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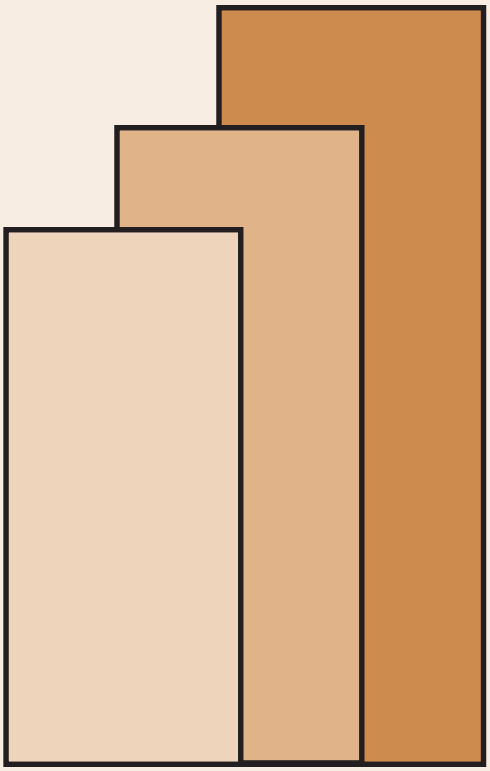

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Philippines 2011 National Transfer Accounts (NTA) Estimates of Consumption and Labor Income Age Profiles: Discussions about 1991-2011 Age Profile Change and Implications on Economic Gains from the First Demographic Dividend[1]

Rachel H. Racelis, Michael Ralph M. Abrigo, J.M. Ian S. Salas, and Alejandro N. Herrin[2]

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Abstract

This paper has two parts. The first part presents and discusses the 2011 Philippine NTA estimates for selected flow accounts components, being the most recent estimates available for the country, and compares the 2011 to the 1991 and 1999 estimates. And the second part, also covering the years 1991, 1999 and 2011, examines change in Philippine population age structure, discusses economic gains from population change and the implications of economic lifecycle change on the economic gain. In the first part more recent information about the economic lifecycle of Filipinos is provided from the 2011 NTA: age profiles of consumption and labor income (and their components) for the year 2011; and which population age groups incurred lifecycle deficit and the sizes of the aggregate deficits. The 2011 Philippines NTA national level estimates for per capita consumption and labor income age profiles are also compared to corresponding components of the 1991 and 1999 NTA estimates to determine the general directions and relative sizes of change over time. In the second part of the paper, findings about the per capita age profiles from the first part are used. The changes in the age structure of the Philippine population over the three years are also examined in the second part. There is potential for economic gain resulting from population change, more specifically from an increasing proportion of the population in the working ages – the phenomenon often referred to as the first demographic dividend. The effects of change in the population age structure and change in the economic lifecycle on economic gain are examined in the second part of the paper in two ways: using aggregate flows estimates of the NTA for the three years; and using economic support ratios as defined in the NTA also computed for the three years.

Keywords: National Transfer Accounts, economic lifecycle, lifecycle deficit, consumption age profile, labor income age profile, demographic dividend

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[1]. This paper is an output of continuing NTA work at the Philippine Institute for Development Studies (PIDS). The NTA work in the Philippines is part of an international collaboration to develop and apply the National Transfer Accounts (see www.ntaccounts.org.)

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Philippines 2011 National Transfer Accounts (NTA) Estimates of Consumption and Labor income Age Profiles: with Discussions about 1991-2011 Age Profile Change and Implications on Economic Gains from the First Demographic Dividend

Rachel H. Racelis, Michael Ralph M. Abrigo, J.M. Ian S. Salas, and Alejandro N. Herrin

1. Introduction

NTA is a comprehensive system of accounts that measures the economic lifecycle and the associated economic support systems. It also includes methodologies for examining economic gains from the first and the second demographic dividends. (General references on NTA include Lee, Lee and Mason 2005, Mason et. al. 2005, Mason, et. al. 2009 and United Nations 2013). NTA estimates for the Philippines are available for a number of years. The first set of NTA flow accounts for the Philippines was estimated for the year 1999, and methods and results are discussed in Racelis and Salas (2007) and Salas and Racelis (2008). Selected NTA components (age profiles of consumption and labor income) were also estimated for the years 1994 and 2002 (Racelis and Salas 2008 and Racelis and Salas 2011). The full set of NTA flow accounts for 2007 and revised 1999 were also subsequently estimated (Abrigo, Racelis and Salas 2012, and Abrigo, Racelis and Salas 2014).

This paper is written in two parts. The first part presents and discusses the 2011 Philippine NTA estimates of selected flow accounts components (i.e., age profiles of consumption, labor income and lifecycle deficit). The 2011 estimates are then compared to corresponding components of the 1991 and 1999 NTA estimates. The 1991 NTA, although for a back year, was estimated for the first time along with the 2011 NTA. For comparability, the 1999 NTA was re-estimated using methods applied to the 1991 and 2011 NTA. The comparisons show the general directions and relative sizes of change over time in the age profiles of consumption, labor income and their components. The results and findings about per capita age profiles from the first part of the paper are used in the second part of the paper. The changes in the age structure of the Philippine population over the three years are also examined and discussed in the second part. The effects of change in the population age structure and change in the economic lifecycle (as revealed in the analysis of per capita age profiles) on economic gain are then examined in the second part of the paper in two ways: using aggregate flows estimates of the NTA (aggregate flows are products of population by age and per capita age profiles); and using support ratios as defined in the NTA (product of population by age and equivalence scales by age derived from the per capita age profiles).

As mentioned above, NTA has been estimated for the Philippines for various years: selected NTA components (age profiles of consumption and labor income) were estimated and compared for the years 1994 and 2002 (completed in 2008); and the full set of NTA flow accounts for 2007 and revised 1999 were also estimated and compared (completed in 2013). The findings from these previous studies are cited in this paper to validate (or to contrast with) findings of the comparisons done in this paper. It should be noted that there have been some changes in the methods and assumptions used to produce the Philippine NTA since the first set

of estimates were prepared in 2007-2008. The 2007 and the revised 1999 NTA estimates which were produced more recently applied methods that are more consistent with those used to produce the set of NTA estimates presented in this paper. Thus, for purposes of this paper the findings from the earlier estimates (specifically the 1994-2002 study) cited in the discussions are limited to directions of change rather than on the specific levels found in these estimates. On the other hand, attention is given to both directions of change and levels found in the more recent 1999-2007 study.

Methods and data used to estimate the NTA components for the three years are described in Section 2. Section 3 contains Part One of the paper and this has three subsections. Section 3.1 presents and discusses the highlights of the consumption, labor income and lifecycle deficit age profiles for 2011, the most recent NTA estimates for the Philippines. In Section 3.2 the 2011 NTA estimates in per capita terms are compared to corresponding components of the 1991 and 1999 NTA estimates. Findings from comparisons of NTA estimates in previous papers are incorporated into Section 3.2 as additional reference for the patterns noted in that section. In Section 3.3 the 2011 NTA estimates in aggregate terms are compared to corresponding estimates of the 1991 and 1999 NTA. Section 4 contains Part Two of the paper and this also has three subsections. Section 4.1 examines population age structure change during the three years, 1991, 1999 and 2011. The effects of changes in population age structure and changes in economic lifecycle on economic gain are sorted out in Section 4.2 using aggregate flows estimates of consumption and labor income. A similar examination is done in Section 4.3 using economic support ratios. Estimates of support ratios are used further in Section 4.3 to examine the implications of economic lifecycle change on the range of support ratio values and the duration of the first demographic dividend phase. The last section, Section 5, concludes this paper.

2. Methods and data

The main sources of data for the estimation of the consumption and labor income age profiles of Philippines NTA for the three years include the following: National Income Accounts data for the specific years, specifically the Income and Outlays breakdown, obtained from the Philippine Statistics Authority (PSA); estimates of the National Health Accounts and National Education Expenditures Accounts available for the specific years (from PSA); Family Income and Expenditure Survey (FIES) and Annual Poverty Indicator Survey (APIS) closest to or exactly for the specific years (1991, 2000, 2012 FIES and 1999, 2011 APIS from PSA); and government finance and budget documents containing data for the specific years obtained from the Department of Budget and Management (DBM) and the Commission on Audit (COA). Population data by sex and in single ages for the years 1991, 1999 and 2011 for the Philippines are taken from the United Nations (2011).

The methods for producing the 1991, 1999 and 2011 estimates generally followed those described in Racelis and Salas (2007) and those recommended in the NTA Manual (United Nations 2013).

The steps for estimating the age profiles or the per capita means of consumption and labor income by age are as follows:

1. Obtain the value of the National Income Accounts (NIA) "equivalent" of the NTA component and use the NIA value as the aggregate control total. Aggregate control values used in the estimation of the selected components of the NTA Flow Accounts for the three years are shown in Table 1.
2. Calculate per capita means of the NTA component (e.g., private household education expenditure, private household health expenditure, salaries and wages, etc.) by age in single years either directly from household survey data or using some other data and method;
3. Multiply per capita means obtained from Step 2 by the population size of each age to obtain aggregate values by age and then compute for the grand total by taking the sum of aggregate values across all ages;
4. Compare the grand total from Step 3 with the control total from Step 1 and, if necessary, adjust the per capita means at each age estimated in Step 2 upwards or downwards to gain consistency with the control total.

Table 1. NTA aggregate controls: Philippines, 1991, 1999 and 2011 (in billion PhP, current prices)

NTA Component	*Control Total Description*	*1991*	*1999*	*2011*
Consumption		934	2,298	7,492
Public – Total	Government consumption expenditures (GCE)	124	389	942
Education	GCE * (education budget share)	29	90	206
Health	GCE * (health budget share)	5	17	33
Other	GCE less public education and health expenditures	90	282	702
Private – Total	Household Final Consumption Expenditures (HFCE) less net indirect taxes paid by households (=netHFCE)	811	1,909	6,550
Education	netHFCE * (education household expenditure share)	28	76	283
Health	netHFCE * (health household expenditure share)	17	47	173
Other	netHFCE less household education and health expenditures	766	1,785	6,094
Labor Income		705	1,680	6,784
Earnings	Compensation of domestic workers	318	815	3,421
Earnings	Net compensation from rest-of-the-world (ROW)	58	223	2,129
Self-employment	2/3 * operating surplus of households	330	642	1,234

In some cases, specifically for public consumption, the reverse process is done wherein estimation starts with the control total. First, the (control) total value is distributed to identified consumers or users of services (e.g., public school students) at each age, where users are identified using survey data. This step provides the total or aggregate value for each age group,

e.g. total public education expenditures allocated to each age group. Next, per capita values (not per user or per consumer) are computed by dividing the aggregate total expenditure at each age by the population size of the age group.

As mentioned above, the effects of population change and economic lifecycle change on economic gain are examined in this paper in two ways, using the aggregate flows of NTA and using economic support ratios. The computation of the NTA aggregate flows and support ratios both involve using population size data by age and the per capita consumption and labor income age profiles. Economic support ratios and the NTA computational approach are described in Section 7.

3. Part One: 2011 NTA estimates of selected components and comparisons with the 1991 and 1999 NTA estimates

3.1 Highlights of the 2011 age profiles of consumption, labor income and lifecycle deficit

The per capita age profiles in Figure 1 show the patterns of labor earnings and consumption over the lifecycle of the average Filipino. The profile for labor income has the expected inverted U-shape, rising sharply between ages 15 to 25, peaking at age 39 and declining thereafter – a general pattern seen in previous NTA estimates except for slight changes in the age at which labor income peaks. Per capita current consumption show steep increase up to around age 19, staying relatively unchanged up to age 45 and gradually increasing again towards old age – again, a general pattern seen in previous NTA estimates. The sharp increases in per capita consumption at younger ages are due to education expenditures while the gradual increase in the older ages is due to health care consumption that increases with age.

