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Finnish Centre for Pensions

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ABSTRACT

A recently introduced methodology of National Transfer Accounts (NTA) provides a comprehensive approach to measure reallocations of income across age and time at the economy level forming a basis to adequately quantify phenomena related to changing age structures. We apply this methodology to the Finnish data for the year 2004. We also consider an illuminating case of golden rule steady states, in interpreting the implications of the current age pattern of the intergenerational transfers for macroeconomic effects of ageing. Consumption minus labour income, i.e. life-cycle deficit, is positive below 26 and above 60 years of age. The average age of consumption in NTA calculations is 40.9 and that of labour income is 43.0 years. This causes currently a need to transfer income from older generations to younger generations. One-third of the deficit in the young age bracket is financed by net public and two-thirds by net private transfers. The deficit of the aged is almost totally financed by net public transfers. Asset reallocation, i.e. income on assets less saving, is positive at all ages and contributes to the financing of life-cycle deficit or increases the life-cycle surplus at all ages. The middle-aged groups with life-cycle surplus transfer their resources to other generations especially via net public transfers. Using steady state calculations for a representative cohort we find out that the currently observed level of consumption path relative to income is not sustainable for future generations. Depending on the assumptions on mortality, fertility, and discounting the life-cycle consumption has to be reduced between two to ten per cent.

ABSTRAKTI

Ikäryhmätilit (National Transfer Accounts, NTA) on viime vuosina kehitelty metodologia, joka tarjoaa kattavan lähestymistavan mitata tulonsiirtoja ikäryhmien välillä sekä yli ajan ja muodostaa näin tarkoituksenmukaisen perustan ikärakenteen muutokseen liittyvien ilmiöiden määrälliseen arviointiin. Sovellamme tätä menetelmää vuoden 2004 Suomen aineistoon. Kuvailemme myös kultaisen kasvusäännön avulla tulonsiirtojen ikärakenteen ja talouskasvun välisiä makrotaloudellisia suhteita. Kulutuksen ja työtulojen erotus, joka muodostaa elinkaarialijäämän, on positiivinen alle 26 ja yli 60 vuotta täyttäneillä. Kulutus tapahtuu ikäryhmälaskelmissa keskimäärin 40,9 vuoden iässä, ja työtulot ansaitaan keskimäärin 43-vuotiaana. Nykytilanteessa tämä johtaa tarpeeseen siirtää tuloja vanhoilta sukupolvilta nuoremmille. Kolmasosa elinkaarialijäämästä rahoitetaan nuoremmissa ikäluokissa julkisilla tulonsiirroilla ja kaksi kolmasosaa yksityisillä tulonsiirroilla. Ikääntyneen väestön alijäämä rahoitetaan lähes yksinomaan julkisten tulonsiirtojen kautta. Pääomatulojen ja säästämisen erotuksesta syntyvä varallisuuden uudelleen allokaatio on positiivista ja sillä on positiivinen vaikutus alijäämien rahoitukseen tai se kasvattaa elinkaariylijäämää. Keski-ikäiset ikäryhmät rahoittavat alijäämäisiä ikäryhmiä pääasiassa julkisten tulonsiirtojen kautta. Hyödyntämällä vakaan kasvun laskelmia edustavalle kohortille voidaan päätellä että nykytasoinen kulutusura suhteessa tuloihin ei ole tulevilla sukupolvilla ylläpidettävissä. Riippuen laskelmaoletuksista kuolevuuden syntyvyyden ja diskonttauksen suhteen elinkaarikulutusta joudutaan alentamaan kahden ja kymmenen prosentin välillä.

CONTENTS

1 Introduction

Population ageing is one of the most important challenges facing countries worldwide. Over the next 50 years, there will be a steep increase in the share of elderly persons in the population. If there is no change in work and retirement patterns, the ratio of older inactive persons per worker will more than double in the world on average. The situation is most challenging in Europe and the rest of the industrialised world, where ageing continues from an already high level of old-age dependency (Dang et al. 2001).

The demographic transition and changing age structure interacts with age patterns of production and consumption, and together with intergenerational transfers they have significant macroeconomic implications on consumption, savings, and capital intensity. A recently introduced methodology of National Transfer Accounts (NTA) provides a comprehensive approach to measure reallocations of income across age and time at the economy level (Mason et al. 2006). It encompasses reallocations achieved through capital accumulation and transfers, distinguishing those mediated by public institutions from those relying on private institutions.

We will demonstrate the usefulness of this methodology applying it to Finnish data for the year 2004. We also consider an illuminating case of golden rule steady states, in interpreting the implications of the current age pattern of the intergenerational transfers for macroeconomic implications of ageing in Finland.

In this article we present the National Transfer Accounts (NTA) that divides public and private transfers and public and private asset reallocations by age for Finland in 2004 following the approach described by Mason et al. (2006). Reallocation channels play an important role in the Finnish accounts. The public sector has a substantial role in the intergenerational distribution. About two-thirds of public expenditures can be regarded as age-related spending, which is roughly 30 per cent of GDP. Unlike most of the countries, the public sector in Finland has positive financial net wealth, because of partially funded statutory earnings-related pension insurance.

In Section 2 we discuss briefly the importance of the changes in age structure for the evaluation of key macroeconomic phenomena. In Section 3 we show how this motivation can be made operational in breaking down the national accounts by age. We present aggregates of life-cycle deficit derived from national accounts that are used as controls when the deficit is divided into its components. The private and public reallocation systems in Finland are shortly described and also the main data sources that are used in our research. Life-cycle deficits, labour income as well as private and public consumption, by age are presented and the structure of private and public reallocation results is elaborated. In Section 4 following Lee and Mason (2007) we present an interpretative framework for ageing and intergenerational transfers that is applied in Section 5 to the Finnish economy. Applying the NTA framework into Finnish economy for the year 2004 we find out that life-cycle deficit, defined as consumption less labour income, is positive below 26 and above 60 years of age. The average age of consumption is 40.9 and that of labour income is 43.0 years. One-third of the deficit in the young age bracket is financed

by net public and two-thirds by net private transfers. The deficit of the aged is almost totally financed by net public transfers. Asset reallocation, i.e. income on assets less saving, is positive at all ages and contributes to the financing of life-cycle deficit or increases the life-cycle surplus at all ages. The middle-aged groups with life-cycle surplus transfer their resources to other generations especially via net public transfers. Using steady state calculations we find out that the currently observed level of life consumption relative to income is not sustainable for future generations. Depending on the assumptions the consumption has to be reduced between two to ten per cent.

2   Age Structure and the Economy

Over the demographic transition, changes in fertility and mortality lead to major changes in the growth rate and age distribution of the population. Changes in the relative numbers of children, elderly, and working-age people interact with age patterns of production and consumption and induce changes in dependency, savings, and capital intensity. Lee and Mason (2007a and 2007b) call these changes the first and second demographic dividends. The first dividend can be characterized by breaking down income per capita $\frac{Y}{N}$ into support ratio $\frac{L}{N}$ defined as labour force relative to population and the productivity of labour $\frac{Y}{L}$:

$$\frac{Y}{N} = \frac{L}{N} \times \frac{Y}{L} \tag{1}$$

where Y is GDP, N is total population and L is labour force. Proportional changes g() of output per capita is:

$$g\left(\frac{Y}{N}\right) = g\left(\frac{E}{N}\right) + g\left(\frac{Y}{E}\right) \tag{2}$$

The first dividend reflects improvements in the support ratio – the ratio of effective workers to effective consumers – that according to Mason and Lee (2007a) occur at an intermediate stage in a classic demographic transition, after fertility has begun to fall and before population ageing erodes the support ratio. As population ageing advances, it reduces the support ratio, which eventually returns to a value close to that at the start of the demographic transition. The first dividend is transitory, and the gains it brings are reversed by population ageing.

Customarily dependency ratios are used to quantify the economic effects of changing population age distributions. The ratios are constructed by dividing the number of children, the number of elderly, or both, by the number of people of working age. The boundaries of these age categories are conventionally taken to be 15, at the low end, and 65 at the high end. Thus the Old Age Dependency Ratio is often calculated as the population aged 65 and over divided by the population aged 16–64.

In Figure 1 statistics and projections of the proportion of the labour force (age group 15–64 years) of the total population for the developed and less developed countries and Finland are shown. The proportion is here an approximation of the ratio of the number of employed persons to the total population. It can be expected that the true ratios are lower. However, the first demographic dividend referred to in the context of Equation (1) is reflected in the curves. The developed countries have experienced a fifty-year period of high proportion of the labour force, a period that is now reaching its end. In Finland this ratio starts to deteriorate around 2010, whereas in other developed countries this will take place somewhat later and smoother. On the other hand, in less developed countries the ratio of working-age population is expected to increase until 2030.

Figure 1. *Labour force (aged 15–64) as percentage of the population in more and less developed countries and Finland in 1950–2050.*
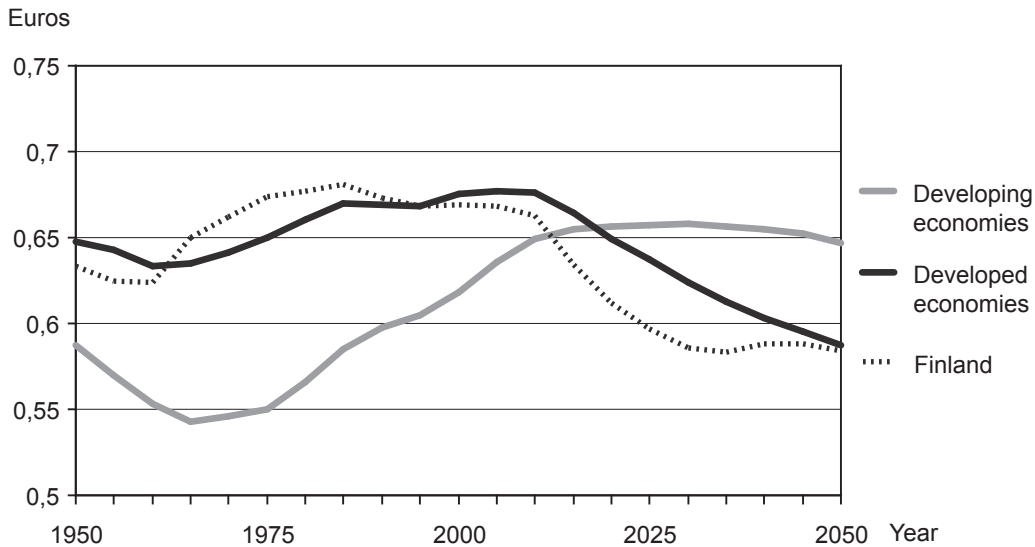
Source: UN Population Data and Projection Revision 2005.

