). The next generation of the Penn Word (Table. American Economic Review, 105(10), 3150-3182.

09
POLICY IMPLICATIONS AND CONCLUSIONS

It is apparent that the demographic transition in Sri Lanka has made a substantial impact on the age structural changes of the population, especially after the 1960s. Although Sri Lanka has come a long way from the onset of the fertility transition, the country still exhibits a pyramidal age structure because of higher fertility cohorts in the past. Sri Lanka is currently experiencing its first demographic dividend (Dissanayake, 2017),[22] thus comprised of a very young labour force. To achieve high economic growth with a young labour force, the results of this study will be very valuable for appropriate national planning and effective budgetary allocations as the NTA shows us which age categories need more investment. Undoubtedly, a young labour force can be made productive with increasing investment in education, health and other necessities. In this context, the association between the NTA and macro economy will be very useful, as shown in this study.

Sri Lanka's labour force is not being used to its full potential. One of the most concerning issues is the low level of female labour force participation. As the study has shown, self-employment (maybe from the informal sector) accounts for a significant share of income. According to the 2016 LFS, approximately 63 per cent men and 54 per cent women were engaged in the informal sector. This may have dire consequences not only for Sri Lankan households that rely on labour income for survival, but also for the Sri Lankan government since it loses a key source of revenue to fund its operations by not being able to collect direct tax.

When the age structure moves upward in the future, with a relatively high proportion of older persons accruing at higher ages, the government may struggle to find financial resources to fund social protection programmes. Increasing household incomes by inducing greater labour productivity or expanding work opportunities may contribute to easing the financial constraints of both households and the government.

At the same time, one may argue that, despite the fact that women's participation in the formal and informal sector is lower than men's, they are more affected because of their caring responsibilities. Girls often look after their younger siblings, ageing or sick relatives. Mothers, who may be the sole breadwinners in their families, often take jobs in the informal sector where they can take their infants and non-schooling young children with them. Usually, these work settings are unsafe and can harm children's health and overall development. Further, the burden of care work on women and girls has increased with HIV/AIDS. Globally, women and girls provide up to 90 per cent of home care due to illness.[23] The unpaid care work of women and girls is often overlooked in the calculations of a country's economy. It's not included in labour force surveys or GDP figures. As a result, the realities of the work burden of women and girls are omitted from the data used to inform policymaking.[24]

[22] This determination of the terminal year of the first demographic dividend is based on the calculation made by Dissanayake using a different approach to the NTA. The NTA calculations showed that the terminal year of the first demographic dividend is 2018, although their is an upsurge afterwards until 2037.

[23] UNFPA/UNAIDS/UNIFEM, "Women and HIV/AIDS: Confronting the Crisis", Executive Summary, p. 2.

[24] UNRISD Research and Policy Brief 9, Why Care Matters for Social Development.

This study shows that the labour force in Sri Lanka does not stop at age 60 but goes beyond it. This is healthy for the Sri Lankan economy, especially with a shrinking labour force expected in future decades. It also implies that the government needs to redifine the retirement age and retain healthy, active and productive older workers to sustain productivity growth. When older workers continue their employment for few more years after present mandatory retirement age, it will curtail public spending on the health and social welfare of older persons. This will benefit the government budget.

Consumption is greater at childhood ages at both per capita and aggregate levels due to the expenditure on education and health. This is mainly because of the high proportion of children in the population which will remain until 2037, when the onset of the second demographic dividend takes place (Dissanayake, 2017). However, estimates of the government's spending needs till 2037 show an increase in fiscal needs, primarily due to the growing older population.

The study showed that the major transfers are drawn from private transfers in comparison with public transfers. Asset-based reallocation constitutes a larger proportion of older persons who finance the Life cycle deficit. For younger people, there is a significant amount of net transfers which finances their consumption but for older people (especially those above 70 years), reliance is on assets rather than transfers. This analysis reveals that older people have accumulated assets that can be used later in life or they have accumulated pension funds or personal savings during their working years and now rely on asset income or on dissaving those assets after retirement. They can also borrow to finance their current consumption and reduce consumption in later periods to repay the loans.

Although Sri Lanka has concluded its first demographic dividend phase and has gradually stepped into its second demographic dividend stage, the country has to bear a double burden of dependence occurring from a large proportion of children and older people. As a result, the population has more receivers than givers. This situation is expected to shift when the extra number of children born as a result of the recent fertility increase enter the labour force. To reap the benefits of the second dividend, Sri Lanka needs to focus on the older population in the future. If older persons can accumulate lot of assets and those assets grow, then there will be an increase in assets per capita, which could lower interest rates or boost labour productivity. As the share of children in the population declines, it becomes easier for society to invest more in each child.

Sri Lanka needs to also increase labour productivity by investing in education and health to create a healthy and productive labour force. This requires resources. Estimation of the government spending requirement as a result of the projected changes in the population's age structure shows that by 2037, the country will need an additional LKR 76 billion (total LKR 1,091 billion) for public consumption. Although public consumption on education will decline, health and other goods will increase due to the growth of the older population who require social protection and health care.

The analysis revealed that Sri Lanka can no longer depend on its first demographic dividend to finance the required investments to enhance productivity through human capital and other necessary investments. To show the potential benefits arising from the second demographic dividend, we simulated the contribution of increasing labour productivity on the aggregate labour income. With only demographic change, aggregate labour income is projected to increase from LKR 4,199.25 billion in 2016 to LKR 4,571.8 billion in 2037. When labour productivity growth is introduced, it would increase aggregate labour income by LKR 872 billion compared to the aggregate labour income in the demographic change-only scenario in 2037. Therefore, Sri Lanka must rely on possible sources of funding to finance the investments necessary to benefit from the second demographic dividend.

Unfortunately, Sri Lanka did not use the first demographic window of opportunity to enhance economic growth like most East Asian countries did during their respective years of the first demographic dividend. This NTA analysis provides the evidence needed for policy planners to take advantage of the second demographic dividend which will be available during the mid-2030s.

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