Figure 1. Age profile of per capita consumption and labor income, Philippines, 2011, current prices (in PhP thousands)

In 2011 there was lifecycle deficit or consumption exceeded labor income for the young up to age 21 and for the elderly from age 57 onwards in 2011. There was lifecycle surplus or

labor income exceeded consumption from ages 22 to 56 years, a span of 34 years. Compared to 2007, the deficit ages had gone down from 24 to 21 years for the young and also gone down from 59 to 57 years for the older ages.

Multiplying the 2011 per capita age profiles for consumption and labor income (Figure 1) with the population size at each age for the same year (shown in Figure 17) produces the aggregate age profiles shown in Figure 2. The aggregate lifecycle deficit by age computed as the difference between the aggregate consumption and aggregate labor income at each age is presented in Figure 3.

Figure 2. Age profile of aggregate consumption and labor Income, Philippines, 2011, current prices (in PhP billions)

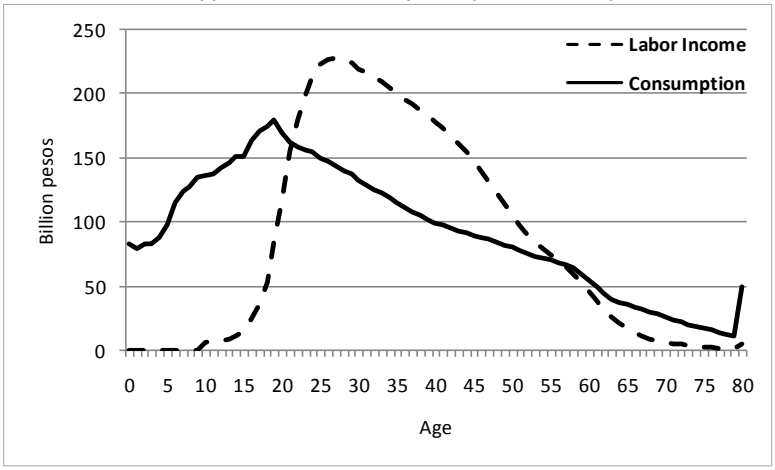
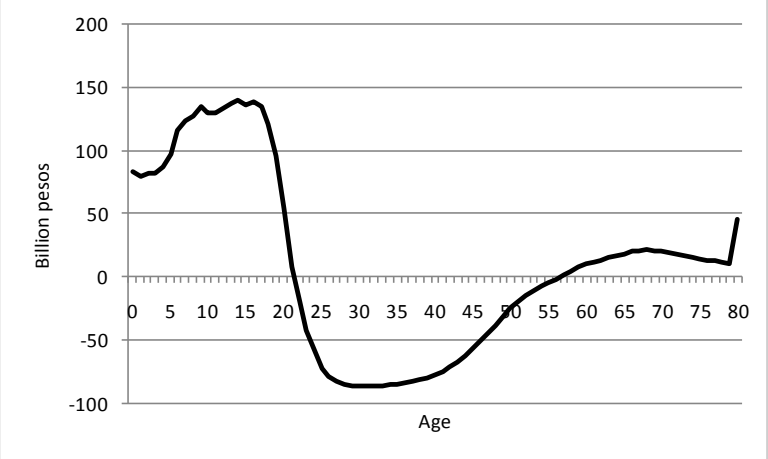


Figure 3. Age profile of aggregate lifecycle deficit, Philippines 2011, current prices (in PhP billions)



As observed previously in the per capita age profiles in Figure 1 and this time in the aggregate age profiles in Figures 3 and 4, there is lifecycle deficit, i.e. consumption exceeds

labor income, for the young up to age 21 and for the elderly from age 57 onwards. The age groups 0-21 years and 57 years or older are referred to as the dependent age groups – defined based on lifecycle deficit rather than arbitrarily just based on age. These age groups are also referred to as the deficit age groups. There is surplus or negative lifecycle deficit, i.e. consumption is less than labor income, from ages 22 to 56 years. The aggregate age profiles indicate the magnitude of the lifecycle deficit of the young and the elderly relative to the surplus generated by the working age group. Two important observations from Figures 3 and 4 are (1) in 2011 the young continued to account for the greater share of total deficits and (2) the aggregate surplus by the age-group 22-56 years is not enough to cover the total deficits of the two dependent populations. These observations are quantified in Table 2.

Aggregate values of consumption, labor income and lifecycle deficit are summarized by broad age groups in Table 2. The age groupings follow the age cut-offs defined for the dependent populations, with the young dependents split further into the "younger young" and the "older young" to highlight the difference in their degree of dependency. Also presented in Table 2 are the components of labor income and consumption. The grand totals in this table may not exactly tally with the control totals shown in Table 1 because of rounding in the age-specific computations.

Table 2. Aggregate consumption, labor income and lifecycle deficit by age group, Philippines, 2011, current prices (PhP Billion)

LIFECYCLE DEFICIT (SURPLUS)	**708**	**1,685**	**688**	**-2,039**	**374**
CONSUMPTION	**7,492**	**1,726**	**1,172**	**3,785**	**809**
Public	942	408	158	318	59
Education	206	150	53	3	0
Health	33	13	4	13	3
Others	702	245	100	302	56
Private	6,550	1,318	1,015	3,467	750
Education	283	111	159	13	0
Health	173	31	9	72	61
Others	6,094	1177	846	3,382	689
LABOR INCOME	**6,784**	**41**	**484**	**5,824**	**435**
Earnings – domestic	3,421	2	222	2995	202
Earnings – from abroad	2,129	0	145	1918	66
Self-Employment	1,234	39	117	911	167

Consumption consists of public and private components with public consumption accounting for around 13 percent of total consumption in 2011. Both public and private consumption are composed of consumption on education, health and others. Education and health consumption are analyzed separately because of their importance as human capital investment and because these components are generally age-sensitive. Education and health consumption in 2011 accounted for 22 and 4 percent of public consumption, respectively, and 4

and 3 percent of private consumption, respectively. The young under age 22 years old account for almost all education consumption in 2011, both public and private – only about 1 percent of public and 4 percent of private education expenditures were spent for the other age groups. The elderly account for disproportionate shares of about 9 and 35 percent of public and private health consumption respectively. The elderly deficit age group accounted for 8 percent of the Philippine population in 2011.

Labor income in the 2011 NTA consists of earnings from domestic paid employment, earnings of Overseas Filipino Workers (OFWs) and income from self-employment (also domestic). Labor income in 2011 is roughly 81 percent earnings from paid employment (domestic, 50 percent, and from abroad, 31 percent) and 18 percent income from self-employment. The elderly 57 or older account for about 6, 6, 5 and 14 percent of total labor income, domestic earnings, earnings from abroad and self-employment income, respectively. The young 15-21 years olds account for about 7 percent of total labor income.

The aggregate lifecycle deficit of the deficit age groups in 2011 amounted to about PhP2,747 billion (Php1,685 for the group 0-14, Php688 for the group 15-21 and Php374 for the 57 and older, all in billions) with the young accounting for around 86 percent and the elderly the remaining 14 percent. Aggregate surplus (indicated by a negative lifecycle deficit) generated by the 22-56 age group amounted to PhP2,039 billion and the ratio of this surplus to the total deficit of the dependent populations (i.e. Php2,039 divided by Php2,747) is about 0.74.

3.2 Comparison of per capita consumption and labor income age profiles: 1991, 1999 and 2011

Examinations across the three years are done using per capita values at constant 2010 prices. The effect of inflation is removed for comparability of the age profiles across time. Before the detailed examination of the age profiles of each NTA component, a summary table of per capita values at the national level is presented to provide as background on the overall direction and size of change of the various components across the years.

Summary of overall per capita consumption and per capita labor income

The general economic conditions during the period 1991- 2011 provide part of the explanation for the patterns of change observed in the per capita consumption and labor income shown in Table 3. In the period 1991–2011 the Philippines experienced varying economic performance. Generally low and even negative real growth rates in per capita Gross Domestic Product or GDP was experienced in the first half of the period (PSA 1997, 2003, 2013). The annual real growth rates were negative throughout 1989–1993, going as low as -3.1 percent in 1990–1991, and then again in 1997–1998 at -2.1 percent. In the years 1998 and onwards the annual real growth rates of per capita GDP were consistently positive, generally exceeding 3.0 percent. The lowest growth experienced was in 2008-2009 at 1.1 percent and the highest since 1998 exceeding 6 percent were experienced in 2003-2004 at 6.7 percent, 2006-2007 at 6.6 percent, 2009-2010 at 7.6 percent and 2011-2012 at 6.8 percent.

The average annual change in per capita consumption and per capita labor income (as shown in Table 3) reflect the general economic conditions as described above during the periods 1991-1999 and 1999-2011. Real per capita consumption and per capita labor income levels seem to have stayed the same from 1991 to 1999, with near zero average annual growth rates. Then these two components showed spectacular annual growth in the next period, 1999-2011.

The patterns of change for the individual components of consumption and labor income, however, are mixed. The annual growth in per capita public consumption, including those for education and health, contrary to the pattern of growth in the general economy was higher in the first period compared to the second period. It is private consumption and its components that showed very low or even negative annual growth in real per capita spending during the first period but recovering, as the general economy did, in the second period.

Table 3. Per capita consumption and labor income by NTA component: Philippines, selected years, constant 2010 prices (PhP)

	Per capita (in PhP)			Average annual change (percent)	
NTA Component	1991	1999	2011	1991 - 1999	1999 - 2011
Consumption	**50,050**	**50,484**	**78,819**	**0.1**	**4.7**
Public	6,636	8,551	9,908	3.6	1.3
Education	1,538	1,982	2,167	3.6	0.8
Health	293	378	351	3.6	-0.6
Others	4,805	6,192	7,390	3.6	1.6
Private	43,415	41,933	68,911	-0.4	5.4
Education	1,492	1,680	2,975	1.6	6.4
Health	892	1,041	1,825	2.1	6.3
Others	41,031	39,213	64,111	-0.6	5.3
Labor Income	**37,782**	**36,906**	**71,374**	**-0.3**	**7.8**
Earnings - Domestic	17,019	17,901	35,990	0.6	8.4
Earnings - Abroad	3,098	4,894	22,398	7.2	29.8
Self-Employment	17,665	14,111	12,986	-2.5	-0.7

Labor earnings from domestic paid employment generally followed the pattern of growth of the general economy. Per capita income from self-employment, however, had consistently declined showing negative annual growth in both the two periods. Per capita net earnings from abroad or OFW remittances is the only component that had very high annual growth rates in both periods making up for the steady decline in per capita self-employment income. It is expected that OFW remittances would have a different growth pattern since it is generated outside of the Philippine economy. More discussion about OFW remittances is provided in the section on per capita labor income.

Per capita current consumption age profiles

Current consumption covers education, health and other consumption (3 types) and both public and private consumption (2 sectors) – a total of six (3x2) current consumption components. The per capita age profiles of the six components, of total public and total private consumption, and total (public plus private) consumption are examined over three time points.

Public education consumption is observed to be targeted to ages attending the basic education level, i.e. ages 5-16 years (before implementation of the basic education reform), while private education consumption is highest in ages attending the tertiary education level, i.e. ages 17-22 years (Figures 4 and 5). The patterns in these education consumption age profiles reflect the fact that basic education in the Philippines is provided by the government for free and that private household expenditures are generally paying for education costs that are not financed by the government.

