

Demography and Recovery from the Financial Crisis in Finland

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ABSTRACT

In this article, we assess the size and scope of the already realised change in demography for macroeconomic developments in Finland using National Transfer Accounts (NTA). It is a method in to break down the national income and its use by age. Using of NTA we demonstrate that population ageing has already had surprisingly large macroeconomic implications. The relatively sizeable current account surplus, at the beginning of this century, would have been substantially reduced because of ageing even without the concurrent structural problems of the export industry. Population ageing creates pressure to change the level and structure of consumption as well as relative prices. The growing need for mainly public health and old age care services is a considerable challenge. There's a need for extensive increase in labour supply to satisfy the current level of consumption with prevailing age profiles. Current level and age pattern of consumption relative to earnings needs to be adjusted, in one way or another, to make it sustainable in longer term.

1. INTRODUCTION

After the financial crisis output in Finland has been dragged down by the global downturn, the decline of the electronics and forest industries and the Russian recession. In recovering from the financial crisis Finland has been performing poorly relative to its peers. Finland's growth performance has been weaker than in the EU on average or in the neighboring Nordic countries (OECD,). In this article we will argue that demographic development is a potential candidate in explaining the slow recovery. The coming unfavourable demographic development is widely recognized in both in domestic and international assessments of the prospects of Finnish economy (MoF, , EC, , or OECD). However, in the interpretation of the prolonged recession following the financial crisis demography has received only marginal attention.

The broadly shared interpretation of the macroeconomic development in Finland following the financial crisis can be described as the story of the rise and fall of Nokia, supplemented by cutbacks in the troubled forest industry caused by digitalisation (see Holmström, Korkman and Pohjola, or OECD). Finland's price-competitiveness has faded throughout the s. Along with the financial crisis, the ICT cluster has headed into a productivity crisis. This has escalated the problems of the unfavourable development that has continued for quite a while. The deterioration of the external balance for more than a decade and the change of the Finnish economy from an international net lender to a net borrower in are indicators of the weakening competitiveness (Kajanoja ; Maliranta and Vihriälä).

In our article, we first present a concise and stylised description of the developments of the Finnish economy in the s, both before the financial crisis and during the prolonged recession following it. We present the established interpretation of the export-driven crisis and consider in which ways the demographic change could be linked to recent developments. After this we define the national transfer accounts and present the age

decomposition of income and consumption in the Finnish economy. With the help of the decomposition, we review the connection between the demographic age structure and the macroeconomic development in the s. Finally, we consider issues raised by this review on the future outlook of the demography and the economic development.

2. POPULATION AGEING, EXTERNAL BALANCE AND COMPETITIVENESS

Deterioration of external balance is a general equilibrium phenomena where adverse shocks to export industries has an impact but also factors determining absorption relative to domestic supplies plays a role. In this respect lifecycle considerations are of importance: workers save individually and through the pension system to smooth consumption over lifecycle, while retirees dissave through the same channels. The declining share of workers reduces the savings rate and, for its part, contributes to the decline in current account surplus. Obstfeld and Rogoff() show in an overlapping generations model that ageing caused by fertility decline decreases net savings of an economy.

Braude () has emphasized that the age structure affects not only through the savings rate but also through the wealth effect. In addition to transferring income from the working-aged to the retired via the pension system, the elderly will cover their consumption with wealth they have accumulated. The increasing number of retirees raises the importance of asset income in forming the purchasing power. The growing number of retirees increases the demand for consumption through the wealth effect without increasing the labour supply. This would be the case even if the retirees would save a share equivalent to that of the working-aged and if their consumption structure would resemble that of the working-aged. The indirect demand for work increases relative to its supply, The asset effect holds an analogous implication as foreign income transfer in an open economy (Obstfeldt and Rogoff,). In other words, it aims at strengthening the real exchange rate.