While useful, this kind of measure has limitations: people are not equally productive over their whole active life, nor do they consume equally at all ages. The NTA approach provides a continuous empirically-based measure of dependency, where estimated age profiles of consumption and labour income are used as population weights to provide estimates of the effective numbers of consumers and the effective numbers of producers.

Let *N* represent the effective number of consumers and *L* the effective number of producers.

$$N(t) = \int_{x=0}^{\omega} w_c(x)P(x,t)dx \tag{3a}$$

$$L(t) = \int_{x=0}^{\omega} w_1(x)P(x,t)dx \tag{3b}$$

The support ratio is the effective number of producers per consumer:

$$\frac{N(t)}{L(t)} = \frac{\int_{x=0}^{\omega} w_c(x)P(x,t)dx}{\int_{x=0}^{\omega} w_1(x)P(x,t)dx} \tag{4}$$

where P(x,t) is the population aged x at time t and w_c and w_1 are age-specific, time-invariant vectors of coefficients measuring age variation in consumption and productivity, respectively. It is appropriate to define Equations (1) and (2) in terms of effective consumers and producers.

Estimates of the economic life cycle, consisting of age profiles of consumption and labour income, are an essential feature of this analysis. The age profiles used here have been constructed utilizing a common methodology described in Mason et al. (2006). A more detailed description is available at www.ntaccounts.org. The consumption profile consists of both public and private consumption. Public consumption has been allocated to age groups using administrative records. Private consumption has been allocated using a household expenditure survey. Labour income includes earnings of employees and income from self-employment. All values have been adjusted to match the System of National Accounts.

The phase of demographic transition when the support ratio is declining is called window of opportunity by Lee and Mason (2007), because some part or the entire first dividend might be invested in human or physical capital or in stronger institutions. These factors are reflected in the second term of Equation (2). This will lead to additional growth in income per effective consumer. Depending on the choices made and the policies pursued by governments, the first dividend may give rise to a second dividend that persists well after the demographic window has closed.

The change in the population age distribution over the transition can cause a substantial and permanent increase in assets per capita and, for a closed economy, in capital per worker, leading to higher per capita incomes and higher consumption than otherwise. The extent to which population ageing brings economic benefits through this route depends on several factors:

- the shape of the age profiles of consumption and labour income over the life-cycle
- the extent to which consumption in old age is provided through saving and asset accumulation rather than through familial or public transfer systems
- the degree of openness to international capital flows.

The mechanisms of the second dividend are briefly discussed through a steady state analysis of population changes in a separate chapter.

3   National Transfer Accounts – A Methodology to Introduce Age into the National Accounts

The aggregate control variables in the National Transfer (flow) Accounts (NTA) are drawn from the National Income and Product Accounts (NIPA or SNA). The aggregates in the flow account are the total value of final goods and services produced in one calendar year by a country's residents, including profits from capital held abroad. National Accounts measures the flows of five main institutions in the economy: households, non-profit institutions serving households, government, financial institutions, and non-financial enterprises, corporate and quasi-corporate.

NTA measures the inflows and outflows to the households (individuals). These total inflows and outflows are equal to the total flows in the economy. NTA classifies two main sectors: private and public. However, the individual is the fundamental analytic unit in NTA. All transactions are treated as flowing to and from individuals. Government and families only mediate these transactions.

Both SNA and NTA share a basic economic concept: the production in the economy is equal to total income earned in the economy, and is equal to total spending. NTA represent national values, not domestic values. The net national disposable income equals domestic spending:

$$Y_l + Y_a + T_g + T_f = C + S = \text{net national disposable income,} \tag{5}$$

where labour income (Y_l) includes net compensation of employees from the rest of the world and the returns to assets (Y_a) includes property and entrepreneurial income from the rest of the world. Net public transfers (T_g) and net private transfers (T_f) include net current transfers from the rest of the world. Consumption (C) includes both public and private consumption. Similarly net savings (S) has private and public components. Net transfers, aggregate consumption and net savings in the NTA are directly drawn from the national disposal income account. Two remaining aggregate variables, labour and asset income, are obtained after adjusting some variables in the account of SNA. This is discussed in more detail e. g. by Lee, Lee and Mason (2006).

By rearranging terms we can express the main equation of NTA flow account:

$$\underbrace{c(x) - y_l(x)}_{\text{Lifecycle deficit}} = \underbrace{\underbrace{y_a(x) - s(x)}_{\text{Asset reallocations}} + \underbrace{\tau_g^+(x) - \tau_g^-(x)}_{\text{Net public transfers}} + \underbrace{\tau_f^+(x) - \tau_f^-(x)}_{\text{Net private transfers}}}_{\substack{\text{Net transfers} \\ \text{Age reallocations}}} \tag{6}$$

The difference between consumption and production, termed life-cycle deficit, must be matched by age reallocations consisting of asset reallocations and net transfers. In Equation (6) small case letters refer to individual components of the aggregate variables in (5). Asset realloca-

tions are property and entrepreneurial income less saving. Both property income and saving can be private or public. Saving may take the form of financial instruments or physical capital. Transfers are further divided into net public transfers consisting of monetary and benefit-in-kind transfers and net private transfers consisting of bequests and inter vivos. Within inter vivos there are inter- and intra-household transfers. Equation (6) describes where the financing of life-cycle deficit is coming from.

In NTA all transactions are treated as flowing from one individual to another and are classified by the age of those individuals. When treating age groups or cohorts of the economy, the information needed is inflows and outflows by age or by age group. The measurement of all variables needed in Equation (6) is not possible directly at the individual level. For some variables there may exist total population statistics or registers with age as a background variable. Several conventions have been adopted to allocate flows that can only be measured at the household, firm or public-sector level to allocate them to individuals or age groups.

In practice consumption can only be estimated with household surveys. Individual consumption can be accurately measured only in the case of single-person households. For multi-person households an allocation rule based on an equivalence scale is needed. Wage income can be measured on an individual basis in a household survey or in a total population register, e.g. for taxation purposes. The income from work of self-employed persons is more difficult to measure, because it may be combined with the property income of an enterprise, and a rule of thumb is needed.

The components of private asset reallocations by age can be measured through a wealth survey. Some components may be reported, e.g., in a register of the tax administration. With both sources the question is, however, whether we should allocate the assets and related transactions to the adults or household head only or also to the children. The principle of the NTA method is that private asset reallocations are transactions of the adults, and the financing of the life-cycle deficit of the minors is a private transfer from the adult age group also in the case when the assets may be formally owned by the minors. Services of the physical capital of households are taken into account as consumption on one hand and as property income on the other hand. The retained profits of firms (the income that is not paid as dividends) are saved by the firm by definition. The sign of returns on assets and the sign of savings are opposite in Equation (6). As a consequence, the net effect of firm sector retained profits and savings are zero to every individual by definition.

In the NTA method public asset reallocation is assumed to follow the distribution of taxes. Public asset reallocation includes also public deficit or surplus as one component. We discuss this issue later.

Public net transfers are monetary transfers plus benefits-in-kind plus collective public consumption minus taxes paid. Monetary transfer, benefits-in-kind and income tax variables can be based on household surveys or total population statistics by age. One way to allocate collective public consumption is to assume it constant per capita, and we applied it here. In-

direct taxes may be derived from the age profiles of consumption or consumption basket in the case of household surveys.

The components of private transfers are the most difficult variables to access data on, though their sum (net private transfers) can be solved as a residual in Equation (6). As mentioned, the components are inter-household and intra-household transfers, both consisting of bequests and inter vivos transfers. By acquiring survey or other type of data on one or some of these components, the sum of the rest may be solved as a residual. In our case we had access to survey data on received bequests and the age profile of wealth in general.

3.1 Aggregate Life-Cycle Deficit, Institutional Setting and Data Sources

The public sector has a substantial role in the intergenerational distribution. About two-thirds of public expenditures can be regarded as age-related spending, which is roughly 30 per cent of GDP. In Finland education and health care are predominantly provided in the public sector. Responsibility for the provision of most of these services rests with municipalities. They have the authority to collect taxes to fund these provisions, but also receive state subsidies to enable them to arrange the services they are required to make available.

In the Finnish educational system there are no tuition fees for full-time students. Both primary and secondary education is financed by the municipalities. All Finnish universities, on the other hand, are owned by the state. In the health care extensive public services are offered to all residents. The responsibility for the provision of primary health services rests with municipalities. Private-sector services are typically complementary. Reimbursements for the cost of private health services are provided by the National Health Insurance run by the Social Insurance Institution. The health insurance is a compulsory, universal coverage program.

