

Finland's slow recovery from the financial crisis: a demographic explanation

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ABSTRACT

This article uses the National Transfer Accounts (NTA) method to explore how demographic changes have impacted recent macroeconomic developments in Finland. NTA allows us to break down national income and consumption by age. The results show that population ageing has already had a profound effect on the macroeconomy. The relatively large current account surplus at the beginning of the 2000s would have been substantially reduced because of ageing even without the concurrent structural problems in the export industry. The declining share of wage earners in the population reduces the savings rate, which in turn contributes to shrink the current account surplus. Population ageing is creating pressure for change in the level and structure of consumption as well as in relative prices. The growing need for public health and old-age care services presents a considerable challenge for public finances. It is essential that the labour supply is substantially increased in order that current levels of consumption can be maintained. The current level and age pattern of consumption relative to earnings must be adjusted in order to make them sustainable in the long term.

1. INTRODUCTION

In the global economic downturn that has followed the 2008 financial crisis, Finland's output and growth performance have been slower to rebound than in its neighbouring Nordic countries and in most other EU countries (OECD, 2016). In this article we will argue that one potential explanation for Finland's slow recovery lies in demographics. Both domestic and international commentators agree that the outlook for the Finnish economy is dampened by current and foreseeable demographic trends (MoF 2013, EC 2013; OECD, 2015). However, analyses of the reasons for the prolonged recession following the financial crisis have given only marginal attention to the role of demographics.

In this article we examine, first, how Finnish macroeconomic development since the millennium has been impacted by population ageing; and second, what impacts can be expected in the future given the baseline population projection. Population ageing exerts a significant impact on the national savings rate (public and private net lending), the current account, demand and supply structure, and relative prices. Our analyses of these issues use the tools of the National Transfer Accounts (NTA) to measure intergenerational resource flows based on observed age profiles of income and consumption. The NTA system is consistent with the System of National Accounts (Mason and Lee, 2011).

Most earlier analyses of macroeconomic development in Finland since the 2008 financial crisis are framed by the rise-and-fall story of ICT giant Nokia. In addition, reference is often made to the troubled forest industry (see Holmström, Korkman and Pohjola, 2014; OECD, 2016). Finland's price competitiveness has declined throughout the 2000s. At the same time, the ICT cluster has been plunged into a productivity crisis. The decline in competitiveness is most readily apparent in the slide in the external or current account balance that has continued to deteriorate for more than a decade, and in the Finnish economy turning from a net lender to a net borrower in 2011 (Kajanoja 2012; Maliranta and Vihriälä, 2013).

The deterioration of the external balance is a general equilibrium phenomenon resulting from adverse shocks to export industries and factors determining absorption relative to domestic supplies. Lifecycle considerations are particularly important in this respect: workers save individually and through the pension system to smooth consumption over their lifetime, while retirees dis-save through the same channels. The declining share of wage earners in the population reduces the savings rate, which in turn contributes to reduce the current account surplus. Obstfeld and Rogoff (1996) show in an overlapping generations model that ageing caused by a decline in fertility decreases the net savings of an economy.

Higgins (1998) has presented an econometric analysis of the relationship between age distribution, national savings and the current account balance with a sample of 100 countries. His results point to substantial demographic effects, with increases in both the youth and old-age dependency ratios associated with lower savings rates. The estimation results indicate that demographics have differential effects on savings and investment and therefore impact the current account balance. In a number of countries the estimated demographic effect on the current account balance over the last three decades exceeds 6% of GDP. Using out of sample projections based on expected demographic trends, he anticipates that these effects will probably be even greater over the coming decades.

Ferrero (2010) has used a multiregional overlapping generation model to analyse the impacts of demographics coupled with differences in productivity growth and fiscal policies on external balance in 1970-2005. He found that demographic differentials imply a non-negligible and nearly permanent external deficit for the US relative to major industrialised economies, whereas fiscal policy differentials are of minor importance. According to Ferrero's simulation exercise, differences in life expectancy, rather than population growth rates, are the main demographic factor responsible for country differences in saving patterns.

These simulations abstract from structural changes in the modelled economies. Relative price changes in the domestic economy provide an additional mechanism for explaining the macroeconomic effects of demographic change. For purposes of studying these impacts on the external balance of an economy, it is useful to distinguish between industries that are open to international competition and those that are sheltered from international competition, since demographics have different effects on their demand. Due to competition, tradable industries must take international prices as a given, while domestic industries can pass through their costs into their prices. When total demand increases relative to domestic production, relative prices in the non-tradable sector will rise and the real exchange rate will become revalued. The amount of movement seen in domestic prices will depend on the supply of foreign substitutes (Obstfeld and Rogoff, 1996).

Changes in age structure affect the structure of demand. American and European consumption studies based on individual-level data have found that compared with the working age population, older people

spend more of their money on services protected from foreign competition (Hojbin and Lakatos, 2003; Ewijk and Volkerink, 2012).

Individual-level data provide only an incomplete picture of the incidence of consumption, however, since they do not tend to take account of public consumption. Public consumption consists of health care and long-term care services. It is, in very large part, publicly subsidised or produced consumption that is not included in consumer surveys' household consumption figures. A major part of the population using such services is excluded from household surveys. In OECD countries health care expenditure accounts for an average of 10% of GDP. One-third of these services are privately financed. Hagist and Kotlikoff (2005) estimated the age profiles of health care expenditure and concluded that older people's per capita health care expenses are several times higher than those of the working aged.

Econometric time series and cross-section studies of the real exchange rate have found that the declining dependency ratio has increased the relative prices of non-tradables (Braude, 2000; Groneck and Kaufmann, 2014). Groneck and Kaufmann (2014) used a group of OECD countries to see how relative prices reacted to changes in the dependency ratio. They estimated that a 10% increase in the elderly support ratio would raise relative prices in the closed sector by 6-13%. Based on a review of a larger group of countries, Braude (2000) estimated that a country's prices will rise by 10-15% if the dependency ratio increases by 10%.

In what follows, we begin by presenting a concise description of economic developments in Finland in the 2000s, both before the financial crisis and during the prolonged recession that followed. We recount the established interpretation of Finland's export-driven crisis and consider the question of how demographic changes in the country could be linked to recent economic developments. Next, we proceed to describe the National Transfer Accounts system as well as the breakdown of income and consumption by age in the Finnish economy. Based on this breakdown, we explore the connection between the population age structure and macroeconomic development in the 2000s. Finally, we discuss some issues raised by this review regarding Finland's demographic and economic outlook.