Taking into account relative price changes in domestic economy gives an additional mechanism how demographic change affect macro economy. When studying impacts on external balance of an economy it is useful to distinguish industries that are open to international competition and those that are sheltered from it, since demographic changes affect relative demand in this respect. Due to competition, tradable industries must take international prices as a given, while the domestic industries can pass its expenses to its prices. When the total demand increases relative to domestic production, the relative prices of the non-tradable sector rises and the real exchange rate is revalued. How much the domestic prices react depends on the supply of foreign substitutes (Obstfeld and Rogoff).

The weakening of the support ratio has an empirically observed increasing effect on the relative prices of non-tradables. It has been observed to have a significant implication in econometric time series/cross-section studies of the real exchange rate (Braude ; Groneck and Kaufmann). Groneck and Kaufmann { } use a group of OECD countries to review the reaction of relative prices to changes in the support ratio. They estimate that an increase in the support ratio of the elderly by ten per cent would raise the relative price of the closed

sector by - per cent. The differences in the productivity growth rates, which they measure with labour productivity, also hold clear and expected implications for the relative prices. Braude (), whose group of reviewed countries is more comprehensive, estimates that a country's prices will rise by - per cent if the dependency ratio grows by per cent.

The change in demography affects the relative price between the open and the closed sectors by changing the balance between demand and supply via savings and wealth effects. In addition to these mechanisms, the change in age structure affects the structure of demand. Compared to that of the working-age population, a larger proportion of the consumption of the elderly is targeted at economic services protected from foreign competition. American and European consumption studies based on individual-level data support this notion (Hojbin and Lakatos ; Ewijk and Volkerink). Ewijk and Volkerink () have assessed that per cent of the private consumption of the under- -year-olds in the Netherlands involves open-sector products. The equivalent figure for the above- -year-olds is per cent. One fifth of the closed-sector demand among the under- -year-olds involves public-sector services while the figure for the above- -year-olds was more than per cent.

However, consumption studies based on individual-level data does not provide a comprehensive picture of the incidence of consumption since they do not tend to take public consumption into account. Public consumption is targeted at services within health care and long-term care. A considerable part of this consumption is individual publically subsidized or produced consumption, which is not included in the figures for household consumption in consumer surveys. A major part of the population using such services is excluded from the target group of household surveys. The health care expenditure accounts for, on average, per cent of GDP in OECD countries. A third of these services are privately financed. Hagist and Kotlikoff { } estimated the age profiles of health care expenditure and concluded that the per-person health care expenses of the elderly are multifold compared to those of the working-aged.

3. NATIONAL TRANSFER ACCOUNTS, LIFECYCLE DEFICITS AND DOMESTIC ABSORPTION

National Transfers Accounts (NTA) is a methodology and a framework for collecting, combining and analysing intergenerational and life cycle reallocation variables that are consistent with the SNA, System of National Accounts (Lee and Mason, and UN,). The essence of NTA is to estimate private as well as public consumption and labour income by age, and to calculate the difference of the two, called lifecycle deficit (LCD). Using the data on age specific information of public and private asset income savings and transfers, the sources of financing the life cycle deficit can be derived. If necessary, the variables are adjusted so that corresponding economy-wide aggregates in the National Accounts are satisfied.

Both SNA and NTA share the same basic economic concepts: the production in the economy is equal to total factor income, which further equals to total spending. NTA measures national, not domestic, values. Net national disposable income equals spending:

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

where labor income (Y_l) includes also net compensation of employees from the rest of the world, and asset income (Y_a) includes also 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 current account B is the difference between the available income Y and the expenditure in the economy. The expenditure is used for private and public consumption C or for net investments I , making the difference as follows:

$$B = Y - C - I \quad ()$$

By dividing the current account identity () with Y , and by multiplying and dividing the middle term by the labour income Y_l , we get

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

In other words, the current accounts are determined based on the labour income and the share of net investments of the national accounts, as well as on the ratio between consumption and labour income (C/Y_l). In the following, we will review how the latter ratio depends on the demographic age structure.