Figure 4. Age profile of per capita public education consumption, Philippines, selected years, constant 2010 prices (in PhP thousands)

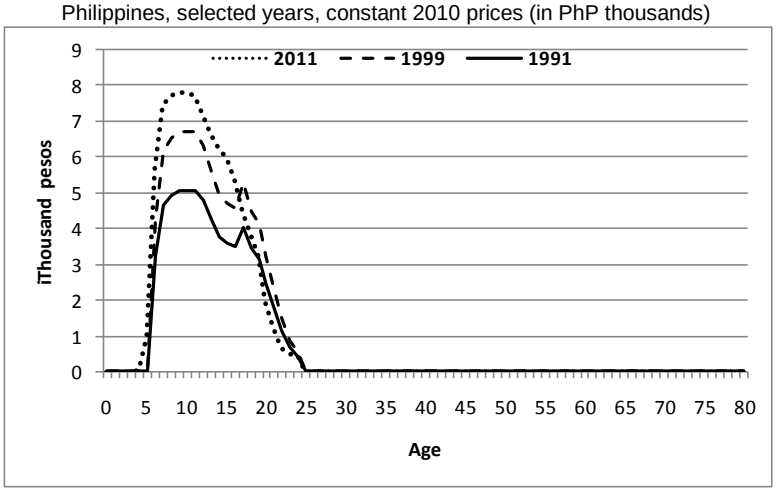
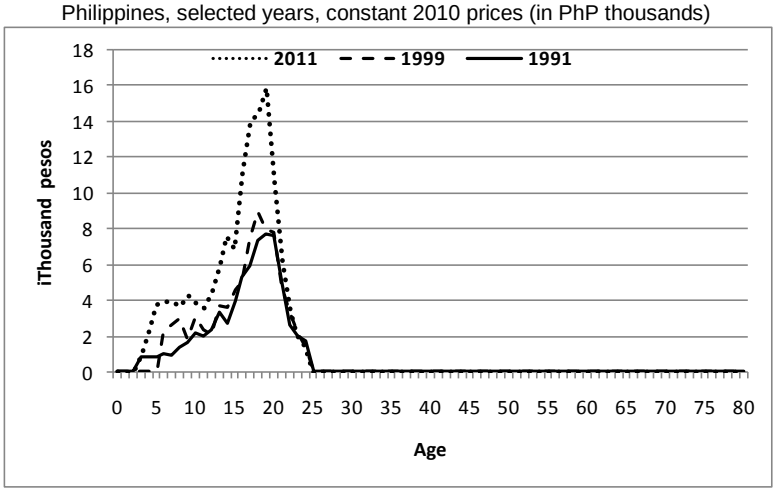


Figure 5. Age profile of per capita private education consumption, Philippines, selected years, constant 2010 prices (in PhP thousands)

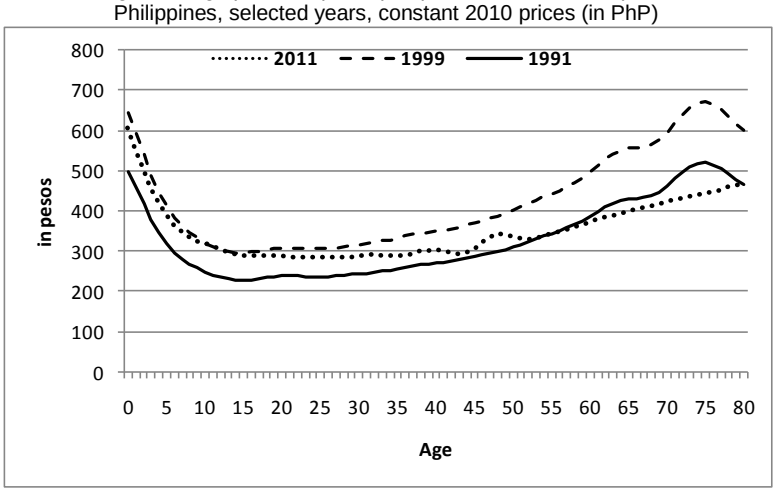


Patterns of spending by age have persisted from 1991 to 2011 but there are clear increases in per capita public spending from 1991 to 1999 and from 1999 to 2011. These findings are consistent with those found in the 1994-2002 and the 1999-2007 studies – one general hump in the age profile at the primary education ages and general increase in per capita spending at all ages.

Per capita private spending for education had stayed nearly the same from 1991 to 1999, but had significantly increased at all ages from 1999 to 2011. The latter finding is consistent with that found in the 1999-2007 study – there was more per capita spending at all ages but more so for the young ages 3-6 years and for the tertiary level ages 16-22 years.

Per capita health expenditures are highest for children and elderly health care as observed in both the per capita public and private health consumption age profiles (Figures 6 and 7) and these patterns are as expected. Per capita public spending for health increased from 1991 to 1999 at all ages, but in 2011 had either stayed the same as the levels in 1999, as observed for young ages 0-20 years, or slipped back close to the 1991 per capita levels, particularly for the older ages 55 years and over. The increase of per capita public spending at all ages from 1991 to 1999 is consistent with the findings of the 1994-2002 study. The 1999-2007 study found per capita public spending for health to have stayed generally the same at all ages in the two years; and this means that the decline in per capita spending observed in 2011 at the older ages (compared to 1999) must have occurred sometime after 2007.

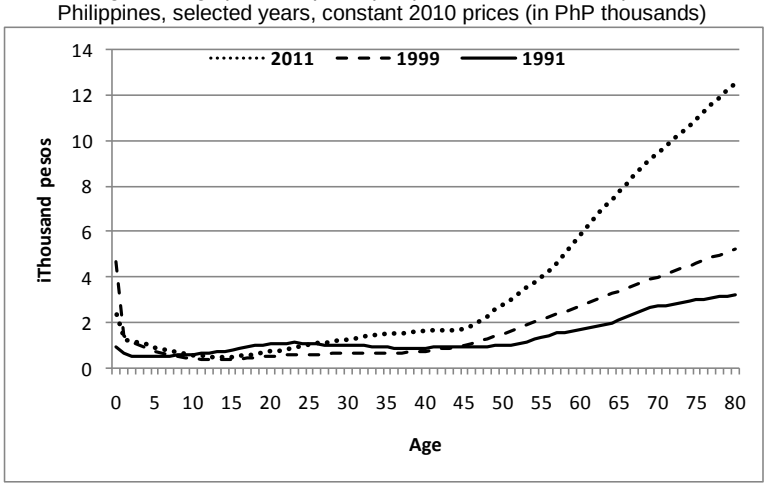
Figure 6. Age profile of per capita public health consumption, Philippines, selected years, constant 2010 prices (in PhP)



Per capita private expenditures for health, on the other hand, had increased from 1991 to 1999 for those age 40 years and older and increased very rapidly from 1999 to 2011 for those age 30 years and older – more than doubling for those over 65 years old in the latter period. This rising per capita spending at older ages over time had been noted previously in both the 1994-2002 and the 1999-2007 studies. It was explained in the latter study that this pattern of change reflects the upward shift in hospital utilization age profiles from 1999 to 2007 based on Annual

Poverty Indicator Survey (APIS) data, with more significant increases at the older ages. Recent Family Income and Expenditure Survey (FIES) data showed hospital expenditures to have constituted a major portion, about 36 percent in 2012, of out-of-pocket spending for health.

Figure 7. Age profile of per capita private health consumption, Philippines, selected years, constant 2010 prices (in PhP thousands)



Public other consumption expenditures are assumed to benefit all individuals in the population equally, hence the equal per capita means across all ages (Figure 8). The shape of the age profile of private other consumption is driven primarily by the ad hoc equivalence scale used to distribute household other consumption expenditures to its members (Figure 9). The allocation method assigned weights to household members on the basis of age as follows: 0.4 for children age 0 to 4; linearly increasing from 0.4 to 1.0 from age 5 to 19; and 1.0 for ages 20 and older.

Figure 8. Age profile of per capita public other consumption, Philippines, selected years, constant 2010 prices (in PhP thousands)

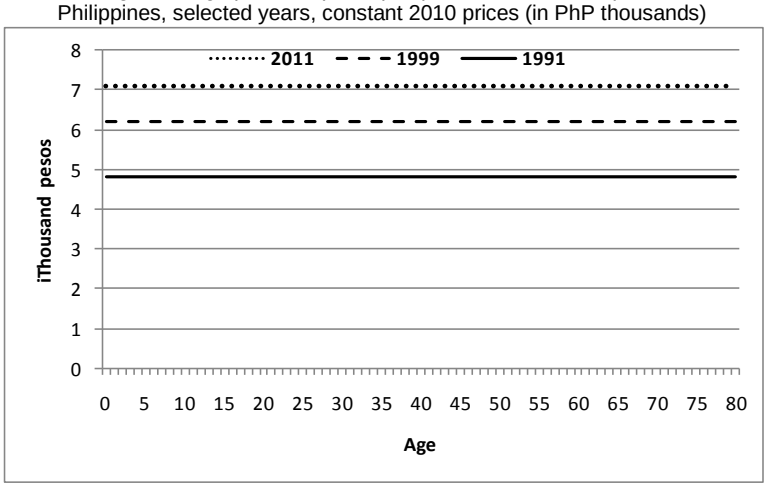
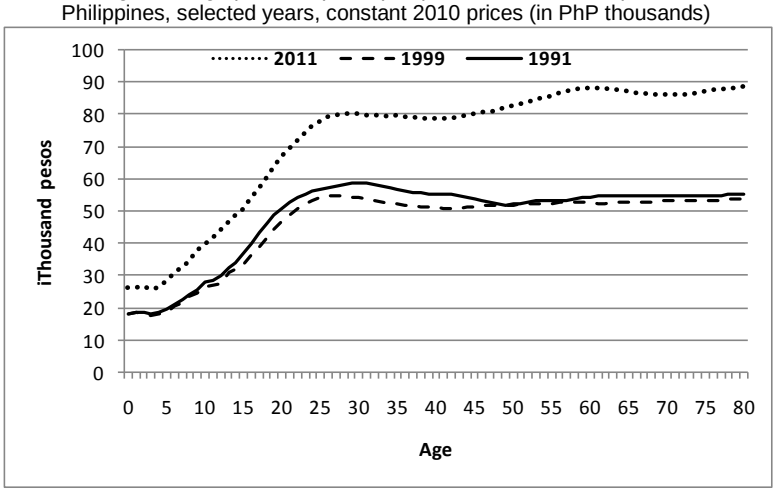


Figure 9. Age profile of per capita private other consumption,
Philippines, selected years, constant 2010 prices (in PhP thousands)



In terms of change across the three years, per capita public other expenditures had consistently increased between the indicated years (Figure 10). Per capita public other expenditures had increased by about Php1,400 from 1991 to 1999 or an average of Php175 increase per year, and by about Php1,200 from 1999 to 2011 or an average of Php100 increase per year. Between 1991 and 1999 per capita private other expenditures stayed nearly the same at all ages. Between 1999 and 2011, however, per capita private other spending had gone up at all ages and the profile has started to show an increasing pattern with age, instead of the flat pattern seen in the other two years (Figure 9). The findings for the latter period are consistent with the findings of the 1999-2007 study – stable shape of age profiles over time and increasing per capita spending at all ages. The increase in per capita private other spending at the older ages which has become more noticeable in 2011 seems to be a new development since this was not observed in the previous two studies for 1994-2002 and 1999-2007.