In Finland all residents are covered by social security schemes which govern basic pensions (national pensions), sickness, parenthood and unemployment benefits. In addition, all employed persons are entitled to benefits based on employment, such as earnings-related pensions and benefits for employment-related injuries. The National Health Insurance compensates for income lost due to temporary incapacity for work. The allowance is proportional to the applicant's earnings. Transfers that have an age-related dimension totalled 24 billion euros, which was about 16 per cent of GDP in 2004.

Table 1. *Aggregate life-cycle deficit (million euros).*

Item	Million €
Life-Cycle Deficit	9 448
Consumption	90 438
Private	58 598
Public	31 841
Less: Labour Income	80 990
Age Reallocations	9 448
Asset-Based Reallocations	10 942
Public Asset-Based Reallocations	-4 162
Public Income on Assets	0
Less: Public Saving	4 162
Private Asset-Based Reallocations	15104
Private Income on Assets	31 582
Less: Private Saving	16 478
Transfers	-1 494
Private	-114
Public	-1 380

Source: National Accounts 1975–2006, Statistics Finland.

National Transfer Flow Accounts are estimated using various sources of data. Data for aggregate controls are taken from the National Accounts statistics that are based on the European System of Accounts ESA95, which complies with the world-wide SNA93 (System of National Accounts) recommendations for national accounts.

Table 1 displays the composition of the aggregate life-cycle deficit that is derived from the National Accounts data. Consumption consists of public and private consumption net of taxes. Public services are an important part of total consumption with a share of 35 per cent. Wage income is composed of wages and salaries and employers' social contributions together with a 67 per cent share of the household sector's operating surplus. In asset-based reallocation public savings and incomes are straightforwardly extracted from the National Accounts.

The public sector in Finland has positive net financial wealth. This is mainly because statutory earnings-related pension insurance, compulsory for all employers, is part of the general government classified as a sub-sector under social security funds. It holds funds that are about 1.7 times the wage sum of the Finnish economy. Public asset-based reallocations of 4,162 million euros include both primary balance surplus and the part of financial investment income that is included in the National Accounts. We discuss the details of this issue later in Chapter 7.2.

In calculating private income on assets, indirect taxes on capital formation as well as production subsidies related to agriculture are taken into account. Transfers are mainly public-sector payments abroad that consist predominantly of the EU membership fee and payments to international organizations.

Table 2 displays the composition of public consumption by the main categories of individual and collective public consumption and by the sub-categories of individual services.

Table 2. Aggregates of public consumption by type in 2004.

| Item	Million €	Share (%)
Age-related consumption	**21 755**	**65.3%**
Education	7 078	21.2%
Culture and recreational services	983	3.0%
Health services	6 349	19.1%
Health insurance and rehabilitation	1 831	5.5%
Social services	4 624	13.9%
Other age-related services	890	2.7%
Collective public services	**11 559**	**34.7%**
Public services, total	**33 314**	**100.0%**

Source: National Accounts 1975–2006, Statistics Finland.

Individual collective services form two-thirds of the total public consumption. Private consumption is 65 per cent, individual public consumption 23 and collective public consumption 12 per cent of the total consumption.

3.2   Consumption and Labour Income by Age

Two sources of data were used to allocate private consumption to different cohorts. Statistics Finland's household budget survey provides data on the consumption expenditure of households by reference person age in 5-year groupings. The data was split into one-year cohorts by linear interpolation. In order to follow the NTA methodology to break down the household level data to individuals, we use additional information on the age composition of households to get the distribution of consumption of each age group in households classified by the reference person's age.

The Household Wealth Survey of 2004 was used to estimate durables consumption by age. The stock of durables for households by age was estimated from the wealth survey, and a 20 per cent depreciation of that stock was interpreted as consumption that was allocated to individuals according to the NTA methodology. The wealth survey was also used to describe the age distribution of bequests received by households.

Figure 2. *Total per capita consumption.*

Euros
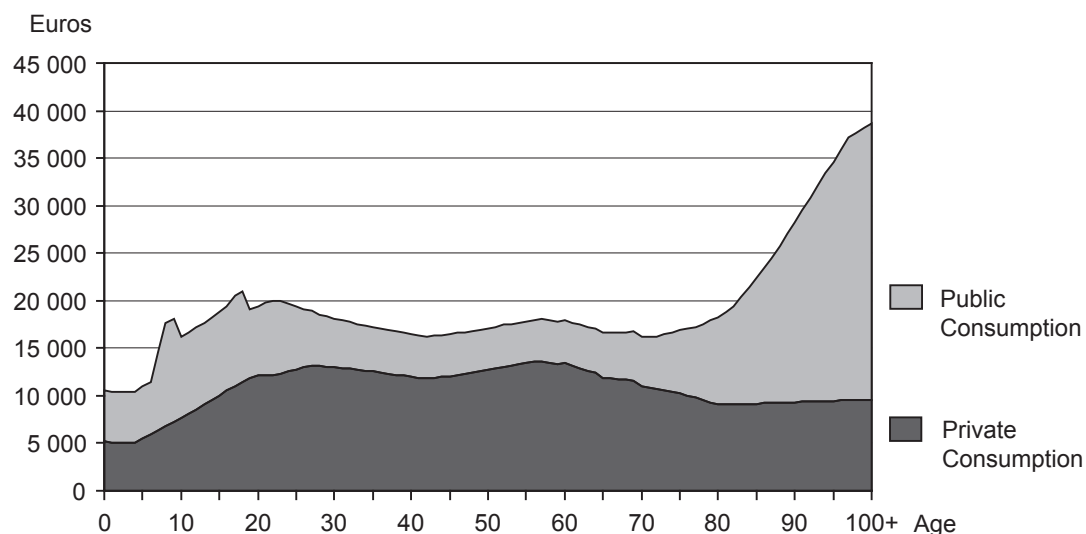
Source: Household Budget Survey 2003; Social Insurance Institution (2005a and 2005d). Own calculations.

Public education services by age are based on the enrolment data of different education levels by age and the respective unit production costs. The data is provided by the education authorities. The Ministry of Health and Social Affairs supplied corresponding data on health and social services. The relative age profile of culture and recreational services was assumed equal to the respective age profile of private consumption. The Social Insurance Institution published statistics on health insurance and rehabilitation costs by age. Collective public consumption was assumed to be constant per capita. Vaittinen and Vanne (2006) include more information on the data sources and transformations of the data.

Total consumption divided into private and public consumption by age is presented in Figure 2. The age profile of private consumption peaks at the ages of 27 and 57. Private consumption grows steadily after birth to the first peak, and declines gradually after the second peak, but does not decline significantly below average consumption. At its lowest, in the older tail of the population, the consumption is about 75per cent of the population average.

The decline in the consumption of people in their thirties is partly due to the fact that people are of child-bearing age. However, in this particular case there is a specific cohort effect. Finland experienced a severe recession at the beginning of the 1990s. Riihelä (2007) has studied a sequence of household surveys from 1985 to 2001. She found out that for the cohorts that were aged 25 and 30 in 1985 both the income and consumption growth from 1985 to 2001 were significantly slower than for the cohorts that were aged 20, 35 or 40 in the same survey. These cohorts were aged 30 and 35 – typically at a strong career-forming phase in the labour market – during the time of prolonged recession. In fact the lowest per capita consumption of middle-aged cohorts in our study is at the age of 42 years in the 2001 survey.

Figure 3. *Distribution of private per capita consumption.*
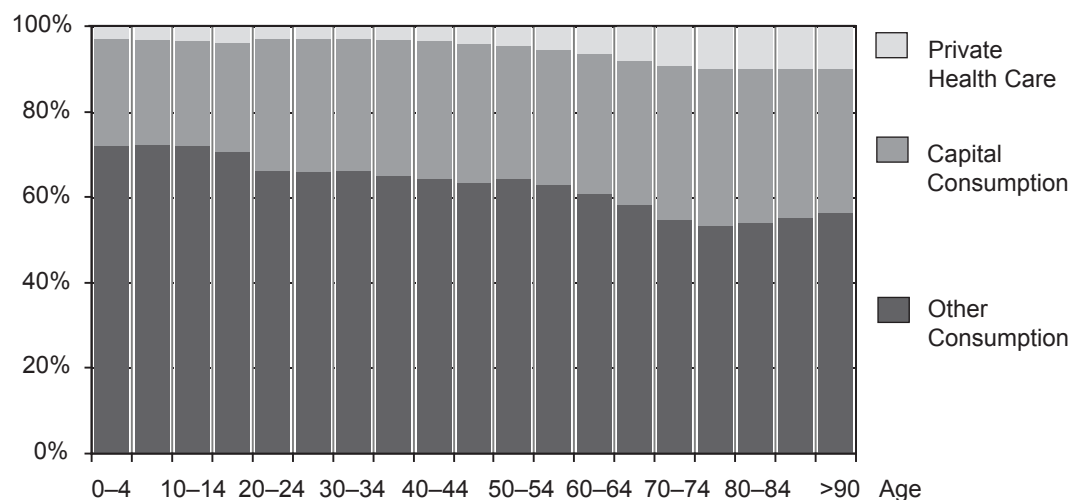
Source: Household Budget Survey 2003. Own calculations.

In private consumption health care and education have a minor role. On average the share of expenditures on private education is about 0.5 per cent, and it varies only modestly across age groups. Expenditures on health care are of more importance. Their average share of consumer expenditures is 4.7 per cent, and they increase progressively by age: for people over 80 the share of health care expenditures is over 10 per cent.

Capital consumption is defined as the sum of durables consumption and imputed rents from owner-occupied housing. Durables consumption is on average about 4 per cent of average consumption. Total expenditures on durables are about 7 per cent, implying that almost half of these expenditures are investments. Housing consumption is more than one-quarter of all consumer expenditures on average. The relative share of capital consumption gradually increases when people live from their early thirties to their late fifties. At later ages the share of capital consumption remains at a relatively high and stable level.