2. FINNISH ECONOMIC DEVELOPMENT IN THE 2000S

Before the 2008 financial crisis, the Finnish economy was posting annual growth of around 3%. This was twice as fast as the average growth rate in the euro area and nearly as fast as in the rest of the EU (The Conference Board, 2016). Table 1 shows the comparative macroeconomic performance of EU countries within and outside the euro area. GDP per capita and labour productivity growth are given for euro and non-euro areas on average and for Finland and Germany as individual euro members, and for Sweden as an individual EU country that is not a member of the currency union. On average, GDP per capita

growth before the financial crisis was much stronger in the EU countries outside the euro area. That growth was driven more by increasing productivity than by increasing employment. In Finland, growth was almost as fast as outside the euro area, and significantly faster than within the euro area on average. Finland and Sweden were on largely similar performance tracks before the crisis, and Germany was close to the average in the euro area.

Things have changed significantly since the crisis. Like most other euro area countries, Finland has failed to recover to the pre-crisis output and labour productivity levels. Germany and Sweden, on the other hand, have rebound to growth: Germany mainly by increasing its employment rate and Sweden by increasing its productivity and maintaining a very high employment rate.

Table 1. Finnish macroeconomic performance in a European perspective

	GDP per capita		Labour productivity		(Population 0-24 and 60+) / Population 25-59		
	2000=100		2000=100		(%)	(%)	(%)
	2008	2015	2008	2015	2000	2008	2015
Euro area	111	109	108	114	104	103	107
Finland	123	116	116	115	103	110	122
Germany	112	119	111	116	99	102	105
Non-euro EU	126	135	120	126	110	105	107
Sweden	118	122	117	123	109	117	122

Source: The Conference Board database (2016), Eurostat (2015).

Demographic trends as measured by the total dependency ratio have been relatively diverse. Conventionally, the dependency ratio is defined as the number of people aged under 15 and over 65 as a percentage of the working age population (15-64 years). However, for purposes of describing economic dependency this is not an entirely satisfactory indicator.

From a life-phase perspective, European people under 25 are, on average, consuming more than they are producing and so generating a lifecycle deficit. The same goes for the population over 60 (Hammer, Prskawetz, and Freund, 2015). Using these age brackets, we find that in the space of 15 years, the number of dependants relative to 100 supporters has increased by 19. This is faster than anywhere else in Europe, where support ratios were slightly improving before the financial crisis and only modestly deteriorating after the crisis.

In the year 2000, the Finnish population aged 25-59 that produced the lifecycle surplus amounted to 2.5 million individuals. The population generating the lifecycle deficit, that is, those under 25 and over 59, amounted to 1.6 million and 1.1 million, respectively. This translates into a ratio of 103 dependants to 100 providers in 2000 (Table 1). By the end of 2013, the number of individuals producing a surplus had fallen by 80,000, while the number of older individuals contributing to the deficit had grown by more than 400,000 to over 1.5 million. The number of young individuals, contributing to the deficit decreased, by 60,000 narrowing the deficit burden caused by the growing number of ageing people. As a result of demographic change, the ratio of dependants to providers was 122 to 100 by the end of 2013. In net terms this amounts to 420,000 individuals, which means that the number of dependants relative to providers increased by 17 percentage points. Such is the magnitude of this change that it will inevitably have left a mark on the macroeconomy.

Changes in the support ratio do not necessarily give a true reflection of the macroeconomic implications of population ageing, since the gap between earnings and consumption varies by age. Macroeconomic costs due to the age structure can change even with a stable support ratio when the relative weights of the young and older people move in opposite directions and overturn each other. An increase in the number of older people relative to the working age population requires a lot more inter-age transfers than an increase in the number of young dependants.

In 2000–2007 the tradable sector¹ of the economy showed particularly fast growth, driven mainly by the sharp rise in total factor productivity.² On the flip side, employment in the open sector was on a slight downward trend (Table 2). In the same time frame, there was no improvement in total factor productivity in the non-tradable sector. Production was increased by expanding the labour force. Employment in the non-tradable sector grew by an annual average of 2%. Measured in terms of the numbers employed, the public sector did not expand during this period. The number of private sector employees increased, but more slowly than the average rate of economic growth.

The relative productivity of the non-tradable sector declined before the financial crisis. In order to be able to compete successfully for labour force, its prices needed to rise relative to those in the tradable sector. Relative prices in the closed sector rose by more than 4% annually in 2000–2008.

¹ The open sector includes agriculture and forestry, mining, heavy industry, transport and storage, as well as information and communications services, or sectors A, B, C, I and H in the Standard Industrial Classification (SIC). Change in production is calculated using value added at fixed prices, and change in prices using a value added deflator. This is standard procedure in comparative research concerned with the determination of exchange rates in the open and the closed sector (Bettendorf and Dewachter 2015; Canzoneri, Cumby and Diba 1999; De Gregorio, Giovannini, and Wolf 1994; Groneck and Kaufmann 2014).

² Overall productivity depicts the part of output growth that cannot be explained by a change in the income-share weighted input. The total factor productivity figures for the open and the closed sector are calculated based on Statistics Finland's industry-specific productivity surveys (2014).

The stagnation that followed the international financial crisis caused a long-term slump in production. Measured in constant prices, total production in the economy still remains well below its pre-crisis level. This is largely attributable to decreasing total factor productivity in the tradable sector. The difficulties Nokia had in keeping up with the competition in consumer innovations was to a considerable degree reflected in the post-recession figures for open-sector total factor productivity.

Overall, total factor productivity growth has been negative throughout the recession. In the non-tradable sector it has also been negative since the onset of recession. Despite an increase in employment, then, production in the sheltered sector has failed to rebound to pre-recession figures.

Table 2. Economic development in Finland in the 2000s

	Period		
	2000–2007	2008–2013	2000–2013
Average change in production (%/year)			
Total economy	2.8	-1.5	1.1
Tradable sector ¹	3.7	-3.3	0.9
Non-tradable sector ²	2.3	-0.6	1.2
Average change in prices (%/year)			
Tradable sector ³	-0.9	-0.2	-0.6
Non-tradable sector ³	3.4	2.1	2.8
Relative prices in open sector ⁴	-4.3	-2.3	-3.4
Change in total factor productivity (%/year) ⁵			
Total economy	0.9	-1.4	0.0
Tradable sector	2.5	-1.7	0.9
Non-tradable sector	-0.1	-1.2	-0.5
Average change in employment (%/year)			
Total economy	1.4	-0.5	0.6
Tradable sector	-0.1	-2.4	-1.0
Non-tradable sector (incl. public sector)	2.1	0.3	1.4
Public sector	0.9	0.3	0.7
Capital-output ratio			
Total economy	4.2	4.6	4.4
Tradable sector	2.2	2.7	2.4
Non-tradable sector	5.5	5.5	5.5
¹ Change in fixed price value added (SIC A, B, C, H and J); ² Change in fixed price value added (SIC D, E-G, I, K-T); ³ Change in value added price deflator; ⁴ Change in open-sector prices relative to closed-sector prices; ⁵ Output change that cannot be explained by growth in input use. Sources: Statistics Finland, Annual National Accounts and Productivity Surveys.			