The NTA methodology offers a comprehensive approach to measure income and its use by age and to reallocate income and changes over time between age groups (United Nations). Dividing the national accounts into different age groups is motivated as the financial flows between age groups occur mainly because people in the beginning and final stages of their life cycle typically consume more than they earn. The difference is covered through direct or indirect income transfers from the working-age population. The fluctuation in the size of the age groups change these flows and determine, in the last resort, in which direction the income transfers move on the age axis. Saving and the amount of asset income also depend on the stages of the lifecycle.

Currently, NTA is used to depict and analyse the financial interactions between age groups in more than countries at various development stages (Lee). The combined population of these countries account for more than per cent of the global population. The method has also been applied in the depiction of the financial implications of demography in Finland (Vaittinen and Vanne ; Riihelä, Vaittinen and Vanne and).

The difference between consumption and labour income depicts the need for financing relative to the various stages of the life cycle. This need is managed through public and private net transfers, asset income and net

saving. Lee and Mason () call this financial deficit a lifecycle deficit. The rearranged identity of income and expenses () for a single one-year age group (a) is:

$$C(a, t) - Y(a, t) = \Delta A(a, t) + T(a, t) \quad (1)$$

The variation of the income and consumption over life cycle makes the identity interesting. The right side of the equation divides the difference between consumption and labour income into net asset income (ΔA), change in assets (S) and net income transfers (T) of financing. If the difference is negative, the right side of the equation divides the income deficit into those quantities.

In international NTA comparisons or comparisons of different periods, the quantities of equation () are standardised by the wage sum of the economy. When equation () is presented with the *per capita* figures for each age group, the standardisation is made with the average wages of the - -year-olds in the statistical year (Lee and Mason).

The presentation mode of the identity emphasizes the view of the lifecycle hypothesis. Initially, citizens have no other financial source for their consumption than their wages and net transfers from others. Part of the wages is saved, and the saved amount and the related received profit are available for use at later stages in the life cycle. Age-linked income transfers divide the income between age groups at a certain point in time. By saving or dissaving, consumption opportunities are transferred across time.

Numerical proportions based on the size of age groups or the numbers of employed and other groups are common indicators of an ageing population. Using NTA, the ratio between the total consumption and wage sum of the economy can be interpreted as a money-weighted support ratio (SR) (Lee and Mason ,):

$$SR(t) = \frac{\bar{C}(t)}{\bar{Y}_l(t)} = \frac{\sum_{a=0}^A c(a, t_0)P(a, t)}{\sum_{a=0}^A y_l(a, t_0)P(a, t)}, \quad (2)$$

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 . $P(a, t)$ 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 of a few highest one-year age-groups.

By selecting $c(a)$ and $y_l(a)$ of the year chosen as the baseline year – for example, the year of the most recently calculated NTA – and by using the demographic weights of different years, we see how the support ratio has developed as a result of the demographic effect. Looking back through history, we can ‘test’ how well the demography explains the ratio between consumption and labour income. On the other hand, for future years, we can make calculations on how the ratio will change due to the demography (Lee ; Lee *et al* ; Prskawetz

and Sambt (2016). In other words, according to equation (1), the net lending of the economy relative to the national income depends on the weighted support ratio derived from the NTA.

4. SECTOR SPECIFIC PATTERNS OF FINNISH ECONOMIC DEVELOPMENT IN THE 2000S

Before the financial crisis, the Finnish economy grew by an average annual rate of three per cent. The growth was twice as fast compared to the average Eurozone growth rate and nearly as fast as in rest of the EU (Conference Board 2016). The tradable sector of the economy grew particularly fast, driven mainly by the rapid development of the total factor productivity.