The distribution of labour income by age is taken from statistics on income and property provided annually by Statistics Finland. The statistics on income and property describe the income subject to taxation, property and taxation of private individuals. The basic data for the statistics are drawn from the Tax Administration's database and are based on total population data. Age profiles of total consumption and labour income by age are presented in Figure 4.

Figure 4. *Consumption and labour income by age.*
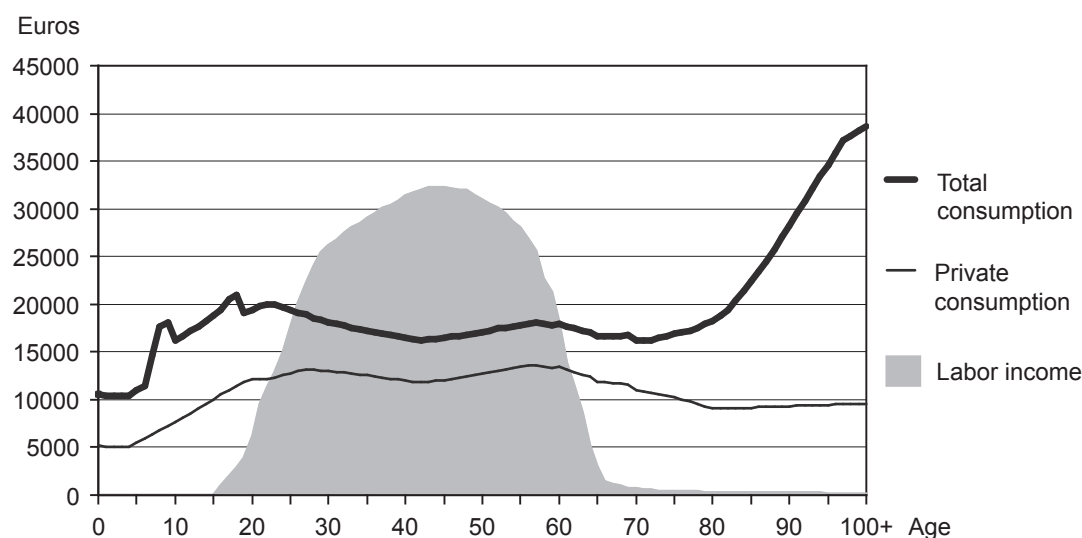
Source: Household Budget Survey 2003; Statistics of Income and Property. Own calculations.

The maximum of labour income is reached at the age of 43. The total consumption is relatively flat over the broad 50-year age bracket of 20–70 years. Public consumption is very high at very old ages, and at the age of 90 the total consumption is twice as high as at the ages of 20–70 years.

3.4 Age Profiles of Public Cash Transfers and Taxes

Public reallocation consists of public transfers plus public services minus taxes minus investment income on public financial assets. Public services and financial investment income were discussed in Chapters 3 and 4. In the following, we discuss public transfers and taxes.

Public Transfers

The total volume of public transfers, i.e. public inflow reallocation, was 30,395 million euros in 2004. The sizes of different public transfer systems are presented in Table 3. The total volume of public transfers was 20 per cent of GDP. We are able to report 24 billion euros, i.e. 80 per cent of the transfers, by age. The distribution by age of the rest is currently unknown (called non-age-related transfers in Table 3), and we assumed that these transfers were constant per capita.

Table 3. *Aggregates of public transfers by type in 2004.*

Item	Million €	Share (%)
Age-related transfers	**24 011**	**79.0%**
Pensions	16 919	55.7%
Unemployment benefits	2 884	9.5%
Health insurance daily allowances	670	2.2%
Family policy (transfers related to children)	2 355	7.7%
Other age-related transfers	1 183	3.9%
Non-age-related transfers	**6 384**	**21.0%**
Public transfers, total	**30 395**	**100.0%**

Source: National Accounts 1975–2006, Statistics Finland.

The public pension expenditure was more than half of the total volume of public transfers. The Finnish statutory pensions are made up of earnings-related pensions and national residence-based pensions, whereas voluntary pensions play a relatively minor role in total pension provision. These pension acts strive to secure a reasonable income for the insured and their families in relation to the earnings while working in the event of old age, disability or death. The earnings-related pensions are defined-benefit, in the sense that the size of the pension expenditure determines the contribution level and the need for other financing. A pension recipient is entitled to a national pension if the earnings-related pension is small.

However, the benefit rules of the earnings-related pension scheme include some features of defined-contribution systems. The scheme is not a final salary scheme, but before 2005 the benefit was based on the average salary for the last 10 years of every spell of employment. Since 2005 benefits are based on the wages of the whole career. When calculating the initial amount of the pension, the earnings for the different years are adjusted in line with the wage coefficient, where the weighting of the change in the earnings level is 80 per cent and the weighting of the change in consumer prices is 20 per cent. Pensions are adjusted in line with an index where the weighting of the change in the earnings level is 20 per cent and the weighting of the change in prices is 80 per cent.

After the year 2009 the initial amount of old-age pensions is adjusted to account for the change in longevity for 62-year-olds through the life expectancy coefficient. This life expectancy coefficient is determined so that the net present value of the old-age pension remains unchanged even if the life expectancy for persons at retirement age has changed in comparison to the expectancy calculated from the statistics for 2003–2007 as a reference value.

The earnings-related pension schemes of the private sector are run by pension insurance companies (not allowed to supply other products), industry-wide pension funds or company pension funds. The employer chooses the insurance provider. There are approximately 50 pension providers of statutory schemes for private-sector employees and self-employed persons. In the public sector there are five pension providers. Each of them takes care of the pensions of a particular sub-sector of the general government. Statistics on the age profiles of all statutory pension benefits is annually published in a yearbook by the Finnish Centre for Pensions and the Social Insurance Institution.

There are three types of unemployment benefits in Finland. Those who have paid the voluntary contribution to the unemployment insurance funds when working, receive an earnings-related unemployment daily allowance from the fund in question. Others receive a basic daily allowance from the Social Insurance Institution. The maximum spell of these benefits is 500 working days. After that the unemployed person is entitled to a means-tested daily allowance from the Social Insurance Institution. Statistics on the age profiles of all unemployment benefits is annually published in a yearbook by the Insurance Supervisory Authority and the Social Insurance Institution.

Health insurance daily allowances as well as parenthood allowances (the latter included in the family policy item in Table 3) are earnings-related and paid by the Social Insurance

Institution. Other family policy benefits are child allowances paid until the child is 17 years old, child day care subsidy and some minor benefits. These transfers are paid by the Social Insurance Institution as well.

Other age-related transfers include among others student allowance, housing allowance and social assistance for poor households. The Social Insurance Institution takes care of the two former benefits, and municipalities pay social assistance benefits. The Social Insurance Institution annually publishes statistics on the age profiles of benefits paid by it.

Taxation

Aggregates of taxes by tax-collecting institutions are presented in Table 4. The state receives over half of the total tax revenues. Local government (municipalities) and statutory pension providers both collect one-fifth of the tax revenues. The Social Insurance Institution and un-employment insurance funds are minor tax collectors. It should be noted, however, that the central government gives financial support to all other tax-collecting sectors.

Labour income is the main source of taxes. It is the main source of state income and local government taxes as well as social insurance contributions, and the only source of pension and unemployment insurance contributions.

Table 4. Tax aggregates by tax collector in 2004 in Finland.

Item	Million €	Share (%)
State tax revenue	**34 539**	52.2
Taxes on income and capital	13 058	19.7
Taxes on the basis of turnover	13 487	20.4
Excise taxes	4 571	6.9
Other taxes	2 492	3.8
Other tax-like revenues	862	1.3
Tax revenue outside the state budget	**69**	0.1
Local government taxes	**13 756**	20.8
Social security contributions to the Social Insurance Institution	**3 320**	5.0
Pension insurance contributions	**13 330**	20.1
Unemployment insurance contributions	**1 116**	1.7
Taxes and fees paid to the EU	**130**	0.2
TOTAL TAX REVENUE	**66 191**	100.0

Source: National Accounts 1975−2006, Statistics Finland.

Almost all public social transfers are taxable income. In the state income taxation the sum of earned income and social transfers are taxed by a progressive tax schedule. The municipal tax schedule is proportional, but the earned income tax credit and other deductions make the municipal taxes also slightly progressive with respect to gross income. The average municipal tax rate is approximately 18.5 per cent of taxable income.

Profits are taxed at a flat rate of 26 per cent. Investor's capital income, including capital gains, is taxed at the rate of 28 per cent of the taxable income. In the case of dividends, the tax-able income is calculated in a rather complicated way. After all, the effective tax rate is below

28 per cent, and depends on, among other things, whether the dividend is based on private equity or on shares of a listed company. In 2004, taxation of dividends was still based on the so-called avoir fiscal principle, and dividend taxes were already collected at the firm level.

The contribution rates of the statutory pension schemes vary slightly depending on the scheme, but in the main scheme (private-sector employees) the total rate is approximately 21 per cent of the wages, of which employees pay 5 and employers 16 percentage points.

The age profiles of the aforementioned income-based taxes, as well as the age profiles of the contribution rates of earnings-related unemployment insurance and health insurance were available by the total population data collected by the tax authorities and published by Statistics Finland.