3. NATIONAL TRANSFER ACCOUNTS, LIFECYCLE DEFICITS AND DOMESTIC ABSORPTION

National Transfer Accounts (NTA) is a framework for collecting, combining and analysing intergenerational and lifecycle reallocation variables that are consistent with the System of National Accounts (SNA) (Mason and Lee, 2011 and UN, 2013). NTA provides a tool for estimating private as well as public consumption and labour income by age, and for calculating the difference between the

two, called the lifecycle deficit (LCD). The sources from which the lifecycle deficit is financed can be derived from age-specific data on public and private asset income, savings and transfers. If necessary, the variables are adjusted so that corresponding economy-wide aggregates in the National Accounts are satisfied.

SNA and NTA share the same basic economic concepts: production in the economy is equal to total factor income, which further equals total spending. NTA measures national, rather than domestic, values. Net national disposable income equals spending:

$$Y = Y_l + Y_a + T = C + S \quad (1)$$

where labour income (Y_l) includes net compensation of employees from the rest of the world, and asset income (Y_a) includes property and entrepreneurial income from the rest of the world. Transfers are net current transfers from the rest of the world. Net income equals consumption (C) and net savings (S), which both have public and private components.

The identity (1) would allow us to study to what extent population ageing combined with the NTA-based constant age profiles of labour income and consumption could explain the observed net saving rates (S/Y) since the year 2000, for example.

In a closed economy, net saving equals net investment. An open economy could save in foreign assets or run into foreign debt in addition to financing domestic net investments. The current account indicates whether an economy is cumulating or decumulating foreign net assets. We get the net national savings rate by dividing the identity (1) by Y and by multiplying and dividing consumption C by Y_l :

$$\frac{S}{Y} = 1 - \frac{Y_l}{Y} \frac{C}{Y_l} = \frac{B}{Y} + \frac{I}{Y} \quad (2)$$

where B is current account and I is net investment. Current account is:

$$\frac{B}{Y} = 1 - \frac{Y_l}{Y} \frac{C}{Y_l} - \frac{I}{Y} \quad (3)$$

In other words, current accounts are determined based on the labour income share, the ratio between consumption and labour income (C/Y_l) and net investment as a share of disposable income. In the following, we discuss how the ratio of consumption and labour income depends on the population age structure.

The NTA methodology provides a comprehensive approach for measuring income and its use by age and for reallocating income and changes in income over time between age groups (United Nations,

2013). It makes good sense to examine the breakdown of the national accounts by age groups because the main reason for financial flows between age groups is that people in the early and final stages of their lifecycle typically consume more than they earn. The difference is covered by direct or indirect income transfers from the working age population. Over time these flows will vary with fluctuations in the size of age groups, and they will ultimately determine the direction of income transfers on the age axis. Saving and the amount of asset income also depend on lifecycle stages.

NTA is currently used to depict and analyse financial interactions between age groups in more than 40 countries at various stages of development (Lee, 2014). Together, these countries account for more than 80% of the global population. In Finland the method has also been used to describe the financial implications of population demographics (Vaittinen and Vanne 2011; Riihelä, Vaittinen and Vanne 2011 and 2014).

The difference between consumption and labour income depicts the need for financing in the various stages of the lifecycle. This need is managed through public and private net transfers, asset income and net saving. The rearranged identity of income and expenses (1) is the lifecycle deficit for a single one-year age group (a):

$$C^f(a) + C^g(a) - Y_l(a) = Y_A^f(a) + Y_A^g(a) - S^f(a) - S^g(a) + T^f(a) + T^g(a) \quad (4)$$

The variation in income and consumption over the lifecycle makes the identity particularly interesting. The right side of the equation divides the difference between consumption and labour income into net asset income, (Y_A) change in assets (S) and net income transfers (T) of financing. Most of the components consist of private (f) and public (g) components indicated by a superscript. If the difference is negative, the right side of the equation divides the income deficit into those quantities.

International NTA comparisons or comparisons of different periods standardise the quantities of equation (4) by the total labour income of the economy. When equation (4) is presented with the per capita figures for each age group, standardisation is performed with the average labour income of the age group 30-49 in the statistical year in question (Mason and Lee, 2011).

The mode in which the identity is presented emphasises the lifecycle hypothesis. Initially, citizens have no other financial source for their consumption than their labour income and net transfers from others. Part of their labour income is set aside, and the saved amount and the profit from these savings will be available for use at later stages in the lifecycle. Age-related transfers distribute resources between age groups at a certain point in time. By saving or dissaving, people transfer consumption opportunities over time.

Numerical proportions based on the size of age groups or the numbers of employed and other groups are commonly used to describe an ageing population. Using NTA, the ratio of total consumption to total labour income can be interpreted as a weighted support ratio (SR) (Mason and Lee, 2011, 75):

$$SR(t) = \frac{Y_l(t)}{\bar{C}(t)} = \frac{\sum_{a=0}^A y_l(a, t_0) P(a, t)}{\sum_{a=0}^A c(a, t_0) P(a, t)}, \quad (5)$$

in which $c(a, t_0)$ and $y_l(a, t_0)$ are consumption and labour income per capita in age group a at time t_0 . $P(a, t)$ is the size of the age group in the year under review t , and A is the highest observed age in the statistical year. In practice, the figures for the highest ages are the averages for a few of the highest one-year age groups.

By selecting $c(a)$ and $y_l(a)$ of the year chosen as the baseline – for example, the year for which the most recent NTA figures are available – and by using the demographic weights of different years, we see how the support ratio has changed as a result of the demographic effect. Looking back through history, we can test how well demographics explain the ratio of consumption to labour income. On the other hand, for future years, we can calculate how demographics will change that ratio (Lee, 2014; Lee et al., 2014; Prskawetz and Sambt, 2014). In other words, according to equation (3), the net lending of the economy relative to national income depends on the inverse of the weighted support ratio derived from NTA.

Age profiles of labour income and consumption in Finland

Age-specific consumption profiles in NTA consist of both private and public consumption. Riihelä, Vaittinen and Vanne (2011, 2014) use household surveys to allocate private consumption in Finland. They separately review the allocation of consumption among age groups for consumer durables, housing, health care and education. Education and health care services have a considerable age-dependent component, and are mainly publicly financed. Riihelä, Vaittinen and Vanne (2011, 2014) allocate public consumption among age groups based on public administration data. Their estimates of age-group-specific labour income are based on income distribution statistics. Labour income includes wage and salary income, the employer's wage-related contributions, and part of self-employment income. The aggregates of income and consumption items in age-specific survey data are balanced to correspond to the figures of the national accounts.