Figure 10. Age profile of per capita public total consumption,
Philippines, selected years, constant 2010 prices (in PhP thousands)

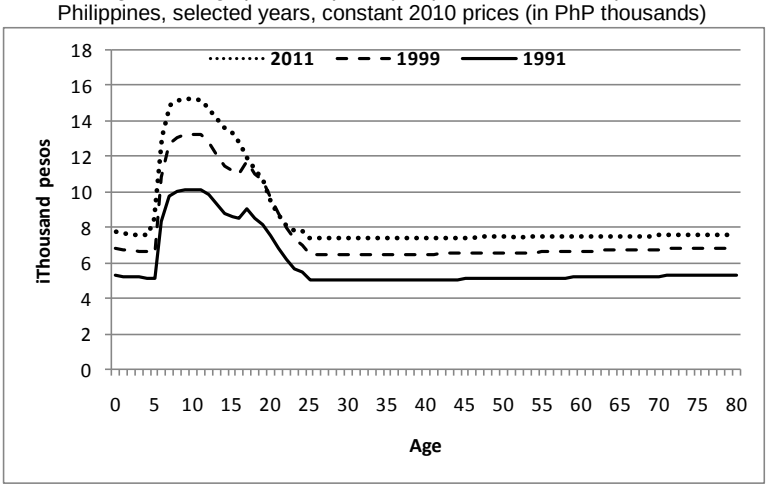
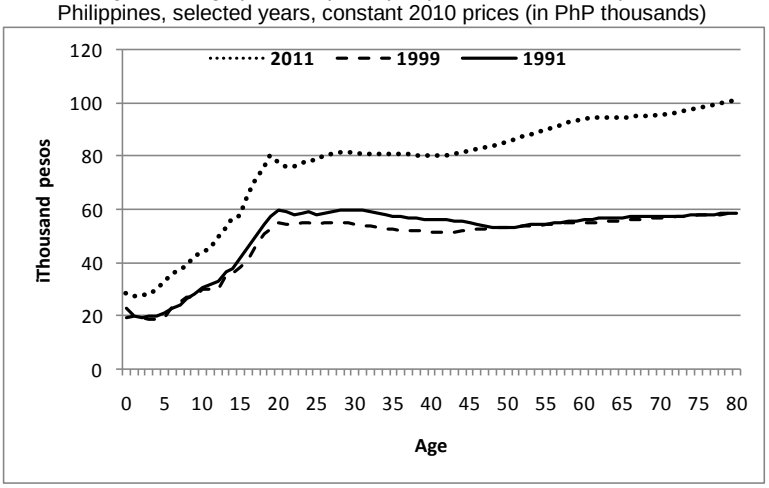
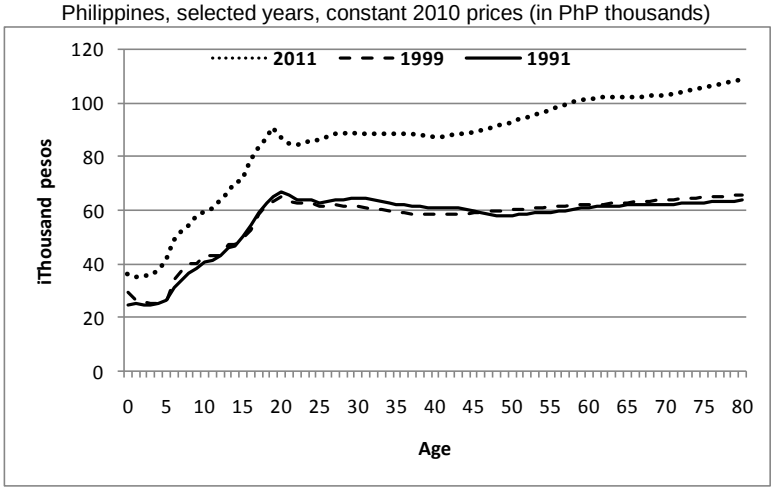


Figure 11. Age profile of per capita private total consumption, Philippines, selected years, constant 2010 prices (in PhP thousands)



Per capita total public consumption (total of education, health and other public consumption) is relatively flat except for the bump in the schooling ages 5-24 years (Figure 10). The overall shape had generally stayed the same across the years, but there was increase in per capita spending at all ages from 1991 to 1999 and from 1999 to 2011. Similarly the overall pattern by age of per capita total private consumption had also stayed relatively constant across the years (Figure 11) and this is pattern basically driven by the age profile of private other consumption. A distinctive change in the age profiles is observed between 1999 and 2011 and this is the gradual rise in per capita spending in the older ages instead of the relatively flat pattern seen in 1991 and 1999. The latter finding is expected since two of the components (private health and private other consumption) had shown this pattern of change between 1999 and 2011.

Figure 12. Age profile of per capita total (public and private) consumption, Philippines, selected years, constant 2010 prices (in PhP thousands)



And because of the relatively large share of private consumption (over 87 percent of total consumption in all the years), the overall shape of per capita age profile of total consumption is driven by the age profile of per capita private consumption (Figure 12). Thus, the

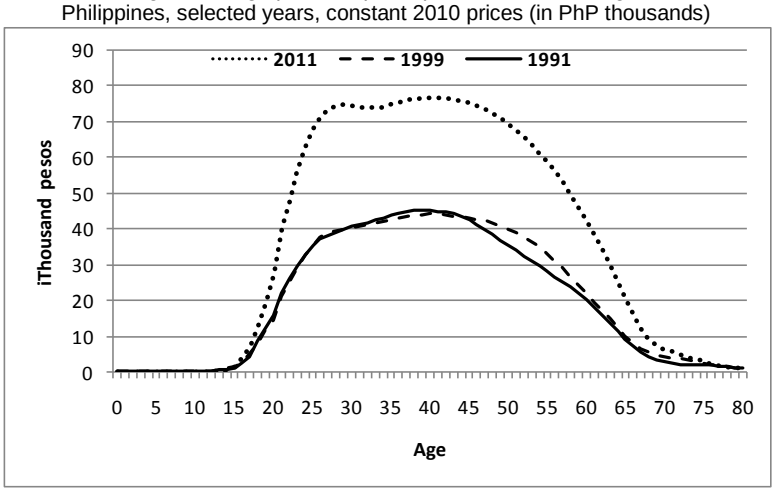
observations about the age profiles for private consumption presented previously generally apply to the age profiles for total consumption.

Per capita labor income

The age profile of paid employment earnings, domestic (Figure 13) and from abroad (Figure14), and self-employment income (Figure 15) generally follow the inverted U-shape. The per capita age profiles, however, differ in overall shapes. Earnings from domestic paid employment largely follows patterns expected in formal sector work, i.e. sharp increase in per capita mean income between 15 to 24 years coinciding with entrance into the labor market after completing schooling and rapid decrease after 65 years coinciding with retirement in formal sector work. Self-employment income, on the other hand, shows a more gradual increase from age 15 years up to its peak and a gradual decline thereafter. The pattern of per capita earnings from employment abroad followed more closely the pattern for self-employment income. The overall patterns by age observed for the different types of labor income are generally consistent with the findings of the 1994-2002 and the 1999-2007 studies.

The shapes and the peaks of the age profiles of the three types of labor income had undergone different patterns of change from 1991 to 1999 and from 1999 to 2011. Per capita domestic paid employment earnings stayed practically the same at all ages from 1991 to 1999, but had increased tremendously at most ages from 1999 to 2011 (Figure 13). The shapes of the domestic wage age profiles while generally the same from 1991-1999, with earnings peaking at ages 40-45 years, had changed significantly by 2011 showing a longer range of ages at which earnings are highest and the range starting at a younger age, i.e. ages 30-45 years.

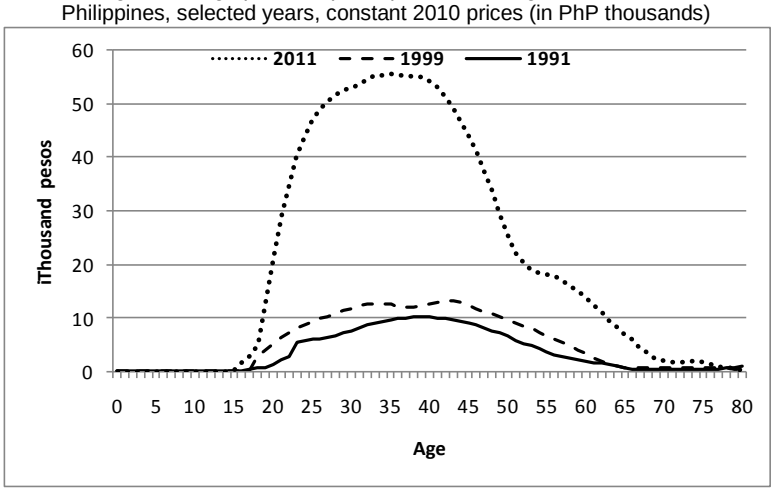
Figure 13. Age profile of per capita domestic earnings,
Philippines, selected years, constant 2010 prices (in PhP thousands)



Per capita earnings of OFWs or per capita earnings from abroad generally had similar patterns of change over time as domestic wage (Figure 14). Per capita OFW earnings did not change much from 1991 to 1999, but had increased tremendously from 1999 to 2011 particularly

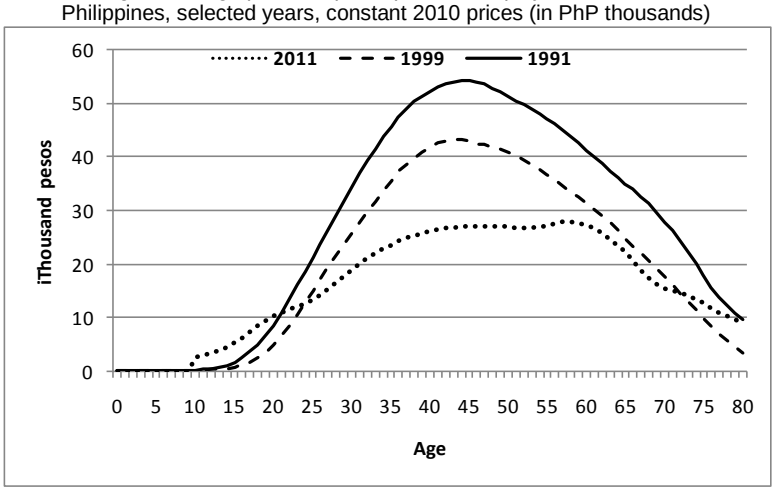
at ages 25 to 50 years. Per capita earnings of OFWs was found to be highest at ages 35-45 years in 1991 and 1999, and at relatively younger ages 30-40 years in 2011.

Figure 14. Age profile of per capita net earnings from abroad, Philippines, selected years, constant 2010 prices (in PhP thousands)



Per capita self-employment income, on the other hand, had the opposite pattern of change (Figure 15) to domestic wage. The overall shape showed peaks that were defined at a specific age in 1991 and 1999, around age 45 years old in both years, and then flattened out showing a range of ages at which per capita income was highest in 2011, i.e. ages 45 to 60 years. And unlike domestic wage, the per capita self-employment income had decreased at almost all ages in the period 1991 to 1999 and from 1999 to 2011.