Figure 5. *Indirect tax rates by age.*
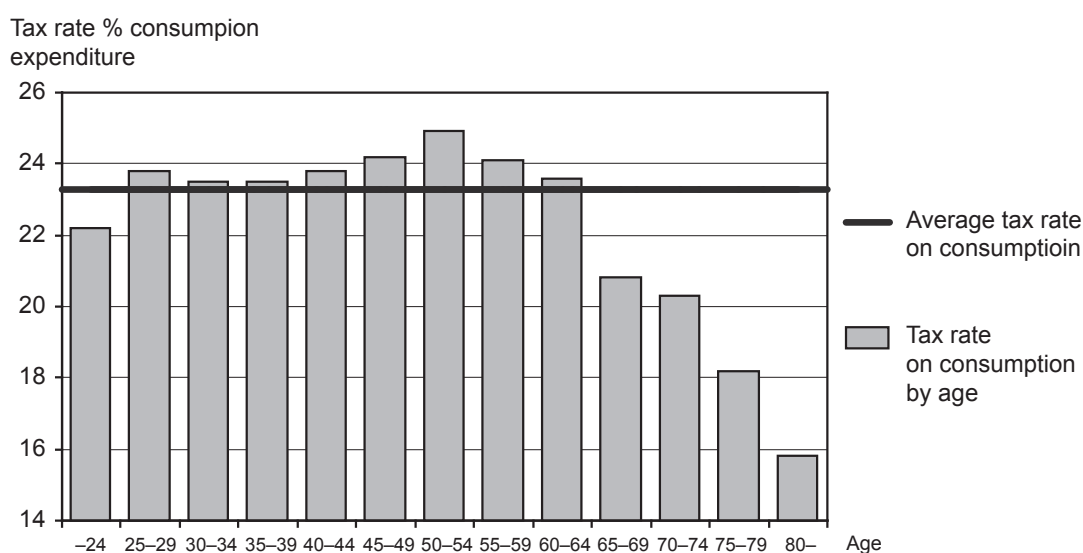
Tax rate % consumpion
expenditure

Source: Household budget survey 2001-2002, Statistics Finland. Own calculations

The main consumption tax is the value added tax. The general tax rate is 22 per cent. Food products are taxed at the rate of 17 per cent, and some cultural products and services at the rate of 8 per cent. There are also excise taxes levied on some products, e.g. alcoholic beverages, tobacco and cars. We estimated these and all other indirect taxes by age by making use of a detailed input-output data of production and combined this data with consumption structures by age observed in the household survey of the years 2001–2002.

There are two main aspects that have to be considered in compiling indirect tax data. In the case of excise taxes, natural persons, as final consumers, do not always pay these taxes. Excise taxes may be a burden for producers in purchases of intermediate inputs, which is the case e.g. in energy. In value-added taxation exemption rules create a similar state of affairs. The other aspect of the problem are the age-specific consumption patterns that have implications on the tax burden over different generations. Younger and middle-aged people tend to consume more alcohol, tobacco and goods related to transportation. These are heavily taxed by excise duties. This is of importance as can be seen in Figure 5.

Public Savings

The market value of net financial assets held by the Finnish general government was approximately 46 per cent of annual GDP at the end of 2004. The public gross debt was 44 per cent of annual GDP, but on the other hand, the market value of listed and unlisted stocks held by the central government, as well as its cash reserves and outstanding loans were 38 per cent of GDP. At the same time the total market value of the financial assets held by the statutory pension providers was approximately 58 per cent of annual GDP.

Due to the financial position, net public capital income was positive in 2004, as was shown earlier. According to national accounting standards, changes of the market values of the assets, capital gains or losses are not included in the net income. Only interest inflows and outflows, as well as dividends are included. We followed the standard when showing the asset reallocation figures and public asset income. In Table 5 we present the total market value and allocation of public net financial assets in 1994–2006, the annual change of net wealth, as well as public surpluses and deficits according to the national accounts in 1995–2006.

Naturally, the net surplus of the last column of Table 5 is part of the total change of net wealth indicated in the fifth column. The data shows that the change of net financial wealth may be many times the standard surplus or deficit, and even the signs may differ. The period under consideration includes both stock market booms and busts, and they are underlying the high variation of net wealth changes.

The standard way of measuring asset performance includes also changes of market values as well as capital gains and losses. Market value changes of assets held may also have an effect on consumption. We could refer, e.g., to the contemporary discussion on the effect of the US housing prices on private consumption. If that is the case, an extreme asset price rally would cause a higher life-cycle deficit, and a stock market crash would lower the life-cycle deficit.

Table 5. *Public net financial assets, saving, asset income and net surplus in 1994–2006 (million euros).*

Year	Fixed income assets, net	Non-fixed income assets	Total net financial wealth	Annual change of net wealth	Public saving (primary balance)	Net asset income in national accounts	Public surplus (net lending)
1994	-284	14 668	14 385		-5 674	-266	-5 940
1995	-13 166	25 061	11 895	-2 490	-5 856	-61	-5 917
1996	-17 657	24 040	6 383	-5 512	-3 014	-494	-3 508
1997	-20 437	28 469	8 032	1 649	-324	-994	-1 318
1998	-22 645	39 651	17 006	8 974	2 520	-572	1 948
1999	-14 002	75 472	61 470	44 464	2 550	-548	2 002
2000	-9 243	50 341	41 099	-20 371	8 421	741	9 162
2001	-6 226	50 269	44 043	2 944	5 667	1 284	6 953
2002	-3 086	48 293	45 207	1 164	4 212	1 684	5 896
2003	-1 021	58 758	57 737	12 530	1 562	1 867	3 429
2004	2 572	66 877	69 449	11 712	751	2 415	3 166
2005	5 968	84 445	90 413	20 964	1 441	2 553	3 994
2006*	8 840	106 191	115 031	24 618	3 156	3 163	6 319

Source: Financial Accounts, Statistics Finland.

In the Finnish case the rise of public asset values seems to have an impact on public consumption and transfers. Rising stock prices give arguments for selling, and when capital gains cause an increase of equity values to materialize, political decision-makers seem to think that there is more room for expansive fiscal policy than when the assets are just held.

The aggregate saving figure in the public sector does not change due to inclusion of asset price effects, and necessarily the age reallocation does not change either. The age reallocation effect depends on how we assess over time the allocation of public net wealth and its returns by cohorts. In the Finnish case there are prevailing rules with respect to the effect of the wealth of the pension funds. According to the rules the effect on the cohorts comes via the pension contribution rates.

3.5   Private Transfers

In this study we have identified two types of private transfers. With intra-household transfers, households shift resources among their members. Those who are consuming more than their disposable income are receiving intra-household transfers from those who are consuming less than their disposable income. The only type of inter-household transfers is bequests.

Intra-Household Transfers

In NTA all wealth is assumed to be held by the household head. Consequently, all saving and dis-saving is carried out by the household head. Non-head members of the household can use their disposable income to purchase consumer goods and services; the remainder becomes an intra-household transfer. The disposable income of the household members consists of labour income and net public transfers. By assumption non-head household members do not receive non-labour income nor inter-household transfers. Intra-household transfers must sum up to zero for each household.

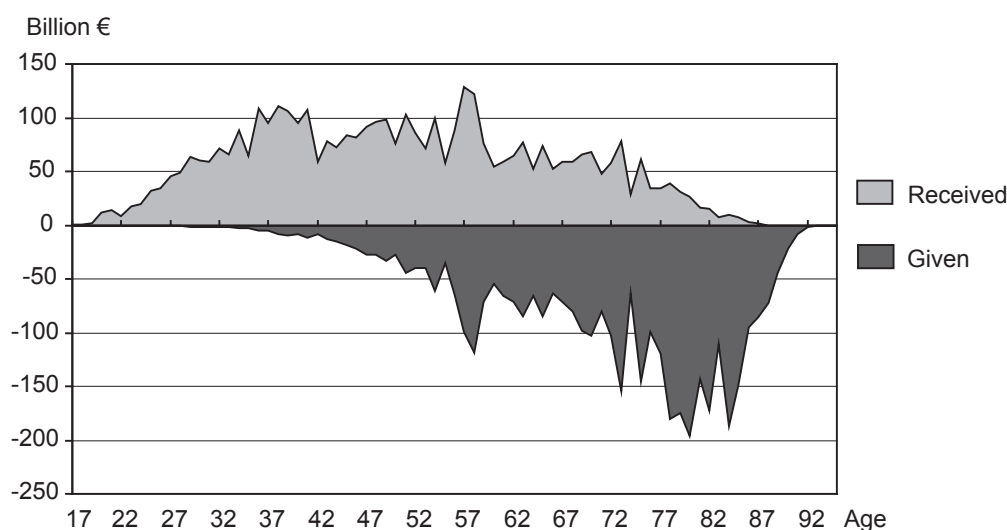**Figure 6.** *Distribution of net wealth.*
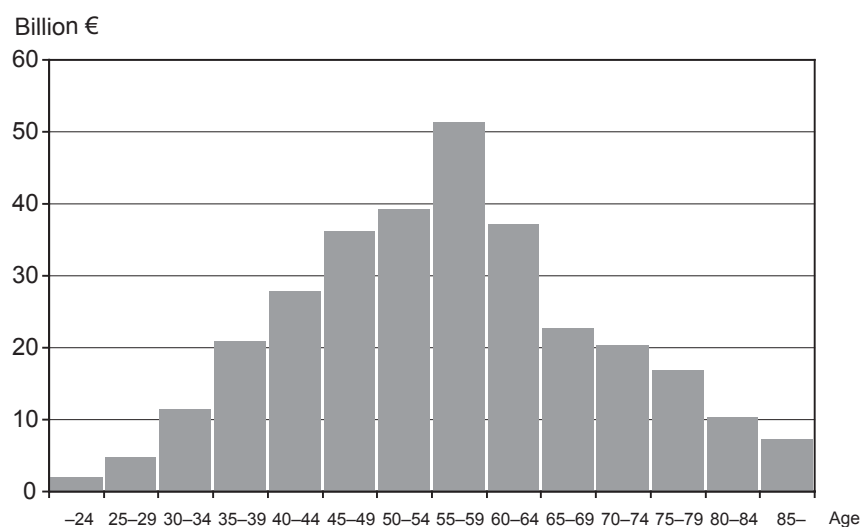
Source: Household Wealth Survey 2004; Statistics Finland 2006.