In our review, income and consumption are examined in proportion to the average labour income of those in prime working age (30-49 years) (Figure 1). Labour income displays a strong age dependency due to age specificity in productivity and employment rates. Consumption is divided into total consumption and private consumption per capita. The difference between the two is public consumption. Total consumption per capita is on a fairly even level in the ages between 15 and 75 years. To cover the costs of that consumption, financing corresponding to the labour income for an average of 0.6 years of

the population in the prime working age is required. Consumption increases sharply after age 80 due to increasing public consumption, i.e. the use of public health and long-term care services.

Labour income exceeded consumption in the population over 26 and under 58 years. Consumption was lowest in the adult population aged 40-44. In 2006 the lowest consumption level was recorded for those born in the mid-1960s. This is partly explained by the child-care burden in this age group, and partly by the lingering effects of the recession in the 1990s. This age cohort had not yet established itself in the labour market when the recession hit, and therefore their earnings showed slower growth than in younger and older age cohorts (Riihelä, 2007). In 2006 consumption in the working-age population was highest among those around 60 years of age, that is, among those born in the mid-1940s.

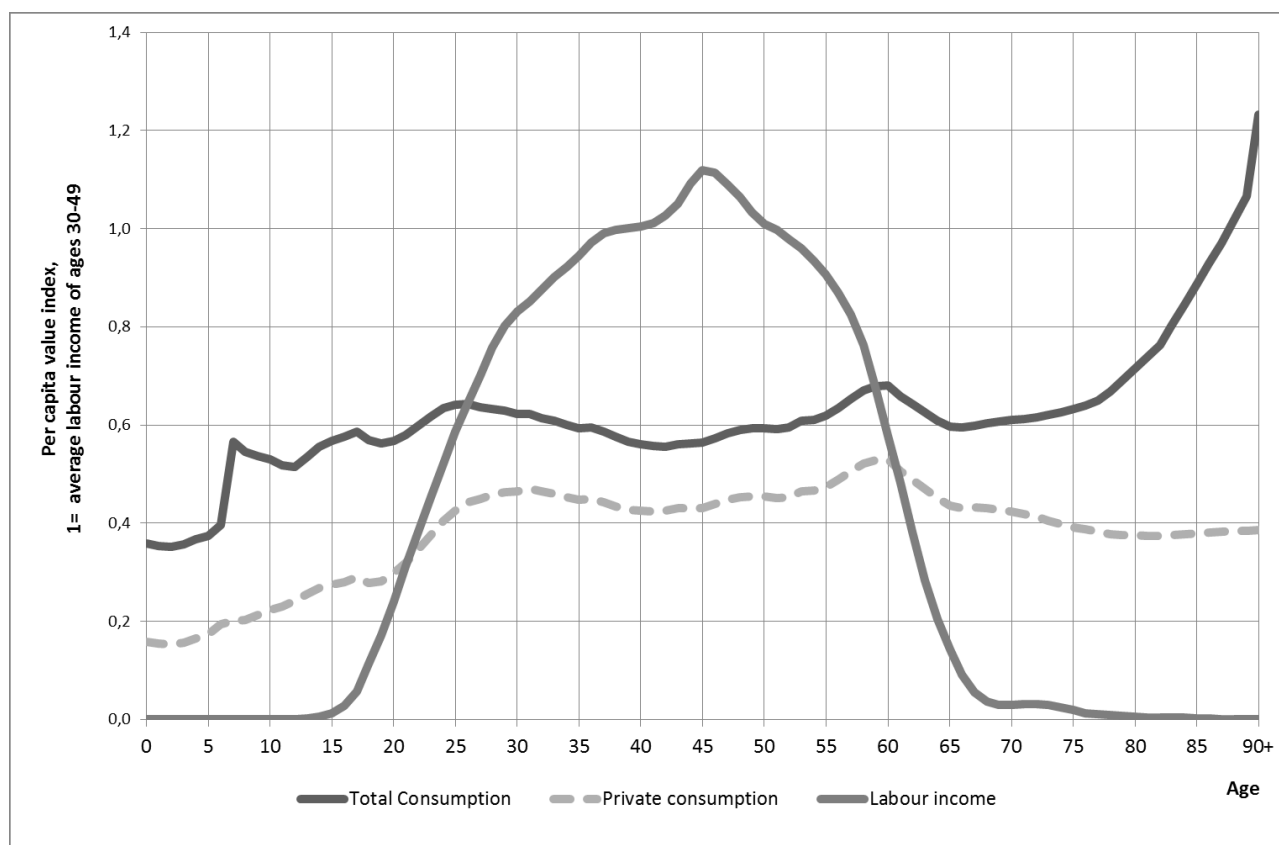


Figure 1. Age profiles of labour income and consumption in Finland in 2006

Source: Statistics Finland and own calculations (Riihelä, Vanne and Vaittinen, 2014)

Public consumption accounts for a relatively small proportion of total consumption in the age range between 30 and 65 years. In younger and older age groups, the weight of public consumption is considerably high, accounting for around one-half and two-thirds of total consumption, respectively. On average, the consumption of an older person in 2006 equals 1.2 times the annual earnings of a person in prime working age.

Public transfer arrangements have a significant role in the financing of the lifecycle deficit and the use of the surplus. In the older age groups, the share of public consumption increases with age and eventually exceeds the share of pensions received. Age-dependent public expenditure is a significant element in intergenerational income transfers, accounting for some two-thirds of total public sector expenditure, income transfers and subsidised services in 2011, equivalent to 32% of GDP. Age-dependent public income transfers accounted for roughly 18 % of GDP (Vaittinen and Vanne, 2013). Public sector net income was generated by those over 25 and under 62 years. This age range is somewhat wider than the corresponding range in the lifecycle profiles.

An examination of how the ratio of total consumption to labour income is impacted by demographic change will allow us to explore the connections of demographic change with the development of the macroeconomy more generally. This can be done by weighting the population according to equation (5) with the lifecycle-specific consumption and labour income presented in Figure 1. We ascribe monetary weight to demographic change, which provides a natural connection between demographic change and current account.

4. DEMOGRAPHICS AND EXTERNAL BALANCE

In this section we use life cycle profiles of consumption and labour income for 2006 to discuss the role of demography in the recent macroeconomic development in Finland. Using NTA profiles and population data, we construct a counterfactual scenario where only the population matters in the macroeconomic development. This scenario is compared to the actual outcomes to find out the role of demographic change for the patterns of recent developments in Finnish macroeconomy.