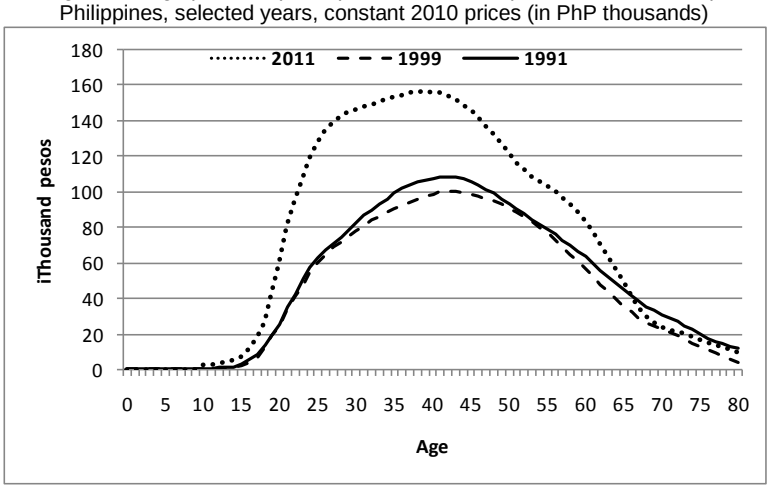
Figure 15. Age profile of per capita self-employment income, Philippines, selected years, constant 2010 prices (in PhP thousands)



The overall shape of total labor income per capita age profile is increasingly being driven by the shape of the per capita age profile of earnings from abroad (Figure 16). This is to be expected as the proportion of total labor income accounted for by earnings from abroad had

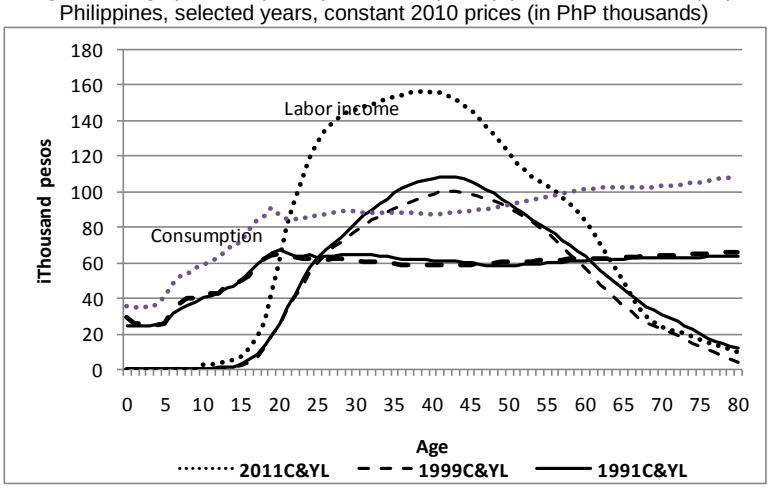
increased significantly as follows: 2 percent in 1991, 13 percent in 1999, 19 percent in 2007 and 31 percent in 2011. (See Racelis, Abrigo and Salas 2015 for more discussion on OFW remittances in the Philippine NTA.)

Figure 16. Age profile of per capita labor income (total from all sources), Philippines, selected years, constant 2010 prices (in PhP thousands)



Per capita current consumption and labor income

Figure 17. Age profile of per capita consumption (C) and labor income (YL), Philippines, selected years, constant 2010 prices (in PhP thousands)



Putting together consumption and labor income age profiles together define the age cut-offs of population groups with lifecycle deficit both at the young and older ages. The cut-offs are identified by the points at which the consumption and labor income age profiles crossover. Figure 17 shows how the age cut-offs have changed over time. The age cut-offs are very close for the years 1991 and 1999, around 25 and 61 years old for 1991 and 25 and 59 years old for 1999. But these age cut-offs changed significantly to 21 and 57 years old in 2011 – reducing the age range for those who are in deficit for the young but increasing for the elderly. The previous

studies had shown similar findings about the lifecycle deficit age cut-offs: for the young, 25 years old in 2002 and 24 years old in 2007; and for the elderly, 58 in 1994 and 59 in 2007.

3.3 Comparison of aggregate consumption and labor income age profiles: 1991, 1999 and 2011

Aggregate age profiles of consumption and labor income valued at constant 2010 prices are similarly examined across the three years. The aggregate age profiles are derived by multiplying the per capita values for consumption and labor income (Figure 12 and 16) with the population size at each age for the same year (Figure 21) and the resulting aggregate age profiles are shown in Figures 18 to 20.

Aggregate current consumption and labor income

As with per capita age profiles, the aggregate consumption and labor income age profiles together (Figure 18 and 19) as well as aggregate lifecycle deficit age profile (Figure 20) also define the age cut-offs of the young and elderly population groups incurring lifecycle deficit. In addition the areas under the aggregate age profiles indicate the sizes of total aggregate consumption, labor income and lifecycle deficit for the entire population (all aggregate values in Philippine pesos). Total aggregate consumption stood at 3,177 billion in 1991, 3,838 billion in 1999 and 7,492 billion in 2011, all in pesos and in constant 2010 prices. Total aggregate labor income, on the other hand, was 2,398 billion in 1991, 2,806 billion in 1999 and 6,784 billion pesos in 2011, all in pesos and in constant 2011 prices. Aggregate lifecycle deficit (aggregate labor income minus aggregate consumption) was 779 billion in 1991, 1,032 billion in 1999 and even lower than the 1991 level at 708 billion in 2011. Using these data, the ratios of aggregate labor income to aggregate consumption are seen to have improved from 44 percent in 1991 (and 40 percent in 1999) to 74 percent in 2011. Or conversely, aggregate "net" lifecycle deficit (young and elderly deficit net of working age surplus) as a percentage of total aggregate consumption had declined from about 24 percent in 1991 (and 27 percent in 1999) to about 9 percent in 2011.

The ages at which per capita labor income reach their peak had been observed in the previous Section to have declined particularly for domestic wage and earnings from abroad. The mean age of labor income in fact reflects this decline in the "peak ages" with the mean ages of labor income (computed based on the aggregate age profiles) at 37.3 years in 1991 (and 37.7 years in 1999) and at 35.0 years in 2011. The change in the "peak ages" of the per capita labor income age profiles seems to have prevailed over the slightly rising mean age of the working age population which was 31.1 years in 1991, 31.7 years in 1999 and 32.7 years in 2011.

On the other hand, similar computations of the mean ages of consumption showed change in the opposite direction; the mean ages (computed based on the aggregate consumption age profiles) stood at 26.8 years in 1991, 27.5 years in 1999 and at 28.9 years in 2011. These latter results may be explained by two factors: change in per capita consumption pattern observed in the previous section (i.e. rising average spending at the older ages); and shift in the age structure

of the population (i.e. declining proportion of children who have lower per capita consumption while proportion of older consumers who have higher per capita consumption was increasing).

Figure 18. Age profile of aggregate consumption and labor income, Philippines, 1991 and 2011, constant 2010 prices (in PhP billions)

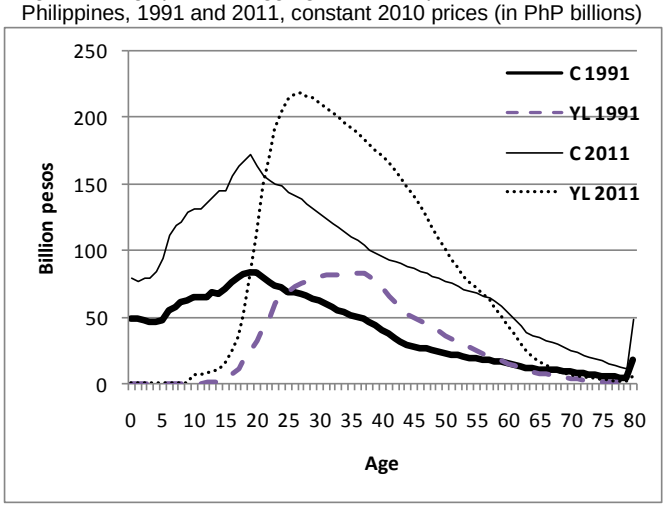
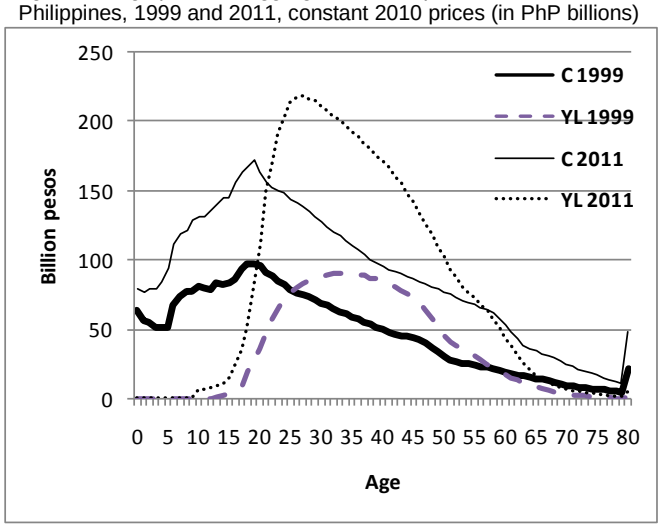


Figure 19. Age profile of aggregate consumption and labor income, Philippines, 1999 and 2011, constant 2010 prices (in PhP billions)

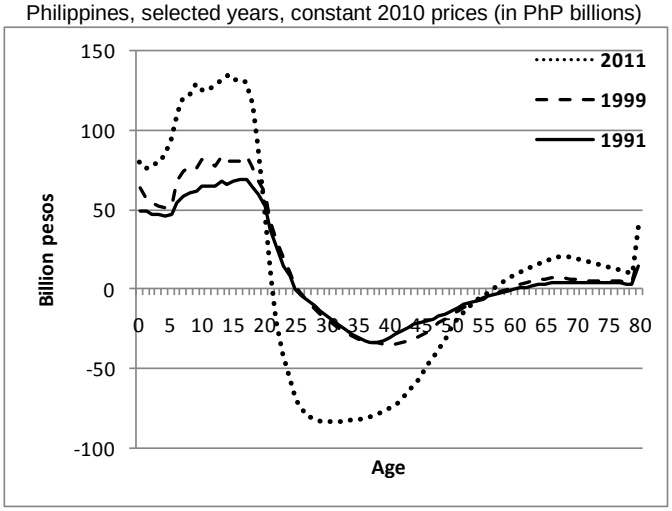


Aggregate lifecycle deficit

The sizes of the aggregate lifecycle deficit of the dependent population groups (areas under the age profile that are above the x-axis at young and older ages) relative to the sizes of aggregate surplus (negative lifecycle deficit or areas under the age profile that are below the x-axis) in the three years can be observed from Figure 20. The ratios of the aggregate lifecycle deficit of the working ages to the total lifecycle deficit of the dependent populations groups indicate the extent to which deficits of the latter population are being covered by the "surplus" of the former. Using data in Table 4, the ratios are computed to have been 0.44 in 1991 (and 0.40 in

1999) and 0.74 in 2011. The lifecycle deficits of the dependent population are increasingly getting covered by the "surplus" of the working population. The findings are consistent with those from the 1994-2002 and 1999-2007 studies where the ratios were computed to be 0.41 in 1994 and 0.60 in 2007.

Figure 20. Age profile of aggregate lifecycle deficit, Philippines, selected years, constant 2010 prices (in PhP billions)



Summary of aggregate flows for young-deficit, surplus and elderly-deficit age groups

Table 4 shows a breakdown of the total aggregate values for the young, working and elderly age groups. The young accounted for a decreasing share of total aggregate consumption at 54 percent in 1991, 52 percent in 1999 and 39 percent in 2011. On the contrary, the elderly share of aggregate consumption had increased at 5 percent in 1991, 7 percent in 1999 and 11 percent in 2011. The consumption shares of the young and the elderly dependent groups are reflective of the age distributions with the proportion of young deficit group at 62 percent in 1991 and 49 percent in 2011, and the elderly deficit group at 4 percent in 1991 and 8 percent in 2011. The elderly population however accounted for shares of total aggregate private health consumption that were three or more times its share of total population: 12 percent of private health spending in 1991 and 35 percent in 2011, with corresponding population shares as mentioned above at 4 percent in 1991 and 8 percent in 2011.

The working-age and elderly population both accounted for increasing shares of total aggregate labor income: for working ages, 80 percent in 1991 (and 1999) and 86 percent in 2011; and for the elderly group, 4 percent in 1991, 5 percent in 1999 and 6 percent in 2011. As the residual, it follows that the shares of aggregate labor income accounted for by the young population had decreased. And of the total aggregate lifecycle deficit of the young and elderly dependent population, the young accounted for a decreasing proportion at 95 percent in 1991, 92 percent in 1999 and 86 percent in 2011. Again, these results are reflective of the change in age distributions with the proportion of the young population decreasing over the years.