Inter-Household Transfers: Bequests

The data on bequests comes from the Household Wealth Survey 2004. This survey reports bequests received in the past 4 years. In 2004 the average amount of gross wealth per household was 147,000 euros. The average wealth net of debt was 128,000, totaling 308 billion over all households, which is about twice GDP. Owner-occupied housing forms 57 per cent of the total wealth. Figure 6 presents the distribution of wealth over 5-year age groups. The wealthiest group is that aged 55–59 years. At the household level the per capita wealth exceeds the country average at the age of 40. Per capita wealth reaches its maximum at the age of 58, from which it starts to slowly decline. At the older tail of the age distribution only households older than 85 have net wealth that is below the average household net wealth. Households under 40 own 15 per cent of the net wealth. Half of the net wealth is owned by households over 55 of age.

In the survey 16 per cent of households have received a bequest during the last four years. The total amount of bequests was 12 billion euros and the average bequest was over 32 thousand euros. One-quarter of the bequests are received by households whose head is under 41, about half of the bequests go to households whose head is over 50 and the last quarter go to households over 62 years.

Figure 7. *Bequests by age in 2004 in Finland.*

Source: Household Wealth Survey 2004, Statistics Finland. Own Calculations.

Figure 7 displays bequests received and given in 2004. The annual bequests follow the smoothed distribution of received per capita bequests and the given bequests have been estimated from smoothed wealth distribution by multiplying it by death probabilities of each cohort. Households under 40 years of age receive 30 per cent of the bequests, whereas the share of households between 40 and 60 is 40 per cent, which means that still a considerable proportion of bequests remain to be collected at relatively old ages. A significant share of the variation in bequest

volumes is due to variation in cohort sizes. For example people in their late fifties belong to the large post-war cohorts that are both dying and receiving bequests.

3.6   Reallocation Age Profiles in 2004 in Finland

In this section we study the intergenerational distribution by comparing the difference between consumption and labour incomes by age. Life-cycle deficits have to be covered by reallocation of resources from generations producing surpluses. The public sector has a predominant role in providing age-related expenditures in Finland. Age-related transfers are also sizeable. Particular attention is paid to the public sector's role in mediating intergenerational transfers.

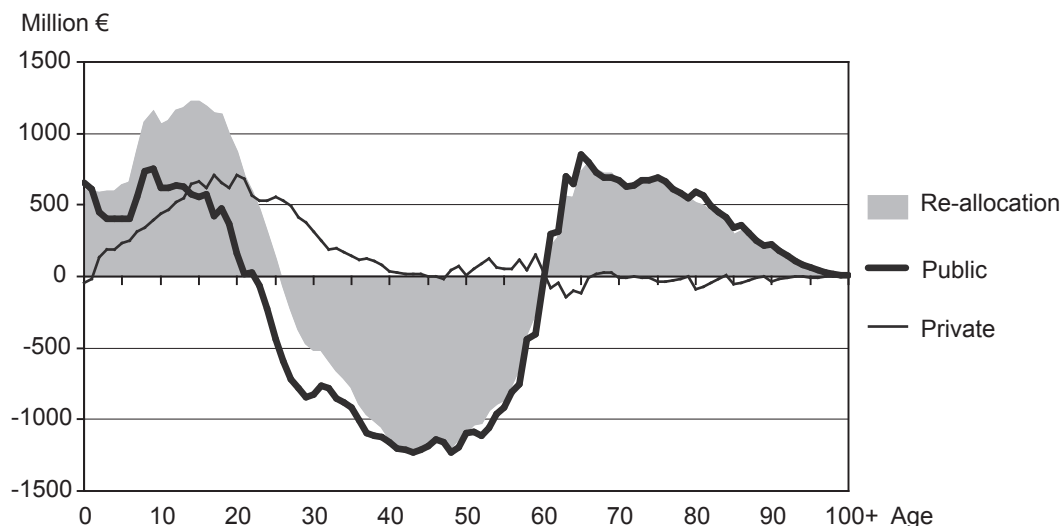**Figure 8.** *Total consumption and labour income.*
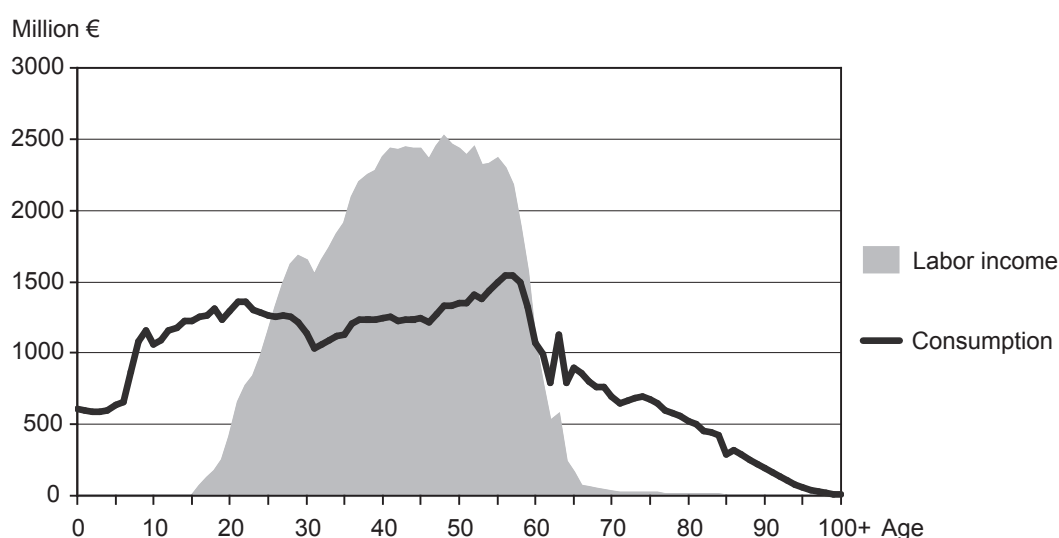
Source: Household Budget Survey 2003; Statistics of Income and Property in 2004. Own calculations.

The main constituents of life-cycle deficits are plotted in Figure 8. At the younger end of generations people consume more than they earn up to the age of 25 years. They produce surpluses between ages 26 and 60 years. Currently the deficit is larger at the younger end of the distribution, but it is expected to reverse pretty soon in the future. The cohort that is earning the most in absolute terms is the cohort aged 48 years. The cohort that is contributing the most to the surplus is the cohort aged 43 years. This generation has the highest per capita earnings and almost lowest per capita consumption within the middle-aged cohorts. The average age weighted with labour income is 43.0. The average age weighted with total consumption is 40.9 years. The average age for private consumption is 42.0 and that for public consumption 39.0 years.

Life-cycle reallocation and its division into private and public components are shown in Figure 9. As was already mentioned, cohorts stop running deficits at the age of 26. There are considerable differences in the patterns of private and public reallocations. Public net transfers turn from positive to negative at the age of 23, while private reallocation is in deficit most of

the time. While a significant part of the consumption of younger cohorts is financed by private reallocation, it is almost completely financed by public reallocations for retired cohorts.

Figure 9. *Public and private reallocation.*

Source: Household Budget Survey 2003; Statistics of Income and Property in 2004 Survey of Wealth in 2004. Own calculations.

Table 6 summarizes the life-cycle deficit by age for broad age groups. The data has been broken down into five age categories. There are two dependent groups receiving intergenerational transfers: the population aged less than 20 and those above 65. Labour income is practically zero in dependant groups and life-cycle deficits, which have to be covered by intergenerational transfers, are large. The middle-aged groups, that are generating life-cycle surplus and providing intergenerational transfers, are divided into age groups with 15-year intervals.

In the consumption of young dependants public and private components have almost equal weights. Public transfers cover more than half of their consumption, but they also receive significant familial transfers to finance their consumption. Interestingly, young dependants have the largest share of all intergenerational transfers. They receive as net transfers 17 billion euros compared to 12 billion going to retired people.

Retired people have a significantly lower share of total consumption than any other age group in our classification. At the overall level this reflects the currently moderate size of this age category. Private consumption declines significantly when people retire (see Section 5), but overall consumption remains at the average level because of the increasing role of publicly provided goods. They constitute over 40 per cent of total consumer expenditures for retired people. Despite the declining private consumption, old people are still saving roughly the same amount as they are leaving in bequests.

The most significant contributors to the life-cycle surplus is the population aged between 35 and 50. They generate by far the largest share of labour income and make the biggest contributions to both private and public transfers. They consume considerably less than their share of

labour income mainly because they contribute to public transfers. They are also the largest net contributor of private transfers and consume relatively little publicly provided goods.

Table 6. Life-cycle deficit by broad age groups.

		Age					
		Total	0–19	20–34	35–49	50–64	65+
Population	1000 p.	5237	1233	971	1120	1083	831
Life-Cycle Deficit	Million €	9 448	18 743	1 930	-19 378	-6 291	14 444
Consumption		90 438	19 361	12 841	24 076	19 098	15 062
Private		58 598	9 741	58 598	9 716	8 391	17 555
Public		31 841	9 656	31 841	9 645	4 450	6 521
Less: Labour income		80 990	80 990	618	10 911	43 454	25 389
Life-Cycle Reallocations		9 448	18 743	1 930	-19 378	-6 291	14 443
Asset Reallocation		10 942	-557	3 148	4 176	1 981	2 194
Income on Assets		31 582	173	1 591	12 525	12 572	4 721
Less: Saving		20 640	731	-1 557	8 349	10 591	2 527
All Transfers (net)		-1 494	19 300	-1 218	-23 554	-8 272	12 249
Inflows		60 856	13 706	6 385	10 082	12 034	18 648
Outflows		62 236	2 106	7 592	29 002	19 215	4 321
Public (net)		-1 380	11 600	-1 207	-18 920	-7 180	14 327
Private (net)		-114	7 700	-10	-4 634	-1 091	-2 078

Source: Household Budget Survey 2003; Statistics of Income and Property in 2004 Survey of Wealth in 2004. Own calculations.