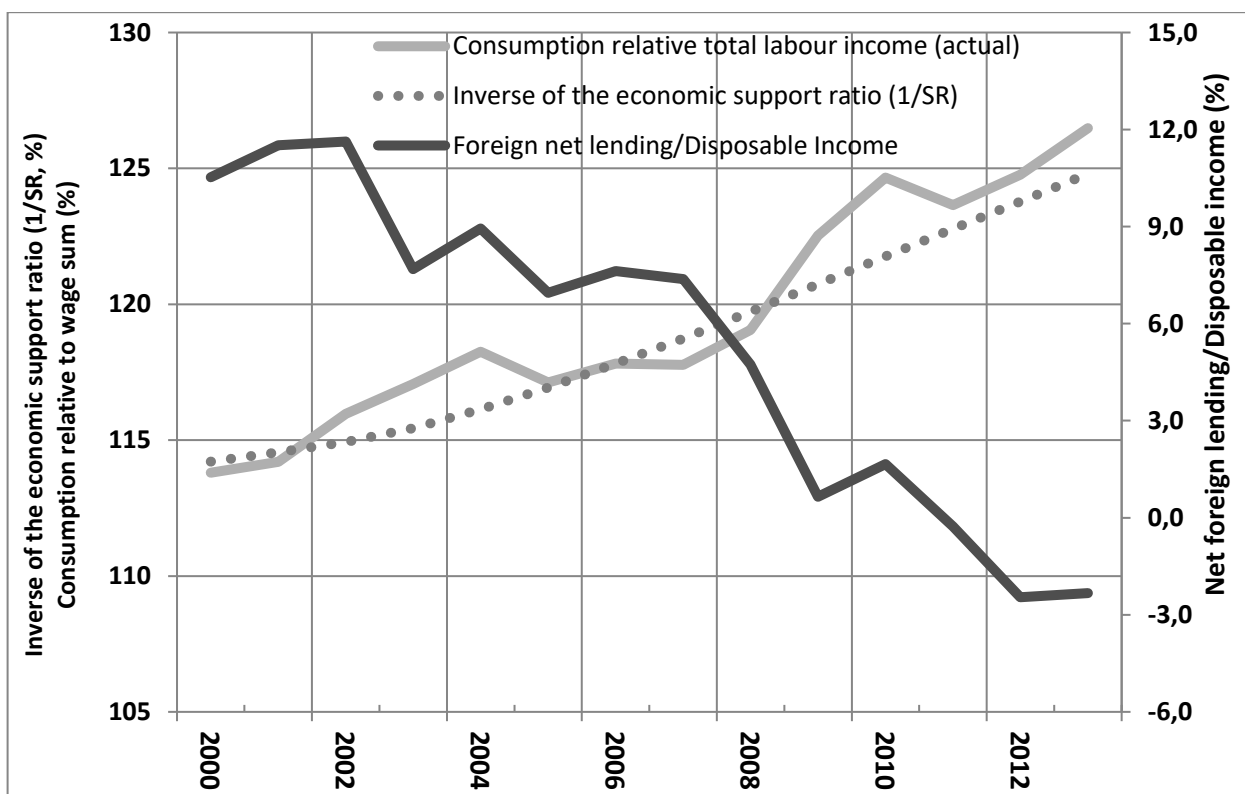
In particular we discuss the implications of ageing for the external balance of the Finnish economy. First, we first describe the recent developments in external balance, and second, how this development can be interpreted with the tools of NTA. Finally, we provide estimates of the effects of demographics on national savings and on its important component, public primary balance, investments and current account as a difference of savings and investments.

The ratio of consumption to labour income and the development of net lending have been each other's mirror images in the 2000s. Figure 2 presents the ratio of consumption to labour income, both based on national accounts aggregates (unbroken line) and the inverse of the support ratio (dotted line). The inverse support ratio captures the significance of demographics for the ratio of consumption to labour income. The difference observed in the actual ratio of consumption to labour income and the inverse of the support ratio depicts the decision-based reactions of economic agents to changes in the economic environment.

In the early 2000s, Finland's net lending relative to national income was firmly in positive territory. Finland financed other countries and saved more than 10% in foreign claims relative to disposable

income. Consumption exceeded labour income by some 14% in 2000 (Figure 2). The difference had to be covered either by capital income or foreign net income transfers. At the end of the review period, the consumption to labour income ratio had grown by approximately 10 percentage points. At the same time, net lending turned negative, meaning that some of the demands in the economy were met by foreign debt.

Figure 2. External balance and inverse of the economic support ratio in Finland



Source: Statistics Finland and own calculations (Riihelä, Vanne and Vaittinen, 2014)

Kajanoja (2012) and Maliranta and Vihriälä (2013) established that the turnaround in Finland's external balance was the result of dwindling exports. Our interpretation, on the other hand, emphasises the effect of domestic absorption factors on the external balance. The current account is the combined savings surplus of the private and the public sector less net investments in the national accounts. People's propensity to save is in part influenced by the export industry's success, as the income generated through exports can be used to accumulate assets. In addition to changes in income, the economy's savings rate depends on its age structure. Population ageing has the effect of lowering the savings rate (see Disney, 1996; Weil, 1994). People in their most active and productive years are more prone to save – in Finland particularly through the pension system – while savings (both private and those in pension providers) are dis-saved during retirement. These trends are accentuated on a macroeconomic level by recent demographic changes.

The changes seen in net lending during the review period correspond closely with those occurring in the inverse support ratio. Given the negative income shock from the financial crisis, consumers have been trying to even out their consumption over a longer period of time. Consumption smoothing is reflected in Figure 2 as the actual ratio of consumption over labour income increased relative to the underlying trend in 2009 – 2011. This was partly reflected also in weaker current accounts. The reaction to this income shock is now easing, and we are returning to a consumption to labour income ratio projected by demographic change.

To what extent are the observed outcomes attributable to demographics as an underlying trend factor, compared to business cycle and behavioural components? Using 2006 NTA age profiles for consumption and labour income, we have estimated the impact of demographic factors for 2000-2006 and 2007-2103 based on the observed population. In addition we present two projections for 2020 and 2030 based on Statistics Finland's population projection (Statistics Finland, 2012)³. We have estimates for the level of national savings rates, public sector primary balance⁴, and investments needed to keep constant the capital to labour ratio. The results are summarised (Table 3) as period averages. We have also made projections for savings, investments and current accounts to evaluate the sustainability of current behaviour patterns given the medium-term outlook for population ageing.

Demographics also impact investments. A decrease or slowdown in the number of working age people due to ageing reduces the investment rate, since this will hamper maintenance of a sufficient production capacity per employed person (Cutler et al., 1990). This will improve the external balance. We estimate the impact of ageing on investment needs by assessing the investment to output ratio (I/Y) needed to keep the capital output ratio (K/Y) constant:

$$\frac{I}{Y} = (g+n) \frac{K}{Y}, \quad (6)$$

³ We measure the expected change in the labour force by efficiency units in the same way as Lee, Mason and Jiang (2016). They use the nominator of equation (5) $Y_t(t) = \sum_{a=0}^A y_l(a,t_0)P(a,t)$ as an indicator of an efficient labour force. The relative annual change in labour input used in calculating the investment needs is $(Y_t(t_1)/Y_t(t_0)) - 1$. We need an age specific wage profile and population projection in estimating the change in the labour force implied by NTA's.