The flip side of the growing productivity was the slightly decreasing employment rate of the open sector. Within the same time frame, the total factor productivity of the non-tradable sector did not improve. Production was increased by expanding the labour force. The employment in the non-tradable sector grew by an annual average rate of two per cent in 2000 – 2007. Measured in the number of employed, the public sector did not mushroom in this period. Although the number of private-sector employees grew, the growth was slower than the average growth of the economy.

The relative productivity of the non-tradable declined before the financial crisis. In order to compete for the labour force in a profitable manner, the price level of its products had to rise relative to that of the tradable sector. The relative prices of the closed sector grew by more than four per cent annually in the period 2000 – 2007.

The stagnation following the international financial crisis caused a long-term slump in production. Measured as a flat-rate appreciation, the production level of the overall economy has not yet recovered to the pre-crisis level but has remained well below it. The tradable sector has been a central contributor in this development caused mainly by the decreasing total factor productivity. Nokia's struggle to keep up with its competitors in consumer innovations was reflected to a considerable part in the development of the post-recession open-sector total factor productivity.

The overall development of the total factor productivity has been negative during the recession. Also the total factor productivity in non-tradable sector has been negative since the beginning of recession. Hence, the production in sheltered sector has also failed to reach pre-recession figures despite its increased employment.

Table 1. Economic development in Finland in the 2000s

¹ The open sector includes agriculture and forestry, mining, heavy industry, transport and storage, as well as information and communications services. In other words, it includes sectors A, B, C, I and H according to the Standard Industrial Classification (SIC). The flat-rate added value has been used as the indicator of change in production. The appreciation deflation has been used as the indicator of change in prices. This is standard procedure in comparative research that examines the determination of exchange rates from the point of view of the open and the closed sectors (Bettendorf and Dewachter 2004; Canzoneri, Cumby and Diba 2003; De Gregorio, Giovannini, and Wolf 2005; Groneck and Kaufmann 2006).

Overall productivity depicts the part of the growth in output that cannot be explained by a change in the income-share weighted input. The total factor productivity figures for the open and the closed sectors have been calculated based on the figures of the industry-specific productivity surveys of Statistics Finland (2008).

| | Period | | |
|---|-----------|-----------|-----------|
| | 2000–2008 | 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 price of the 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 rate (%/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 |

¹Change in flat-rated appreciation (SIC A, B, C, H and J); ²Change in fixed-priced appreciation (SIC D,E-G, I, K-T); ³Change in deflation of appreciation; ⁴Change in open-sector price relative to closed-sector price; ⁵Change in output, which cannot be explained by growth in input use. References: Statistics Finland, Annual National Accounts and Productivity Surveys.

Table 2 gives evidence on comparative macroeconomic performance on EU countries within and outside of the European monetary union. Indicators in the growth of GDP per capita, labor productivity are presented 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 not member in the currency union. Growth in GDP per capita before financial crisis has on average been much stronger in countries outside the monetary union. It has been based mainly on productivity growth and less on the growth in employment. In Finland growth has been almost as fast as outside Euro area and significantly faster than within it on average. Economic performance prior to crisis was pretty similar in Finland and Sweden, whereas Germany resembled the average development in Euro area.

After the crisis patterns in performance have changed significantly. Finland and Euro-zone on average has not been able to recover to pre-crisis level of output within six years. For Finland this means that it has not yet regained the labor productivity level preceding the crisis. On the other hand Germany and Sweden has succeeded to grow after the crisis: Germany mainly by being able to increase employment rate and Sweden more by growing productivity and maintaining a very high employment rate.

Table2: **Finnish macroeconomic performance in European perspective**

| | GDP per capita | Labor 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: Conference Board database (2016), Eurostat.

Demographic development measured by total dependency ratio has been relatively diverse. Conventionally dependency ratio is measured as a share of population below and above to working age population (). Looking from life-phase perspective in European context, on average, population below of age is consuming more than it produces and is generating lifecycle deficit. The same applies to population over of age (Hammer, Prskawetz, and Freund,). Using these age brackets we see that relative to supporters the number of dependants has increased by persons within years in Finland. This is the fastest change within Europe where support ratios were on average slightly improving before the financial crisis and only modestly deteriorating after the crisis.