Although still positive, the life-cycle surplus diminishes significantly for those aged between 50 and 64 years. These people have the highest proportion of consumption with a relatively small share coming from public services. The oldest group of the active population generates significantly less labour income than the previous age category, but earns much more asset incomes. This is well in accordance with our observations about the wealth distribution by age in Section 3.5. This category is saving a significant part of its income, but not making intergenerational transfers even close to the magnitudes of the previous age group.

4 An Interpretative Framework for Age Structure and Intergenerational Transfers

In this section we present some results linking growth and intergenerational transfers. The significance of these is illustrated using Finnish data. This section relies heavily on Lee and Mason (2007b). The age structure of the National Transfer Accounts can be used in anticipating the consequences of ageing. Some insightful relations between intergenerational transfers and life-cycle consumption in a golden rule growth setup has been set out by Arthur and McNicoll (1978), Willis (1988) and Lee (1980, 1994a and 1994b).

We have already discussed the impact of population ageing on the output per capita by its effect on the support ratio. A preferable measure to evaluate welfare consequences is consumption. This, by definition, is the part of the income (Y) that is not saved (S). In per capita terms consumption is:

$$\frac{C}{N} = \frac{Y}{N} - \frac{S}{N} = \frac{L}{N}\left(\frac{Y}{L} - \frac{S}{L}\right) , \tag{7}$$

where N is population and L labour force. In a standard growth theoretical setup, an economy is in a steady state when its capital-labour ratio $k = \left(K/L\right)$ is constant. For example, if the labour force grows one per cent annually capital stock has to grow at anwith equal rate to keep the ratio constant. The growth of capital stock must be matched by savings:

$$S = nK , \tag{8}$$

where K is the aggregate capital stock and n is the growth rate of the labour force.

Income can be expressed as thea sum of labour and asset incomes:

$$Y = W + rK , \tag{9}$$

where W is the total wage bill and r is the rate of return on capital. Plugging (8) and (9) into (7) we get

$$\frac{C}{N} = \frac{L}{N}\left(\frac{W}{L} + \frac{rK}{L} - \frac{nK}{L}\right) = \frac{L}{N}\left(\frac{W}{L} + (r-n)\frac{K}{L}\right) . \tag{10}$$

Consumption per head depends on the support ratio, unit wages, the capital-labour ratio and the difference between rate of return and population growth rate.

The effect of ageing on consumption per head depends on the interactions of savings, interest rate and capital intensity. Conventionally one of the two polar cases has been analyzed. In the closed economy setup domestic savings and investments are identical. Increases in savings raise the capital-labour ratio, and the growth of capital relative to labour raises wages but

lowers the rate of return by boosting labour productivity. In the other extreme case of a small open economy rental is set by international markets. Variations in savings are not reflected in factor prices or in the capital-labour ratio, but in the asset position of the economy. In this case *K* in the Eequation (10) should rather be interpreted as net domestic wealth than domestic productive capital as do Elmerdorf and Sheimer (2000) or Guest (2007) among others.

Per Capita versus Life time Consumption

Several studies analyzing the interaction of age structure, intergenerational transfers and growth have abstracted from the endogenity of savings assuming its determination by 'golden rule' criteria (Arthur and McNicoll 1978; Willis 1988; Lee 1980, 1994a and 1994b). A golden rule steady state is one at which, for any population age distribution, per capita consumption is maximized through appropriate choice of the level of aggregate savings and capital per worker[1]. It thus focuses on elaborating how a different demographic regime, with alternative population growth, affects the highest level of per capita consumption that could be achieved in a sustainable way. Introducing changes in age distribution give additional life-cycle interpretation to some standard results of neo-classical growth theory without age distribution.

If labour force growth is the only factor inducing investment demand at the steady state, equilibrium savings are compatible with a capital–labour ratio that implies a rate of return on capital equal to the population growth rate. In this particular equilibrium, all income from labour is consumed and all income from aggregate capital is saved. In the golden rule steady state the last term disappears from Equation (6).

In the standard neo-classical framework, a golden rule steady state with faster population growth will have a higher golden rule level of saving and a lower capital-labour ratio. The more rapidly growing labour force has to be equipped with capital proportionately more than the rate of labour force growth, because the rate of return has to increase in order to match the golden rule condition that rate of return and population growth rate should be equal. Maintaining the new level of capital costs more, because output per worker is lower and savings out of that output are higher, steady state consumption per capita must be lower.

Arthur and McNicoll (1978) showed that the effect of life time consumption $\tilde{C}$ is not necessarily the same as the effect on aggregate per capita consumption $c = {}^C\!/_N$. They analyze changes of population growth rate to life-cycle consumption using a stable population theory. When age- specific mortality and fertility rates are constant the population grows at a constant exponential rate. If the stable population is growing at rate n, then the population aged *x* at time *t P(x,t)* is

$$P(x,t) = B(t)e^{-nx} p(x,t) , \tag{11}$$

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[1]   On the elaboration of the golden rule steady state see Barro and Xala-i-Martin (2004) or Burda and Wyplosz (2005).

where B(t) is number of births at date *t*, and *p(x,t)* is the proportion of those surviving from birth to age *x*. Using Equation (11) age-weighted consumption and production in Equations (3a and 3b) can be re-expressed as:

$$\widetilde{C}(t) = \int_{x=0}^{\omega} e^{-nx} p(x,t) \mathrm{w}_c(\mathrm{x}) dx \tag{12a}$$

$$Y_l(t) = \int_{x=0}^{\omega} e^{-nx} p(x,t) \mathrm{w}_1(\mathrm{x}) dx \tag{12b}$$

where $\widetilde{C}(t) = {}^{N(t)}\!/_{B(t)}$ and $Y_l(t) = {}^{L(t)}\!/_{B(t)}$, which can be seen to present discounted values of life-cycle consumption and labour earnings with the population growth rate as a discount factor. Noting theat crude birth rate $b = {}^{N}\!/_{B}$ the economy-wide per capita levels of consumption and wage income are respectively $c(t) = b\widetilde{C}(t)$ and $y_l(t) = bY_l(t)$.

In the golden rule steady state aggregate wage income and consumption are equal. This macroeconomic constraint is identical to the life- cycle constraint in this special case implying that $\widetilde{C}(t) = Y_l(t)$. Arthur and McNicholl (1978) use this to show that:

$$\frac{d \ln(\widetilde{C})}{d\, n} = \left(A_c - A_{yl} \right) - \frac{k}{c} \ . \tag{13}$$

Equation (9) states that in addition to a capital dilution effect $\left({}^k\!/_c \right)$ on life- cycle consumption, there is another effect depending on the timing of earnings and consumption during the life cycle. This is measured by average ages of consuming A_c and producing A_y. If consumption takes place on average earlier than production this reinforces the effect of capital dilution. More rapid labour force growth leads to a younger population that is the reason forto this additional effect. If consumption on average takes place later than production the overall effect is ambiguous. From the individual point of view it is more informative to use the present value of the life time consumption, rather than per capita consumption, to measure the consumption and welfare effects when demography changes.

Arthur and McNicholl (1978) does not discuss explicitly about the mechanism of covering the differences between consumption and income when there are age- specific deficits. Willis (1988) does this in the same modelling setup and derives two striking results[2]. He shows that the population-weighted average demand of per capita wealth is related to the age distribution of production and consumption:

$$W = c \ (A_c - A_{yl}) \tag{14}$$

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2   Willis (1988) derives his results in discrete time with no deathd hazard before the maximum age. Lee (1994a,b) generalizes these results to continuous time and distribution described in Equation (7).

If consumption on average takes place earlier than production there is need to shift resources downwards on average and vice versa: per capita wealth can be either negative or positive. Willis specifies wealth as an aggregate of physical capital and transfer wealth T. Transfer is specified as the present value of survival- weighted future net transfers. Total wealth is:

$$W = k + T \tag{15}$$

Using (14) and (15) we can re-express (13) as:

$$\frac{d\ln(\widetilde{C})}{dn} = \frac{T}{c} \tag{16}$$

When transfers are zero, the population growth rate has no impact on life time consumption. Consumption per head has to decline for the reasons discussed above. When transfers are zero, people have to save for life-cycle reasons to back their consumption when they have no earnings. Acceleration of population growth increases the share of younger people who consume less than they earn. Age-specific consumption does not have to change to keep the economy on thein golden rule path, because a change in age distribution induces the necessary increase in the per capita savings.

When transfer wealth is negative – transfers go downward – an increase in population growth leads to lower life-cycle consumption. An increase in population growth leads to a younger population that increases the transfer burden and reduces consumption consequently. On the other hand, if transfer wealth is positive then more rapid population growth will reduce the share of elderly in the population and relieve the transfer burden, allowing consumption to rise. This is an important result, since transfer wealth can be influenced by public policy. However, one should keep in mind that a large share of transfers are mediated through the private sector as intra-familial or inter vivos transfers.

5 Population Ageing and Intergenerational Transfers – What can we Infer from the Finnish NTAs

The components of life-cycle deficit per capita are presented in Table 7. Also the average ages of consumption, production and transfers received and given are reported. Several interesting features can be pointed out from the per capita figures. Although, at the aggregate level, the life-cycle deficit was largest for the young population, in per capita terms the deficit for the retired population is bigger. At the economy-wide level, this state of affairs is expected to change while population ageing is taking place and the age distribution tends to concentrate at the older end of the distribution.