⁴ Primary balance (PB) is defined as the difference between current government spending on goods and services less current revenue from all types of taxes and net transfer payments. In terms of equation (4) $PB = \sum_a T(a) - C^g(a)$. It is the main determinant of public savings. We use 2006 NTA age profiles of public sector expenditure taxes and transfers to derive the impact of demographic change on primary balance.

where g is the growth rate of output per worker and n is the growth rate of workers. Inserting equations (5) and (6) into equation (3), the external balance to output ratio can be expressed as:

$$\frac{B}{Y} = 1 - \left(\frac{\alpha}{SR} \right) - (g+n) \left(\frac{K}{Y} \right), \quad (7)$$

where α is the labour share of income. NTA estimates of the effects of demographics on the savings rate are derived using the inverse of the support ratio, which is multiplied by the average share of labour income ($\alpha=0.73$) in 2000–2013. To calculate the investments needed to keep the capital-income ratio constant, we use a coefficient of 4.4, which is the average for 2000-2013 (see table 2) and the respective output and employment growths.

Based on 2006 NTA profiles and the observed demographic change, the average savings rate would have declined by four percentage points from 2000-2006 to 2007-2013, compared with the true figure of almost 10 percentage points. The estimated effect of demographics is thus about 40% of the actual change. The estimated savings rate was lower than the realised rate in the first period and higher in the second period. The observed difference is partly explained by consumers evening out their consumption expenditure over several years. However, demographics explain almost half of the reduction in the savings rate.

Table 3. Impact of demographic change on savings, investments and current account

	National savings rate S/Y (%) ¹		Public sector primary balance PB/Y (%) ¹		Investment rate (I/Y) (%) ¹		Current account (B/Y) (%) ¹	
	NTA estimate and projection	Observed	NTA estimate and projection	Observed	Constant capital to labour ratio estimate	Observed	NTA estimate and projection	Observed
2000-07	15.5	17.7	6.6	6.7	5.8	8.4	9.7	9.3
2008-13	11.5	7.6	3.5	0.0	4.8	6.2	6.7	1.3
2020	6.2		-0.8		5.7		0.5	
2030	-0.8		-5.0		6.2		-7.0	

¹ Relative to net disposable income

Source: Statistics Finland and own calculations.

The projected demographic effect is to a significant extent attributable to changes in the state of public finances. Three percentage points out of the estimated decline in the savings rate can be attributed to the population-induced change in the public sector primary balance that was firmly positive in 2000-2007. The demographic back casting of primary balance in 2000-07 (6.6%) is closely aligned with the observed figure (6.7%). Despite a considerable decline in primary surplus because of increased old-age related expenditure, the demographic projection of primary balance was still, on average, positive in 2008-2013. The actual change in primary balance showed no surplus in 2008-2013. Demographics accounted for half of the change in this particular component of national savings. Nevertheless half of the observed change is attributable to adjustment to the financial crisis and possibly other policy actions.

The actual change in the public sector financial balance amounted to more than six percentage points, accounting for more than half of the observed decline in the national savings rate. Unless changes are made to tax or spending policies, this will eventually swell into a significant deficit as expenditure on the older population continues to grow. In fact, if there are no policy interventions, the imbalance in public finances will ultimately be the main factor that turns the national savings rate negative.

Investment rates have varied between the two comparison periods far less than savings and variation has been larger than anticipated by constant capital-output ratio rule. When calculating the NTA estimate of investments, we have assumed that labour productivity growth is the difference between output and employment growth in the period 2000-2007 ($2.8\% - 1.4\% = 1.4\%$ in Table 2). For example the average investment rate of 4.8 for 2008-2013 is estimated by multiplying capital output ratio with labour productivity and estimating the change of efficient labour units [$4.8 = 4.4 * (1.4 - 0.3)$]. The expected drop in the NTA scenario is a counterfactual that describes what we would expect, if there were no financial crisis. The crisis is reflected in actual productivity and employment outcomes.

The investment rate has dropped by no more than some two percentage points. This is totally attributable to employment changes partially caused by population ageing, which reduces the need to equip the shrinking labour force with productive capacity. Given the severe shock to labour productivity (Table 2), one would have expected a sharper decline in investments in response. One possible reason for a more restrained reaction is that investments are based on a prospective development in productivity and difficulties during the crisis have been seen only as temporary phenomena of productivity growth.

On the other hand, there has been a clear shift from tradable to non-tradable production, which is far more capital-intensive and which requires more investment to expand. This is one potential reason why investment has not reacted more strongly to the crisis. The needs for sectoral adjustment in production in the face of population ageing are discussed in the next section.

If we take into account the changed investment needs due to the reduced number of working age people it is reasonable to conclude that the impact of ageing on the current account has come mainly from the changing state of public finances.

In the future, the impact of ageing on the labour supply will contribute to reduce capital formation. In the last period of our projection, ageing has no effect on capital formation. The savings rate, on the other hand, is expected to decline further and finally become negative. At current consumption and labour income levels it is expected that national savings will be negative. Thus, even without any net investments Finland will finance part of its expenditure out of foreign debt.