The population aged - years that produces the life cycle surplus amounted to . million individuals in . The share of the population generating the life cycle deficit, that is, the under- -year-olds and the above- -year-olds, amounted to . million and . million individuals respectively. This means that there were dependants per providers in Finland in the year (Table). By the end of , the number of individuals producing a surplus had been reduced by , while the number of elderly individuals contributing to the deficit had grown by more than , to an ample . million (Figure). To counterbalance the growing number of ageing people in the deficit phase, the number of young individuals contributing to the deficit was reduced by , , that is, by approximately one tenth relative to the growth in the number of the elderly. As a result of the demographic change, the dependants numbered relative to providers. The net change equalled , individuals, which means that the number of dependants relative to the providers grew by percentage points. The change was of such magnitude that it has inevitably left a mark on the macroeconomic development.

Changes in demographic support ratio do not necessarily give correct magnitude of the macroeconomic implications of ageing, since differences in the gap of earnings and consumption varies by age. Macroeconomic costs due to the age structure can change even with stable support ratio when the relative weights of the young

and the elderly develop in opposite directions and overturn each other. Increasing number of elderly relative to working age population requires a lot more inter-age transfers than increasing number of young dependants.

5. DEMOGRAPHIC CHANGE AND AGE PATTERNS OF CONSUMPTION AND EARNINGS IN FINLAND

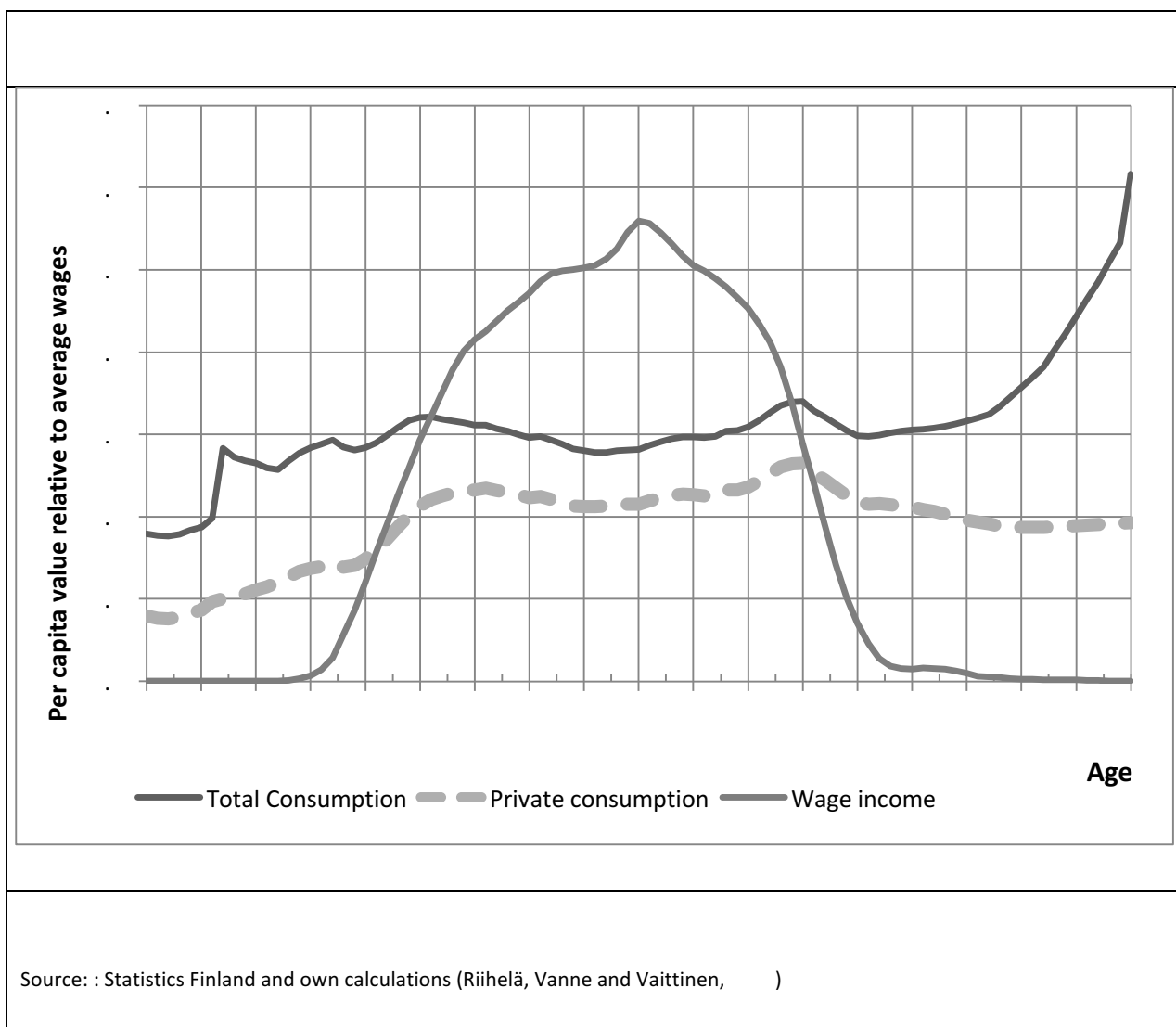
Age specific consumption profiles in National Transfers Accounts consist of both private and public consumption. To divide private consumption in Finland, Riihelä, Vaittinen and Vanne (;) have made use of household surveys. The division of consumption per age group has been separately reviewed in terms of consumer durables, housing, health care and education. Education and health care come with a considerable age-linked component, and their consumption is significantly linked to public services. Public consumption has been allocated to the age groups based on public administration data. The estimates of the age-group-specific labour income have been constructed based on income distribution statistics.