Table 4. Aggregate consumption, labor income and lifecycle deficit by group, Philippines, selected years, constant 2010 prices (in PhP billion)

	1991			1999			2011		
NTA Component	Young Deficit	Surplus Ages	Elderly Deficit	Young Deficit	Surplus Ages	Elderly Deficit	Young Deficit	Surplus Ages	Elderly Deficit
Group Age Cut-Off									
Lower Limit (years)	*0*	*26*	*61*	*0*	*26*	*59*	*0*	*22*	*57*
Upper Limit (years)	*25*	*60*	*over 61*	*25*	*57*	*over 59*	*21*	*56*	*over 57*
Lifecycle Deficit	1,318	-615	76	1,587	-688	129	2,373	-2,859	374
Consumption	1,784	1,380	173	2,814	1,568	263	2,898	3,785	889
Public	300	107	15	452	170	28	565	318	59
Education	98	0	0	151	0	-	203	3	-
Health	12	6	1	17	9	2	17	13	3
Others	191	101	13	284	161	26	345	302	56
Private	1,484	1,193	159	1,563	1,390	235	2,333	3,467	750
Education	95	0	0	128	-	-	270	13	-
Health	29	21	7	38	25	15	40	72	61
Others	1,280	1,173	152	1,397	1,364	220	2,023	3,382	689
Labor Income	386	1,915	97	427	2,243	135	525	5,824	435
Earnings - Domestic	226	837	18	261	1,058	42	224	2,955	202
Earnings - Abroad	29	166	2	72	295	5	145	1,918	66
Self-Employment	132	912	78	95	891	87	156	911	167

4. Part Two: Population change, per capita age profile change and their effects on economic gain

Population change refers to the change in the population size and age distribution over time. The per capita labor income age profile captures age variation in labor force participation, hours worked, unemployment, and productivity or wages. Similarly, the per capita consumption age profile captures age-specific variation in consumption. Per capita labor income and per capita consumption age profiles changes, thus, represent behavioural change of workers and consumers; but additionally change in these age profiles essentially capture and represent change in the economic environment in general.

Aggregate flows in the NTA are estimated using population size by age and per capita age profiles; while economic support ratios as defined in the NTA are estimated using population size by age and equivalence scales by age (equivalence scales as derived from the per capita age profiles). Economic gain is indicated by increase in real aggregate consumption and real aggregate labor income, and increase in support ratio over time. Effects of population change and per capita age profiles change on economic gain can thus readily be examined using aggregate flows and support ratios because of their computational form.

4.1 Population change: describing size and age distribution in 1991, 1999 and 2011

Philippine population grew from 63 million in 1991, to 76 million in 1999 and to 95 million in 2011. The growth had in fact slowed down from an average annual growth of 2.34 in 1991-1999 to 1.86 in 1999-2011.

Figure 21. Population size by age, Philippines, selected years (in millions)

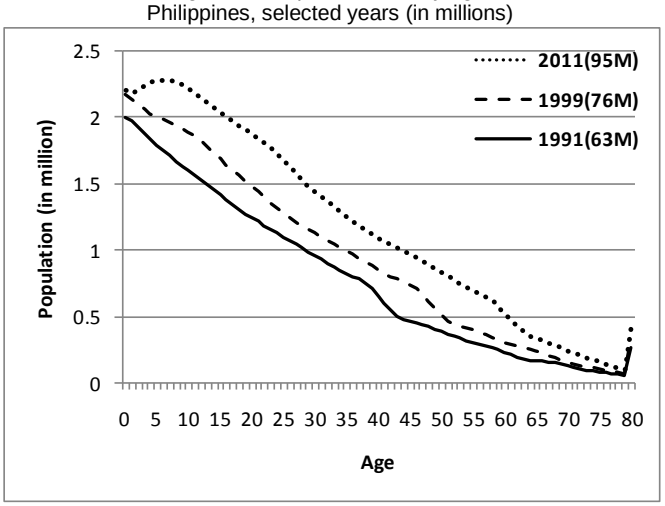
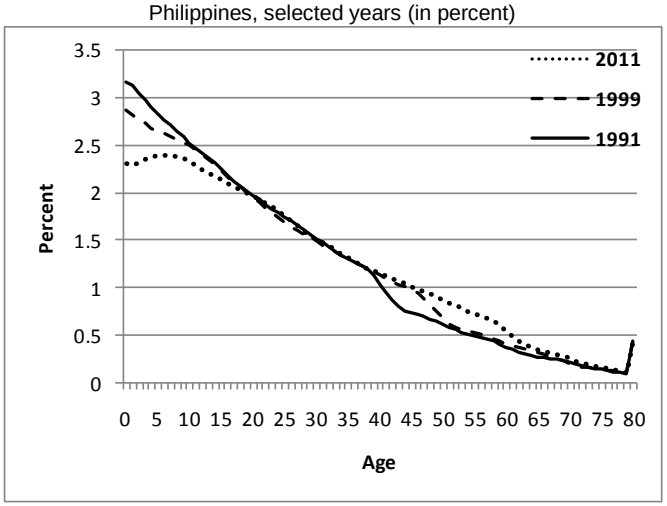


Figure 22. Population distribution by age, Philippines, selected years (in percent)



In terms of age structure the Philippine population was still predominantly young during the study period (Figure 21 and 22). But discernable changes in the age distribution had taken place. The proportion under 15 years old declined at 41 percent in 1991, 39 percent in 1999 and 35 percent in 2011. Based on Figures 21 and 22, the decline is most noticeable for the very young ages. The proportion who are age 15-64 years old or the working ages increased at 56 percent in 1991, 58 percent in 1999 and 61 in 2011. The proportion of older persons hardly changed at around 3 percent in 1991, 1999 and at 4 percent in 2011. Overall, as a result of these

age distribution changes the median age of the Philippine population increased from 18.5 years in 1991, to 19.5 years in 1999 and to 21.5 years in 2011. Still, Philippine population remains to be predominantly young since half or 50 percent of the population is aged 21.5 years or less in 2011.

Based on the increasing share of the population in the working age from 1991 to 2011, the Philippines is still within the period within which it can potentially gain economically from population change. Achieving the potential gain however depends on whether economic policies in the country result to favorable economic environment.

4.2 Sorting the effects of change in population and change in per capita consumption and labor income age profiles using NTA estimates: aggregate consumption and aggregate labor income

Aggregate flows components of the NTA are constructs that can readily be used to examine effects of changing population and per capita age profiles since the basic computation for aggregate values entails using the two parts. That is, aggregate values at each age are derived by multiplying population size and per capita value for the specified age. Then the aggregate values by age are summed across all ages to obtain the national aggregate value.

The effects of changes in population and the per capita age profiles of consumption and labor income are examined using actual and simulated values for aggregate consumption and aggregate labor income shown in Table 5. The entries in Table 5 were computed using population data for the years listed along the columns and the per capita age profiles from the NTAs listed along the rows. The aggregate values computed using population data and NTA estimates for the same year are "actual" values and the rest of the values are "simulated" values. The effects of population change may be examined using aggregate values along a row – constant NTA age profiles and changing population size and age structure. The effects of change in per capita age profiles may be examined using aggregate values from a column – constant population size and age structure and changing NTA age profiles. The accounting of the two sets of effects is done only period by period – although there are more ways of using the information shown in Table 5. Aggregate values discussed below are in Philippine pesos.

In the period 1991-1999 the change in actual aggregate consumption and labor income were 661 billion and 407 billion, respectively, and the corresponding average annual percent change were 2 percent and 3 percent, respectively. Assuming, on one hand, that during the period 1991-1999 only population had changed while the per capita age profiles remained at those in 1991, then aggregate consumption and aggregate labor income would have increased by 676 billion (3,853 minus 3,177) and by 633 billion (3,031 minus 2,398), respectively. On the other hand, assuming that only per capita age profiles had changed while the population profile remained at those in 1991, then aggregate consumption and aggregate labor income would have changed by -10 billion (3,167 minus 3,177) and by -178 billion (2,220 minus 2,398), respectively.

Table 5. Actual and simulated aggregate consumption and labor income, Philippines, selected years, constant 2010 prices (Php billion)

	Year of population data by age		
Year of NTA age profiles	1991	1999	2011
Actual (same year of NTA and population data)			
Consumption	**3,177**	**3,838**	**7,492**
Labor Income	**2,398**	**2,806**	**6,784**
1991 NTA			
Consumption	**3,177**	3,853	4,933
Labor Income	**2,398**	3,031	4,076
1999 NTA			
Consumption	3,167	**3,838**	4,910
Labor Income	2,220	**2,806**	3,775
2011 NTA			
Consumption	4,606	5,594	**7,492**
Labor Income	3,919	4,897	**6,784**

Note: Figures not in bold are simulated aggregate values.

Putting these computations together, the actual increase in 1991-1999 in aggregate consumption of 661 billion is the result of contributions by population change 676 billion (102.2 percent), by per capita age profile change -10 billion (-1.5 percent) and a residual joint effect of -5 billion (-0.7 percent). The actual increase in aggregate labor income of 407 billion is the result contributions by population change, 633 billion (155.4 percent), by per capita age profile change -178 billion (-43.7 percent) and a residual joint effect of -48 billion (-11.7 percent). Recall that between 1991 and 1999 the per capita age profiles had hardly changed and the above results reflect this fact.

In the period 1999-2011 the change in actual aggregate consumption and labor income were 3,654 billion and 3,979 billion, respectively, and the corresponding average annual percent change were much higher compared to the previous period at 8 percent and 12 percent, respectively. Again, assuming, on one hand, that during the period 1999-2011 only population had changed while the per capita age profiles remained at those in 1999, then aggregate consumption and aggregate labor income would have increased by 1,072 billion (4,910 minus 3,838) and by 970 billion (3,775 minus 2,806), respectively. On the other hand, assuming that only per capita age profiles had changed while the population profile remained at those in 1999, then aggregate consumption and aggregate labor income would have increased by 1,757 billion (5,594 minus 3,8s8) and by 2,092 billion (4,898 minus 2,806), respectively.

Thus, the actual increase in the period 1999-2011 in aggregate consumption of 3,654 billion is the result of contributions by population change 1,073 billion (29 percent), by per capita age profiles change 1,757 billion (48 percent) and a residual joint effect of 82 billion (23 percent). Similarly, the actual increase in aggregate labor income of 3,979 billion is the result of contributions by population change 970 billion (24 percent), by per capita age profile change 2,092 billion (53 percent) and a residual joint effect of 918 billion (23 percent).

The pace of demographic change had been constant and favorable in the periods 1991-1999 and 1999-2011 as described in Section 4.1, with the proportions young steadily declining

and the proportions of working age steadily increasing. And yet the changes in aggregate consumption and labor income experienced in the periods 1991-1999 compared to 1999-2011were very different: very low annual growth rates in 1991-1999 and very high annual growth rates in 1999-2011. The effect of per capita age profiles change on aggregate consumption and labor income had switched drastically from being negative in 1991-1999 to being high and positive in 1999-2011. These findings highlight the importance of a favorable economic environment to obtain the gains from demographic change.

4.3 Sorting the effects of change in population and change in per capita consumption and labor income age profiles using NTA estimates: support ratios and the economic gain from the first demographic dividend

Economic gain that can potentially arise from population age structure change, specifically from the rise in the proportion of the working ages or referred to as the first demographic dividend, can be quantified using economic support ratios. The support ratio has become a standard tool used to consider the economic effects of changing population age structure. The first demographic dividend operates through growth in the support ratio (United Nations 2013). The first dividend phase is marked by the interval during which the support ratio is increasing and during which the average annual change in support ratio or the year to year change in the support ratio is positive. The ending of the first dividend phase is indicated when the support ratio levels off, begins to fall and the average annual change turns negative.

Economic support ratio as defined in the NTA and the way it is computed (United Nations 2013, p. 109) captures not only the effects of demographic change but also the effects of economic lifecycle change. The computation of a specific support ratio involves first deriving the equivalence scales for consumption and labor income at each age (with the age group 35-49 as reference) using a specific set of per capita age profiles as estimated in the NTA. Next the product of the equivalence scales and the population size at each age for a given year are obtained yielding the effective number of consumers and effective number of producers for the different ages. Then the sums across all ages are taken to generate the values for total effective number of consumers and total effective number of producers. The support ratio is computed as the ratio of total effective producers to total effective consumers.