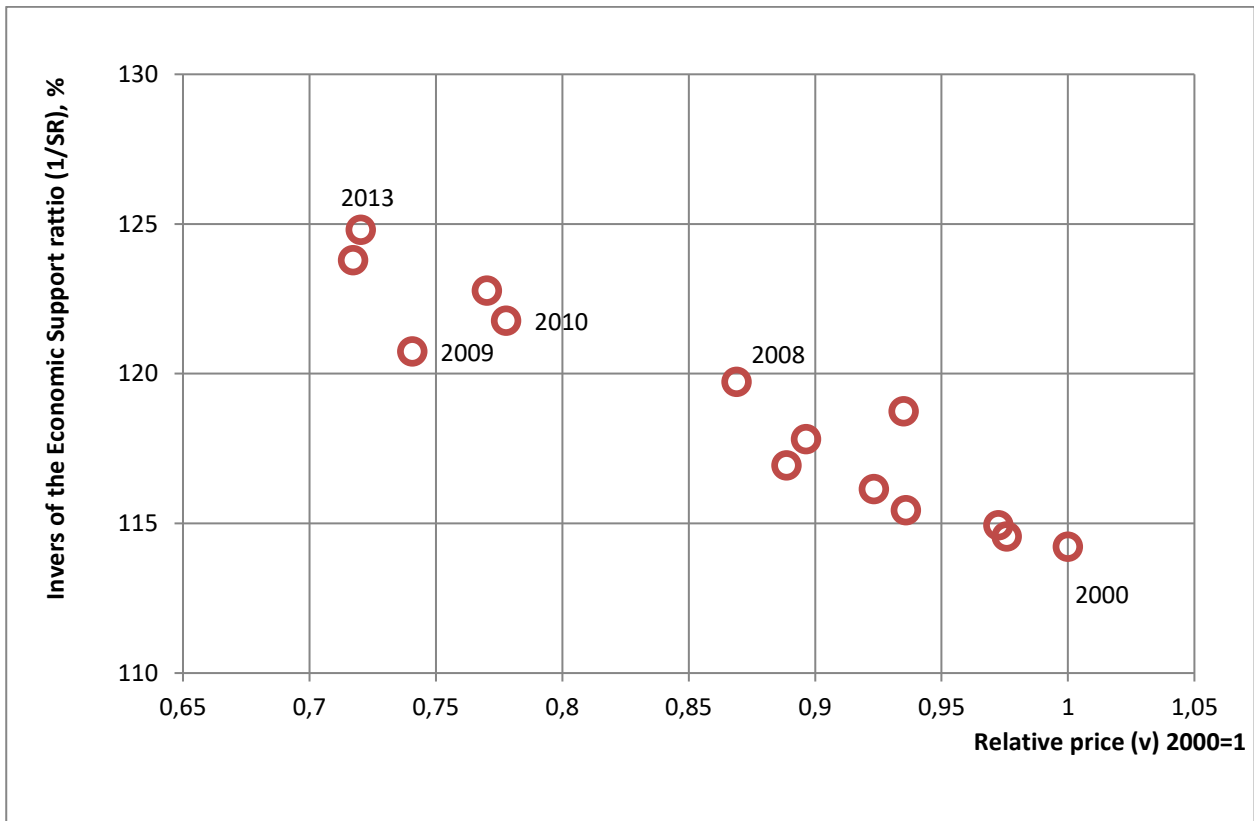
The anticipated current account deficit at the latest projection date is about 7.0% of disposable income, assuming an investment rate compatible with that during the post-crisis period (2007-2013). The main factor behind the increasing deficit is the projected primary balance (-5.0%). The anticipated outcomes are conditional on the assumption that there will be no behavioural changes. In section 6 below we discuss the extension of working lives as a possible way of sustaining current consumption levels.

5. POPULATION AGEING AND THE ECONOMIC STRUCTURE

The failure of Finnish export industries to keep up with global competition is not the only reason why their contribution to the economy's output has dwindled. It is possible that the declining role of exports also reflects the competition over resources for alternative needs. One indication of this is the relatively high investment rate in the financial crisis period, which might be caused by a shift in economic activity to the production of non-tradables that is far more capital-intensive on average than the production of tradables (Table 2). In this section we discuss briefly the causes and scope of the expansion in this sheltered sector.

Demographic change affects the demand and supply balance in general by reducing labour supply and increasing consumption demand, as was discussed in the previous section. Additionally, the structure of demand is impacted by age structure changes. Older people consume more services sheltered from foreign competition than people of working age (Hojbin and Lakatos, 2003; Ewijk and Volkerink, 2012). Over-60s households in Finland spend more than twice as much as the rest of the population on health care (Ahonen and Vaittinen, 2015). Indeed, public expenditure is a crucial aspect of any analysis of age-related consumption. Health and long-term care services account for a considerable share of publicly subsidised or produced consumption. Public consumption rises sharply around age 80, and at ages 90 and over, total consumption is almost twice as high as at ages 20–70 (Figure 1).

Figure 3. Relative prices and the inverse of the economic support ratio in Finland 2000-2013



Source: Statistics Finland and own calculations (Vaittinen and Vanne, 2015)

There is a clear dependence between the relative prices (v)⁵ in the open and the closed sector and the inverse of the economic support ratio during the review period (Figure 3). The economic support ratio has declined by 10 percentage points at the same time as the exchange rate was revalued by nearly 30%. When consumption is increasing relative to labour force resources, rising prices in non-tradables provide the channel for bridging the gap between supply and demand. Earlier econometric studies have also found an association between the real exchange rate and demographic support ratios (Braude, 2000; Groneck and Kaufmann, 2014).

Real exchange rate appreciation has the effect of transferring resources to the domestic sector and of deteriorating the external balance. In 2000–2013 the closed sector grew at an annual rate of 1.2%, 0.3% faster than the open sector (Table 2). Output declined in both sectors after the financial crisis (2008–2013). Both sectors saw negative productivity growth, but the decline in output was more limited in the

⁵ The relative price $v = \frac{P_T}{A_T} / \frac{P_N}{A_N}$ is the open sector's value added deflator (P_T) divided by the index of total factor productivity (A_T) relative to the productivity-adjusted price in the closed sector. The price ratio associated with the support ratio has been adjusted to relative productivities. It has been known since the 1960s that differences in productivity growth are reflected in real exchange rates (Balassa 1964; Samuelson 1964). In Finland, productivity has grown faster in the open sector than in non-tradable production (Table 2). If the productivity effect is not taken into account in relative prices, the association between the weakening support ratio and exchange rate appreciation would have a strong spurious element.

sheltered sector because of the shift in productive factors. Employment growth was positive in the period after the financial crisis, when employment overall and in the open sector in particular declined. The growth of employment in the more capital-intensive production of non-tradables explains, at least in part, the relatively limited reaction of investment to the productivity shock following the financial crisis.

6. DEMOGRAPHIC PROJECTIONS AND THE LIFECYCLE DEFICIT

In the section we discuss demographics and external balance using NTA profiles to project future developments and assuming no behavioural responses to demography. Our examination of current lifecycle profiles of consumption and earnings have made it clear that in the decade ahead, national savings will turn negative, and Finland will have to borrow from abroad in order to maintain the current level and age pattern of consumption. If we are to effectively manage the challenge of population ageing, then, we will need to either save more, work more, or probably do both in some combination. We examine what would happen to lifecycle deficits and savings if we assume higher labour force participation rates. Our aim is to characterize the magnitude of adjustments needed in terms of the most recommended means, i.e., in terms of the average length of working lives. Would it be sufficient to maintain current age patterns of consumption if we extend working lives by three years by 2030?

Based on Statistics Finland's population projection (Statistic Finland, 2012) and the lifecycle profiles in Figure 1, the following compares 2030 lifecycle projections based on the observed wage profile with an alternative scenario where employment rates are assumed to be the same as in Sweden in 2013 (Eurostat, 2015). Taking into account the life expectancy of the working age population (15-74), the expected time in employment for a 20-year-old at the start of their work career is calculated according to Hytti and Valaste (2009, 38). They used a method originally developed in health research for assessing the length of disability-free life expectancy (Sullivan, 1971). Based on the life expectancy in Finland and employment rates in Sweden, Finnish work careers would be extended by three years.