The labour income includes wage income, the employer's wage-related payments and part of the income from self-employment. The aggregates of income and consumption items have been balanced to correspond to the figures of the national accounts.

In our review, income and consumption have been proportioned to the average wages of those in prime working age (- -year-olds) (figure). The labour income comes with a strong age-dependency both due to the unit wages and the age-linked nature of the employment rates. Consumption has been divided into total consumption and private consumption *per capita*. Their difference is public consumption. The total consumption is fairly even in the ages between and years. To cover the expenses of that consumption, an income that corresponds to the earnings of the population in prime working time for an average of . years is required. Consumption grows fiercely after the age of years due to growing public consumption, i.e. the use of public health and long-term care services.

The labour income exceeded consumption among the population aged above and under years. The lowest consumption level among the adult population was for the - -year-olds. The lowest consumption level in was found among those born in the mid- s. The low consumption level for this age group is partly explained by their child-care burden, partly by the long shadow of the recession in the s. This age cohort was establishing itself on the labour markets when the recession hit. Their weak position in the labour market during the recession resulted in a slower growth in earnings compared to younger or older age cohorts (Riihelä). The consumption of the working-age population in was at its highest among those around years, that is, among those born in the mid- s.

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



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

The share of public consumption of the total consumption is relatively small and stable in the age range between 20 and 60 years. The weight on public consumption is considerably high among age groups younger or older than that. Among the young age groups, approximately half of the consumption consists of public services. In older age groups, public consumption forms two thirds of their total consumption. The consumption of a person in the older age groups in 2000 equals, on average, 1.5 times the annual earnings of a person in prime working age.

Public transfer arrangements, that is, net public income transfers and services dominate the financing of the life cycle deficit and the use of the surplus. In the older age groups, the share of consumption received and financed as public services grows with age and finally supersedes the share of received pensions. From the point of view of intergenerational income transfers, the significance of age-dependent public expenditure is major. In 2000, approximately two thirds of the public-sector expenditure, income transfers and subsidized services can be classified as age-dependent. This was 15 per cent relative to GDP.