The actual support ratios for 1991, 1999 and 2011 are computed and examined. Recall that the changes in population and the per capita age profiles over the three study years have already been characterized in Sections 4.1 and 3.2, respectively. Actual support ratios (Table 6) are first examined and discussed in the context of the population and per capita age profiles changes observed previously. Then simulated support ratios are computed using the alternative sets of per capita age profiles (i.e., from the 1991, 1999 and 2011 NTA) and the 1991, 1999 and 2011 population by age data (Table 7) to sort out effects of population change and per capita age profile change on support ratios. And finally, support ratios are simulated using alternative sets of per capita age profiles and the long-term population projections for the Philippines (Figure 22). The latter simulations of support ratios are used to examine the effects of change in per capita age profiles from a long-term perspective including effects on the range of support ratio values and the duration of the first demographic dividend phase.

Actual support ratios for the years 1991, 1999 and 2011

The "actual" support ratio for a given year is computed based on population data and per capita consumption and labor income age profiles for the same year. Thus, any change observed in a support ratio for given year compared to the support ratio for another year is a result of both population change and change in economic lifecycle age profiles during the indicated years. Table 6 shows the actual support ratios computed for three years along with some summary measures that indicate changes in population age distribution and change in consumption and labor income per capita age profiles.

In the period 1991-1999 the support increased from 0.433 to 0.455 or by 2.77 percent over the 8-year period. That is, in 1991 there were 43 effective producers for every 100 effective consumers in 1991 and in 1999, eight years later, there was very little change with 46 effective producers for every 100 effective consumers. During this period the median age of population had increased as a result of the increasing proportion that was in the working ages (15-64 years). The increasing proportion in the working ages means more effective producers. The mean equivalence scales for consumption and labor income had both increased but slightly more for consumption which is not favorable to increasing the support ratio – this is consistent with the finding from Section 6 where the effects of the per capita age profiles on aggregate consumption and aggregate labor income were found to be negative. The low change in the support ratio from 1991 to 1999 is due to the dampening effect of the per capita age profile change on the effect of population change.

Table 6. Actual support ratios, Philippines, selected years

Indicator	1991	1999	2011
Support ratio	0.433	0.445	0.545
Population age structure indicators			
Median age (years)	18.5	19.4	21.5
Percent with age 15-64 years	56.1	58.0	61.4
Percent with age <35 years	77.5	75.0	71.4
Percent with age >49 years	9.8	10.4	13.4
Economic lifecycle indicators			
Consumption equivalence scales			
Mean equivalence scales	0.861	0.880	0.854
Mean equivalence scale for age <35 years old	0.803	0.820	0.770
Mean equivalence scale for age >49 years old	1.005	1.055	1.124
Labor income equivalence scales			
Mean equivalence scales	0.416	0.418	0.465
Mean equivalence scale for age <35 years old	0.255	0.260	0.340
Mean equivalence scale for age >49 years old	0.579	0.571	0.507

In the period 1999-2011 the support ratio increased from 0.455 to 0.545 or by 22.47 percent over the 12-year period. That is, the number of effective producers for every 100 effective consumers had increased significantly from 46 in 1999 to 54 in 2011. During this period the median age of population had also increased as a result of the increasing proportion that was in the working ages (15-64 years). The mean equivalence scale for consumption decreased while the mean equivalence scale for labor income increased – both changes favorable to increasing the support ratio. This finding is consistent with the finding from Section 4.2 where

the effects of the per capita age profiles change on aggregate consumption and aggregate labor income were found to be positive. The relatively higher change in the support ratio in 1999-2011 relative to the change found in 1991-1999 is due to the combined favorable effects of the per capita age profile change and population change.

The increases or positive growth rates seen in the support ratios indicate economic gains: average growth of 0.35 percent per year in the period 1991-1999; and average growth of 1.87 percent per year in 1999-2011. The positive growth in the support ratios indicate that in the period 1991-2011 the country was within the first demographic dividend phase.

Examining effects of alternative per capita age profiles on support ratios: point-in-time simulations

For sorting the effects of population change and change in the economic lifecycle on the support ratio, two sets of support ratio computations or simulations are done. One set of support ratios are computed or simulated using varying population data for the different years (i.e. actual population data) and keeping the per capita consumption and labor income age profiles constant to one specific year. The support ratios computed this way are used to examine the effect of population change. In the other set, support ratios are computed or "simulated" keeping population data fixed and applying varying per capita consumption and labor income age profiles. The support ratios computed this way are used to examine the effect of per capita age profiles change.

Table 7 shows actual support ratios and simulations computed as described above. The first row shows the actual support ratios, e.g. the support ratio of 0.445 was computed using 1999 population data and the 1999 NTA per capita age profiles for consumption and labor income. For the remaining entries of the table, the column indicates the year of the population data and the row indicates the year of the NTA data used in the computation of the support ratio. For example, the support ratio of 0.425 was computed using 1991 population data and the 1999 NTA per capita age profiles. Support ratios across a specific row represent alternative support ratios resulting from changing population age structure and assuming constant per capita age profiles. Similarly, support ratios from a specific column represent alternative support ratios resulting from the application of different per capita age profiles on the same population data.

Table 7. Actual and simulated support ratios, Philippines, selected years

	Year of population data by age		
Year of NTA age profiles	1991	1999	2011
Actual (same year of NTA and population data)	**0.433**	**0.445**	**0.545**
1991 NTA	**0.433**	0.453	0.482
1999 NTA	0.425	**0.445**	0.475
2011 NTA	0.503	0.521	**0.545**

In the period 1991-1999 the actual support ratios had changed from 0.433 to 0.445, a total increase of about 2.77 percent. Assuming on one hand that during the period only population had

changed while the per capita age profiles remained at those in 1991, then the support ratio would have changed from 0.433 to 0.453, about 4.62 percent increase. On the other hand, assuming that only per capita age profiles had changed while the population remained to be that in 1991, then the support ratio would have changed from 0.433 to 0.425, a decrease of about -1.85 percent. The actual change in support ratio from 0.433 in 1991 to 0.455 in 1999 is thus accounted for by change in population 163.6 percent, change in per capita age profiles -64.3 percent and residual joint effect of 0.7 percent.

In the period 1999-2011 the actual support ratios had changed from 0.445 to 0.545, about 22.47 percent increase. Assuming on one hand that during the period only population had changed while the per capita age profiles remained at those in 1999, then the support ratio would have changed from 0.445 to 0.475, about 6.61 percent increase. On the other hand, assuming that only per capita age profiles had changed while the population remained to be that in 1999, then the support ratio would have changed from 0.445 to 0.521, about 16.97 percent increase. The actual change in support ratio from 0.445 in 1999 to 0.545 in 2011 is thus accounted for by change in population 29.5 percent, change in per capita age profiles 75.5 percent and residual joint effect of -5.0 percent.

Note that the contributions of each source of change of support ratios in the periods 1991-1999 and 1999-2011are similar to those found when aggregate consumption and aggregate labor income were similarly examined in Section 4.2. And similar to the observations made in Section 4.2, while population change had stayed constantly favorable, yet the changes in support ratios experienced in the periods 1991-1999 compared to 1999-2011were very different: very low annual growth rates in 1991-1999 at 0.35 percent and very high annual growth rates in 1999-2011 at 1.87 percent. The effect of per capita age profiles change on support ratios had also switched from being negative in 1991-1999 to being positive in 1999-2011. Again, these findings emphasize the importance of a favorable economic environment to obtain economic gains from population change.

Examining the effects of alternative per capita age profiles on support ratios in the long-term and implications on economic gain from the first demographic dividend: long-term simulations

The implications of consumption and labor income age profiles change on support ratios and economic gain from the first demographic dividend are examined using long-term population projections data by age (i.e., from 1950 to 2050) together with the per capita age profiles of consumption and labor income from the 1991, 1999 and 2011 NTA. Each set of per capita age profiles is applied to the same population projections data to produce three sets of support ratios series (each series is shown plotted separately in Figure 25) and each series is referred to according to the NTA age profiles used in the simulation, e.g. 1991 NTA or 1999 NTA. In each series of support ratios only population was assumed to be changing while the per capita age profiles were kept constant. Thus, any one series can be used to examine the effect of changing population age structure on support ratios in the long-term. The three support ratios series can be compared to determine the implications of different per capita age profiles on economic gain from the first demographic dividend.

First, an examination of the effect of population change on support ratios in the long-term can be done using any one of the three series in Figure 23 – all three sets of plots show similar patterns of change over the 100-year period: declining, rising and then declining again. Using the support ratios series based on the 2011 NTA (labeled SR11NTA in Figure 23), the support ratios are observed to reach the lowest level at 0.463 in 1970 and the highest level at 0.582 in 2039. That is, there were 46 effective producers for every 100 effective consumers in 1970 and it is projected that there will be 58 effective producers for every 100 effective consumers in 2039. To put these support ratios in the context of population change, the proportion young of age 0-14 years old started to decline in 1964-1965; and it was at this same time that the proportion of working age 15-64 years old started to increase. The proportion in the working ages is projected to begin to decline in 2044-2045. The support ratios start to increase within the period when the proportion that is young begins to fall and as the proportion in the working ages begins to rise. The support ratio levels off and starts to decline around the time when the proportion in the working ages begins to fall. The total increase in support ratio (lowest to highest) in the 69-year span is 25.7 percent or an annual average increase in the support ratio of 0.37 percent per year.

Second, the implications of change in the per capita age profiles on economic gain can be determined by comparing the three support ratios series. The series are compared on the following aspects: the range of values of support ratios (lowest and highest); the timing or turning points in the support ratios; the average annual change in support ratio during the dividend phase; and the duration of the dividend phase.

As observed previously, the support ratios in all the series showed decreasing, then increasing, and then decreasing patterns over time. But it can also be noted that the series of support ratios based on the 1991 and 1999 per capita age profiles are close to each other and, as expected, these are located below the series based on the 2011 per capita age profiles (Figure 23). Recall that in the simulations presented in Table 7, the simulated support ratios based on the 1991 and 1999 per capita age profiles were always lower than the support ratio simulations based on the 2011 age profiles – regardless of which year's population data is used in the computation – and the plots in Figure 23 are consistent with these previous findings. Each series however show points at which the support ratio was lowest and highest. The range of values of support ratios for each series was as follows (lowest to highest value): 1991 NTA, 0.400 to 0.555; 1999 NTA, 0.391 to 0.540; and 2011 NTA, 0.463 to 0.582. Highest maximum value for support ratio is expectedly found in the series based on the 2011 NTA.

The timing or the years when the lowest and highest support ratios are experienced, i.e. the turning points, also varied. The lowest and highest support ratios are reached in the years indicated for each of the series: 1991 NTA, 1971 and 2049; 1999 NTA, 1971 and 2047; and 2011 NTA, 1970 and 2039. The lowest and highest support ratios are reached earliest for the series based on the 2011 NTA.

The average annual change of support ratios going from the lowest value to the highest value is an indicator of the economic gain from year to year. In the case of the three series, the average annual change of support ratios is as follows: 1991 NTA, 0.5 percent; 1999 NTA, 0.5 percent; and 2011NTA, 0.37 percent.

The start of the first dividend phase is indicated by the turning of the year-to-year support ratio growth rate from negative to positive and the ending of the phase is indicated by the turning back of the support ratio growth rate from positive to negative. The average annual growth rates or the year-to-year growth rates in support ratios were computed for each series presented in Figure 23. The growth rates are plotted in Figure 24 and these plots are used to identify the first dividend phase. The starting and ending years of the dividend phase are identified by the points where the growth rate plots crossover the x-axis (Figure 24). The starting and ending years for the dividend phase are as follows: 1991 NTA, 1971 and 2049; 1999 NTA, 1971 and 2047; and 2011 NTA, 1970 and 2039. Note that these years also correspond to the years when the support ratios had reached their lowest and highest levels. The durations of the first dividend phase are as follows: 1991 NTA, 78 years; 1999 NTA, 76 years; and 2011 NTA, 69 years.