With current work career lengths and current age profiles of wages and consumption, 27.8% of consumption in 2030 will be financed through asset reallocation (Figure 4). This equals the average value of capital income relative to disposable income in the 2000s. In the baseline projection, the deficit of the young will grow by less than one percentage point, which will be offset by equal growth in the surplus of the working aged. The almost ten percentage points increase in the lifecycle deficit is mainly due to the increased deficit of older people. The national net savings rate will become negative. This, in turn, is largely the result of increasing public sector spending on health and old-age care services (Vaaitinen and Vanne, 2011) – the same situation as in other high-income countries with ageing populations (Lee et al., 2014).

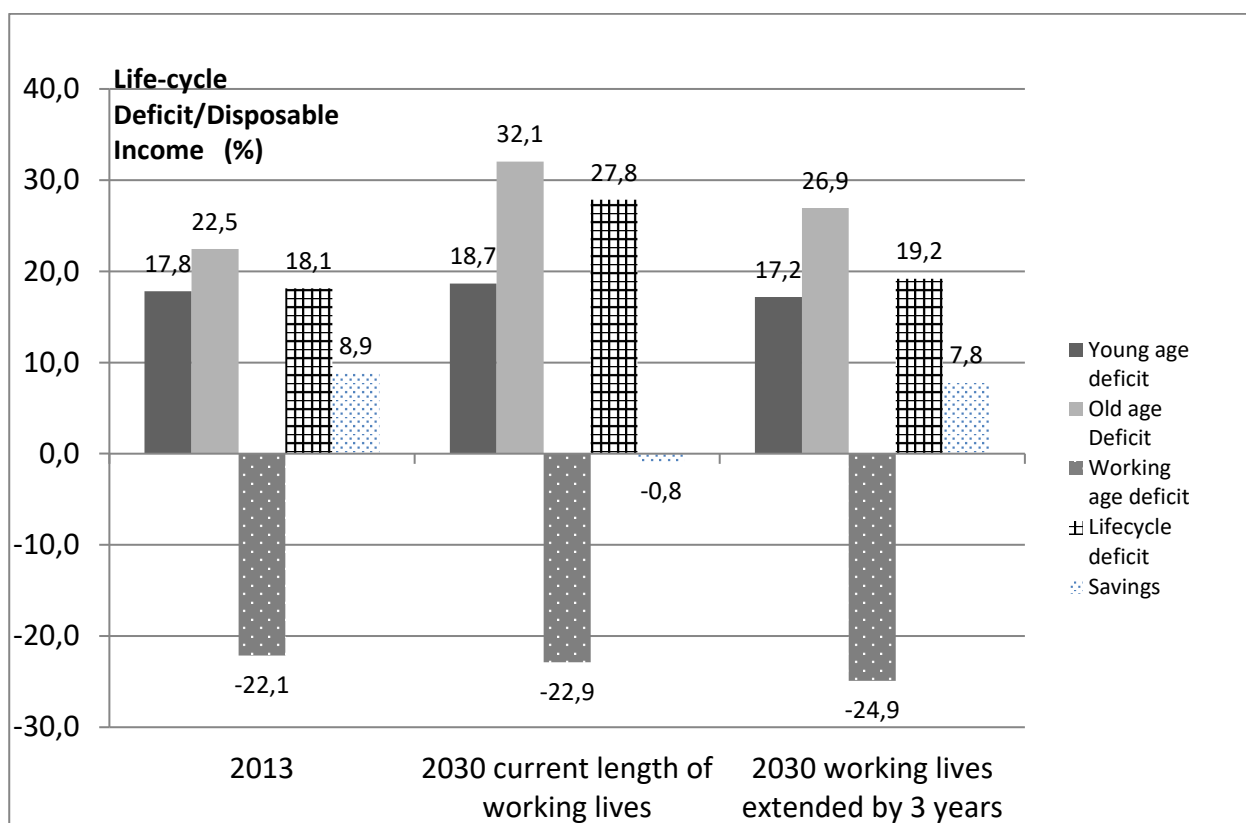


Figure 4. Lifecycle deficit and net savings in 2030 with different working lives (% of disposable income)

Source: Statistics Finland and own calculations.

If working lives were extended by three years, the lifecycle deficit would be 8.6 percentage points lower (i.e. $-8.6\% = 19.2\% - 27.8\%$) than in the alternative scenario that foresees no change in labour force participation. The need for transfers at old age would be reduced by five percentage points, and the lifecycle surplus at working ages would be increased by two percentage points. The young age deficit would also shrink slightly. The savings rate would be 7.8% of disposable income, which is almost as high as the projected value for 2013 in Figure 4. One should keep in mind that because of the financial crisis, the projected savings rate for 2013 is an estimate excluding the cyclical component. The actual savings rate was lower than the projection estimate because of cyclical factors. The projected savings rate with extended work careers would be sufficient to finance investment needs in 2013 and 2030. If Finland recovers to business as usual, a three-year extension of work careers would be enough to maintain current consumption patterns.

How plausible is it to assume that work careers can be extended by three years in the space of one and a half decades? That would imply an increase in the employment rate of 5.3 percentage points in the population aged 15-74. In November 2015 the Finnish Parliament adopted a pension reform that will push up retirement age and cut benefit levels. Given these reforms and cyclical factors, Reipas and Sankala (2015) estimate that employment will increase by approximately two percentage points by 2030,

with the pension reform alone contributing about half of this. Average pensions are projected to fall by 7–12% when one compares persons retiring at the same age under current rules and under the new rules. This will reduce the sustainability gap in public finances by one percentage point of GDP (Economic Policy Council Report, 2015).

7. CONCLUSIONS

Finland's recent demographic changes have had surprisingly profound effects on the macroeconomy. Even if Nokia had not crashed and the forest industry had not slumped, Finland's current account surplus would have fallen significantly. Our estimate is that demographic change is responsible for roughly 40% of the decline in the national savings rate during the past decade. On the other hand, the continued decline in the share of the working age population has also reduced the need for investment to maintain the capacities of the existing labour force, which is easing pressure on the external balance.

The decline in the national savings rate in 2000–2013 is largely attributable to the declining public sector primary balance. In the future, the expected growth of the lifecycle deficit will in large part stem from an increasing demand for health and long-term care services for an ageing population – services that at the moment are publicly funded. All of this has long been common knowledge, yet in the 2000s the gross tax rate was reduced by five percentage points relative to GDP. This resulted in a decline in the public savings rate at the given expenditure level. Now, the government has shifted its focus and the aim is to reduce the deficit by extending working lives.

The pension reform that takes effect in 2017 will push up the retirement age and cut existing benefits. It will also ease expenditure pressure on public finances and contribute to extend work careers. The current government programme also includes a number of measures that are expected to increase the labour supply. That increase will have to be substantial, however, if we are to maintain current consumption profiles in the long term. If it is not, we inevitably face deep adjustments.

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