Net transfers in both of the dependant groups are more or less equal, but young dependants are receiving private transfers, whereas the retired are contributing to net private transfers. The two dependant groups differ significantly from the other age categories in their patterns and financing of consumption. Almost half of the total consumption of the young is public services, and about two-thirds of the overall consumption is financed by public transfers. Aggregate consumption per head is fairly flat over the age groups, even though the young generation and those contributing most to cover the life-cycle deficit consume somewhat less than the population on average. Total consumption of the retired is roughly equal to the population average, but their private consumption is considerably smaller. Conspicuously, the consumption of retired people is completely financed by public transfers. Despite this fact, people in old age have positive savings about the same size as the bequests they are leaving.

Table 7. *The components of per capita life-cycle deficit by broad age groups.*

		Age					
	Per capita €	0–19	20–29	30–49	50–64	65+	Average Age
Life-Cycle Deficit	1 814	15 205	2 906	-13 590	-5 809	17 382	
Consumption	17 360	15 707	19 332	16 885	17 636	18 127	40.9
Private	7 882	12 633	12 312	13 163	10 447	10 310	42.0
Public	7 825	6 699	4 573	4 472	7 680	7 647	39.0
Less: Labour income	15 546	502	16 426	30 475	23 445	744	43.0
Life-Cycle Reallocations	1 814	15 205	2 906	-13 590	-5 809	17 382	
Asset Reallocation	2 100	-452	4 740	2 929	1 829	2 640	
Income on Assets	6 062	141	2 395	8 784	11 609	5 681	
Less: Saving	3 962	593	-2 344	5 855	9 780	3 041	
All transfers (net)	-287	15 657	-1 834	-16 519	-7 638	14 742	
Inflows	13 943	17 366	10 058	8 257	12 236	23 500	42.7
Outflows	14 230	1 709	11 891	24 777	19 874	8 758	45.9
Public transfers (net)	-265	9 411	-1 818	-13 269	-6 630	17 242	
Private transfers (net)	-22	6 246	-16	-3 250	-1 008	-2 500	

Source: Household Budget Survey 2003; Statistics of Income and Property in 2004 Survey of Wealth in 2004. Own calculations.

The middle-aged people ranging from 35 to 50 years are the main providers of net transfers per capita. This is not because they are disproportionately paying transfers relative to their labour income, but because they are receiving, on average, less transfers than other age groups. The older age group of working age is earning labour income per head of about 25 per cent less than middle-aged people but receiving transfers about 50 per cent more. This reduces their contribution in financing the life-cycle deficit to about 40 per cent in per capita terms relative to those aged 35 to 50. The youngest generation of working age contributes even less, making the size of the contribution by the middle-aged to be about twice as large as the combined contributions of the other two active age groups.

The average ages of consumption and production are informative indicators in assessing intergenerational transfers. When production takes place earlier than consumption there is a need for upward transfers. In terms of the previous section life-cycle transfer wealth is positive. There has to be some mechanism to transfer purchasing power of earned income to older ages when consumption takes place. In the opposite case downward transfers are needed, and the life-cycle transfer wealth is negative. This is clearly the case in Finland, where both private and public consumption takes place earlier than production. Relative to private consumption this difference is about one year, but taking into account public consumption, the difference broadens to more than two years. Transfers go downward: they are received about three years earlier than given.

Life-Cycle Consumption with Stable Population

In Section 4a specific growth theory context was used to demonstrate the importance of inter-age transfers. Although instructive to present analytical results this setup is not a good description of actual economies. Typically all profit income areis not invested but aggregate savings are smaller because of a preference for current consumption. The Equilibrium level of savings and investments would also be affected by productivity growth.

In this section we use a stable population theory to analyze the impacts of changes in population structure with the Finnish intergenerational transfer data in a simulation framework similar to Mason, Ogawa and Chawla (2008). We calculate the life-cycle consumption for the cohort born in 2004. Initial assets are assumed to be zero, hence the lifetime budget constraint is:

$$\text{PV}[Y_1] + \text{PV}[T] = \text{PV}[\widetilde{C}] \; , \tag{137}$$

where PV[] is present value operator. Equation (711) is used to calculate age distribution. Population growth rate (*n*) is and age-specific survival rates *p(x)* are exogenous. The cross-sectional age profile ofis wages $w_l(x)$ is assumed to be exogenous and its shape is unchanging, .but the profile shifts upward by the rate of productivity growth (*g*).The present value is calculated using the constant discount rate. Consumption is endogenously determined. The shape of the cross-sectional profile is constant, but it increases at a constant rate equal to the rate of growth of productivity or income. The level of consumption is determined by the life-

time budget constraint of the representative cohort born in 2004. Discount and interest rates are assumed to be equal.

Table 8 presents life-cycle consumption results for a representative cohort born in 2004, the base year of our intergenerational transfer accounts. These are calculated using current mortality rates and estimated rates for 2050. With current mortality the life-expectancy of a newborn is 79 years and with 2050 mortality rates it is 87.5 years. Current fertility is below reproduction rate in Finland but because of migration the population is expected to grow annually on average by 0.15 per cent up to 2075 in population forecasts. As an alternative to the forecasts we assume a stationary population.

The discount rate has a crucial role in the determination of life-cycle consumption. In calculating life-cycle consumption we have used 4.5 and 6 per cent as two alternative rates in evaluating present values of steady state consumption and income profiles. The discount rate is taken asto be given and population changes are assumed to have no effects on it. We have also assumed an the annual productivity, which shifts consumption and income profiles up by 1.75 per cent annually.

Table 8. *Steady state life-cycle consumption of 2004 cohort with alternative mortality rates and population growth.*

		2004 mortality rates		2050 mortality rates	
		Discount rate		Discount rate	
		4.5 %	**6 %**	**4.5 %**	**6 %**
Population growth rate	**0.15%**	92.5%	97.1%	90.2%	96.7%
	0.00%	93.9%	98.5%	91.5%	98.1%

With observed mortality rates in 2004 sustainable life-cycle consumption with forecasted population growth and a 4.5 per cent discount rate is 92.5 per cent relative to that with the current consumption profile. Keeping in mind that consumption is growing annually by 1.75 per cent this means for the representative cohort that it's consumption at the age of 50 is 1.2 times higher than the consumption of those currently at the age of 50. It would have been 1.38 times higher if the current profile had been compounded by the productivity growth.

We can see that a decline in the population growth rate makes it possible to increase consumption for the reasons discussed in the previous section. Expected declines in mortality rates would increase significantly the average age in the economy. If labour income patterns remain unchanged, as we are assuming here, savings have to be increased to back up the consumption at older ages. With a lower rate of return this implies relatively large deviation (2.5%) from to the consumption with current mortalities. If the rate of return for savings is 6 per cent the needed adjustment is about half a percentage points in consumption.

The observed level of consumption seems not to be sustainable neither with the current or expected mortality rates. The question is how we should optimally approach this target. One possibility is to incorporate the national transfers account data into the Ramsey optimal growth model modified in the fashion ofby Cutler et al. (1990), Elmerdorf and Sheiner (2000) or Guest (2006).

6   Concluding Remarks

National Transfer Accounts (NTA) provides a comprehensive approach to measure reallocations of income across age and time at the economy level forming a basis to adequately quantify phenomena related to changing age structures. We have demonstrated the usefulness of this methodology applying it to the Finnish data for the year 2004.

Generations run life-cycle surpluses in the middle of their lives for 35 years between ages 26 and 60. The noticeable feature in the pattern of reallocation is in the relative roles that public and private allocations have in smoothing consumption over time. There are substantial private life-cycle deficits for the younger cohorts but no private dis-saving within the older cohorts.

Cohorts reach the average level of net wealth at the age of 40, although they have been net savers just for a few years. This is due to intergenerational transfers of wealth. Households under the age of 40 receive about one-third of bequests, but their relative share of net wealth is only half of that figure.

In Finland the public sector has a substantial role in the intergenerational distribution. Education and health care are predominantly provided in the public sector. Conspicuously high consumption at very old ages is provided by the public sector. Life-cycle reallocation at old ages is almost completely due to public reallocations.

In Finland the public sector is typically in surplus according to national accounting standards. In addition to that, there are remarkable changes of the positive public financial wealth due to market price changes of held assets, capital gains and losses. On average these changes are positive, and the question could be raised, how should we allocate the wealth accumulation by age?

The strong position of the public sector but also the patterns of public consumption are reflected in the age patterns of intergenerational transfers. Transfers are received on average more than two years earlier than they are contributed. Currently transfers flow downward in age. This is a favourable condition to meet the challenges of an ageing population. When the population is ageing, the share of young people is diminishing, reducing the need for downward transfers that gives room for higher life-cycle consumption. Although this result applies to the population with current survival probabilities, it indicates that there is room for manoeuvre with more challenging prospects.

Using steady state calculations we find out that the currently observed level of consumption relative to income is not sustainable for the future generations. Depending on the assumptions the consumption has to be reduced between two to ten per cents. This is, however, not in absolute terms but relative to the trend with current consumption level. How the adjustment would take place in an optimal manner is subject to another study.

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The Finnish Centre for Pensions is the statutory central body of the Finnish earnings-related pension scheme. Its research activities mainly cover the fields of social security and pension schemes. The studies aim to paint a comprehensive picture of the sociopolitical, sociological and financial aspects involved.

Eläketurvakeskus on Suomen työeläkejärjestelmän lakisääteinen keskuslaitos. Sen tutkimustoiminta koostuu pääasiassa sosiaaliturvaan ja työeläkejärjestelmiin liittyvistä aiheista. Tutkimuksissa pyritään monipuolisesti ottamaan huomioon sosiaalipoliittiset, sosiologiset ja taloudelliset näkökulmat.

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