Figure 23. Support ratios based on the 1991, 1999 and 2011 NTA per capita age profiles, Philippines 1950-2050

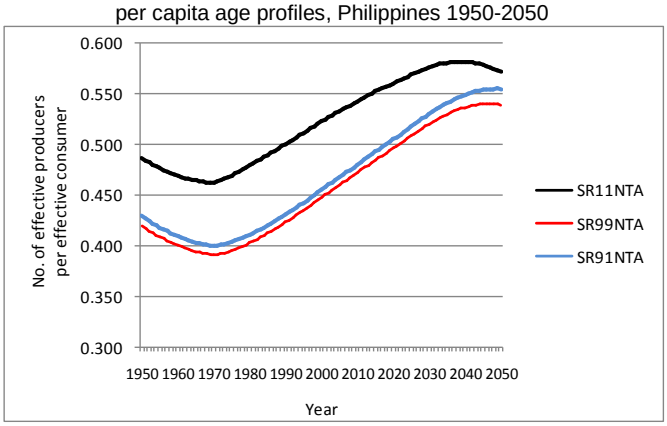
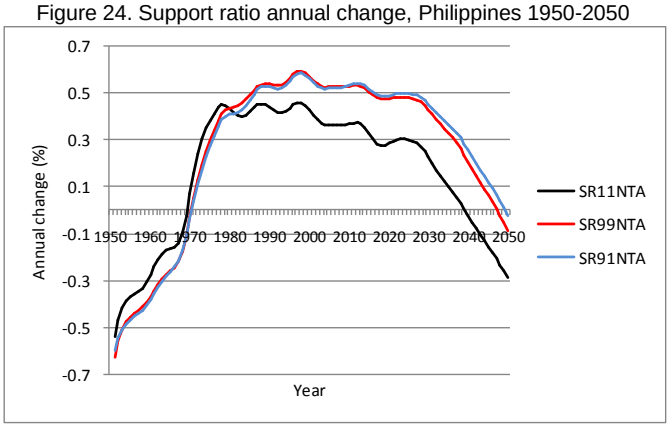


Figure 24. Support ratio annual change, Philippines 1950-2050



The change in the per capita age profiles from 1991 to 2011 while bringing in 2011 higher levels of support ratios (highest maximum value at 0.582), would also bring lower average annual growth in the support ratio (0.35 percent) and a shorter duration of the first dividend phase (69 years). These long-term simulations of support ratios are hypothetical but they are useful for indicating potential economic gains given different scenarios for per capita age profiles. While a high support ratio is desirable, a high average annual increase in the support

ratio is also desirable. The simulations indicate that the per capita age profiles that would bring higher support ratios would bring lower annual growth rates. But as experience showed, a situation of low support ratio and low annual growth in the support ratio (such as that observed for the period 1991-1999) could be followed by a situation of both high support ratio and high average annual growth in the support ratio (such as that observed in the period 1999-2011). As pointed out earlier, what is needed for the latter to happen is for population change to stay on course and for population change to be accompanied by favorable economic environment.

5. Concluding remarks

The newest set of NTA estimates for the Philippines is for the year 2011. This set of estimates was compared to the corresponding components of the 1991 and 1999 estimates. The first part of the paper describes the 2011 estimates and presents findings from the comparisons highlighting in particular how the economic lifecycle had changed through the years. The second part of the paper uses findings about change in economic lifecycle and findings about population change to explain change in aggregate consumption, aggregate labor income and support ratios during the same period.

Key findings from the first part of the paper particularly about the per capita consumption and labor income age profiles and change over the years 1991, 1999 and 2011 include the following:

- The average annual change in per capita consumption and per capita labor income reflect the general economic conditions during the periods 1991-1999 and 1999-2011. Real per capita consumption and per capita labor income levels had stayed almost unchanged from 1991 to 1999, with near zero average annual growth rates, but had showed spectacular annual growth in the next period, 1999-2011, exceeding 4 percent.
- Per capita income from self-employment had consistently declined showing negative annual growth in both the two periods. Per capita net earnings from abroad or OFW remittances is the only component that had very high annual growth rates in both periods making up for the steady decline in per capita self-employment income.
- Per capita domestic paid employment earnings had similar patterns of change in its age profile as per capita earnings from abroad: earnings stayed practically the same at all ages from 1991 to 1999, but had increased significantly at most ages from 1999 to 2011.
- The overall shape of total labor income per capita age profile is increasingly being driven by the shape of the per capita age profile of earnings from abroad.
- A distinctive change in the per capita consumption age profiles observed between 1999 and 2011 is the gradual rise in per capita spending in the older ages instead of the relatively flat pattern seen in 1991 and 1999.
- The lifecycle deficit age cut-offs are very close for the years 1991 and 1999, around 25 and 61 years old for 1991 and 25 and 59 years old for 1999. But these age cut-offs changed significantly to 21 and 57 years old in 2011.

Key findings about population change from the second part of the paper include the following: steady decline in the proportion young age 0-14 years and steady increase in the proportion in the working age 15-64 years over the years 1991, 1999 and 2011; and negligible change in the proportion of older persons.

Key findings about the effects of population change and per capita age profiles change on aggregate consumption and labor income include the following:

- The pace of demographic change had been constant and favorable in the periods 1991-1999 and 1999-2011 but the changes in aggregate consumption and aggregate labor income experienced in the periods 1991-1999 compared to 1999-2011were very different: very low annual growth rates in 1991-1999 and very high annual growth rates in 1999-2011.
- The effect of per capita age profiles change on aggregate consumption and labor income had switched drastically from being negative in 1991-1999 (hence the low annual growth rates in that period) to being high and positive in 1999-2011.
- The findings highlight the importance of a favorable economic environment to obtain the gains from demographic change.

Key findings about support ratios and the effects of population change and per capita age profiles change on support ratios include the following:

- In 1991, 1999 and 2011 the support ratios were 0.43, 0.46 and0.54, respectively. That is, in 1991 there were 43 effective producers for every 100 effective consumers and in 1999, eight years later, there was very little change with 46 effective producers for every 100 effective consumers; but in 2011 there was significant increase to 54 effective producers for every 100 effective consumers.
- The positive growth rates seen in the support ratios indicate economic gains: average growth of 0.35 percent per year in the period 1991-1999; and average growth of 1.87 percent per year in 1999-2011.
- The positive growth in the support ratios also indicate that in the period 1991-2011 the country was within the first demographic dividend phase.
- Population change had stayed constantly favorable but the changes in support ratios in 1991-1999 compared to 1999-2011were very different: very low annual growth rates in 1991-1999 and very high annual growth rates in 1999-2011. The effect of per capita age profiles change on support ratios had switched from being negative in 1991-1999, hence the low annual growth rate in the support ratio, to being positive in 1999-2011
- Based on long-term simulation of support ratios, the change in the per capita age profiles in 1991- 2011 while bringing for the 2011-based simulations higher levels of support ratios (highest maximum value at 0.582), would also bring lower average annual growth in the support ratio (0.35 percent) and a shorter duration of the first dividend phase (69

years). These long-term simulations of support ratios are hypothetical but they are useful for indicating potential economic gains given different scenarios for per capita age profiles and the economic environment in general.

- But as actual experience showed, a situation of low support ratio and low annual growth in the support ratio (such as that observed for the period 1991-1999) could be followed by a situation of both high support ratio and high average annual growth in the support ratio (such as that observed in the period 1999-2011). As pointed out earlier, what is needed for the latter to happen is for population change to stay on course and for population change to be accompanied by favorable economic environment.

An important lesson from Part One of the paper is that periodic updating of the NTA such as the 2011 NTA is necessary to be able to track how economic lifecycles are changing overtime. There can be new patterns emerging such as the shift in the per capita labor income age profile towards younger ages and the rising per capita consumption at older ages observed in 2011. And as this paper has shown, change in the age profiles and levels at each age can have important implications on economic gain that can be realized even with a favorable population change.

And finally, the main lesson learned from Part Two of the paper is that the potential economic gain from a favorable population age structure change can be achieved more securely under a favorable economic environment. Conversely, the effect of a favorable population age structure change on total economic gain is mitigated by an unfavorable economic environment.

References

Abrigo, Michael Ralph M., Rachel H. Racelis,and J.M. Ian S. Salas (2012). "Philippines 2007 National Transfer Accounts (NTA): Consumption, Income and Intergenerational Reallocation of Resources – Revised Estimates." Makati City: Philippine Institute for Development Studies, Discussion Paper Series No. 2012-35, October 2012.

Abrigo, Michael Ralph M., Rachel H. Racelis,and J.M. Ian S. Salas (2014). "Comparing the 1999 and 2007 Philippine NTA Estimates and Examining the Effects of a Definitional Change of Overseas Workers' Remittances" Makati City: Philippine Institute for Development Studies, Discussion Paper Series No. 2014-24, May 2014.

Lee, R., S. H. Lee and A. Mason (2005). "Charting the Economic Lifecycle." Manuscript in www.ntaccounts.org

Mason, A., R. Lee, G. Donehower, S. H. Lee, T. Miller, A. C. Tung and A. Chawla (2009). "National Transfer AccountsManual: Draft Version 1.0". Manuscript in www.ntaccounts.org

Mason, A., R. Lee, A. C. Tung, M. S. Lai and T. Miller. (2005) "Population aging and intergenerational transfers: Introducing age into national accounts". Manuscript in www.ntaccounts.org

Philippine Statistics Authority (1997). 1997 Philippine Statistical Yearbook. PSA, Makati City.

Philippine Statistics Authority (2003). 2003 Philippine Statistical Yearbook. PSA, Makati City.

Philippine Statistics Authority (2013). 2013 Philippine Statistical Yearbook. PSA, Makati City.

Racelis, Rachel H. and J.M. Ian S. Salas (2007). "Measuring Economic Lifecycle and Flows Across Population Age Groups: Data and Methods in the Application of the National Transfer Accounts (NTA) in the Philippines." Makati City: Philippine Institute for Development Studies, Discussion Paper Series No. 2007-12, October 2007.

Racelis, Rachel H. and J.M. Ian S. Salas (2008). "Have Lifecycle Consumption and Income Patterns in the Philippines Changed from 1994 to 2002?" Makati City: Philippine Institute for Development Studies, Discussion Paper Series No. 2008-11, March 2008.

Racelis, Rachel H. and J.M. Ian S. Salas (2011). "Changes in Patterns of Philippine Lifecycle Consumption and Labor Income Between 1994 and 2002 (Chapter 18)." In Ronald Lee and Andres Mason (eds.), *Population Aging and the Generational Economy*. Cheltenham, U.K. Edward Elgar Publishing Limited.

Racelis, Rachel H., Michael Ralph M. Abrigo, and J.M. Ian S. Salas (2015). "Financing consumption over the lifecycle and overseas workers' remittances: Findings from the

1999 and 2007 Philippine National Transfer Accounts" *The Journal of the Economics of Ageing*, Volume 5, April 2015, 69–78.

Salas, J.M. Ian S. and Rachel H. Racelis (2008). "Consumption, Income and Intergenerational Reallocation of Resources: Application of National Transfer Accounts in the Philippines, 1999." Makati City: Philippine Institute for Development Studies, Discussion Paper Series No. 2008-12, March 2008.

United Nations (2013). NTA Manual: Measuring and Analyzing the Generational Economy. New York: UN Department of Economic and Social Affairs, Population Division.

United Nations (2011). World Population Prospects: The 2010 Revision, CD ROM Edition. New York: UN Department of Economic and Social Affairs, Population Division.