The share of age-dependent income transfers of expenditure was circa 15 percentage points (Vaittinen and Vanne, 2002). The net income of the public sector was accumulated by the above 60-year-olds and the less than

-year-olds. The age range is somewhat wider because part of the total consumption was covered by capital income.

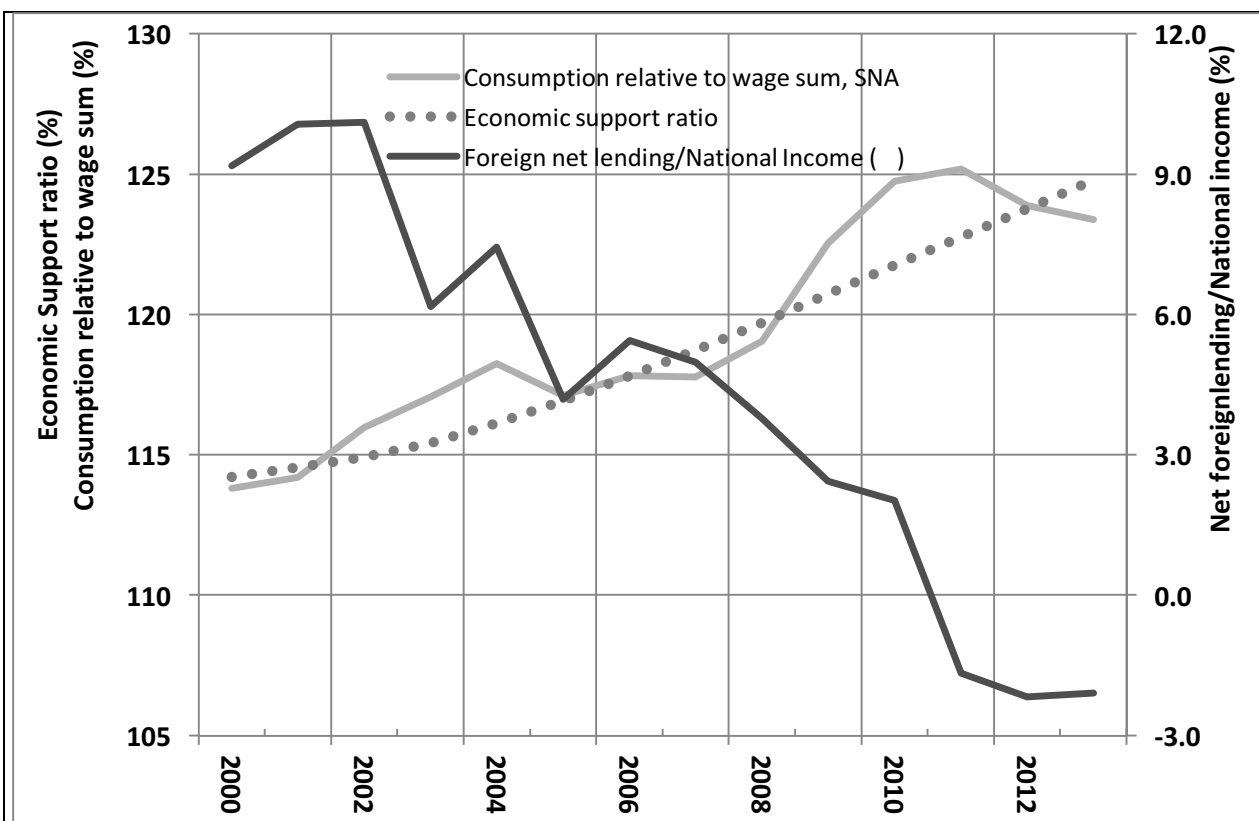
By examining the ratio of total consumption and wage income as a result of demographic change, we can estimate the connection of demographic change with the macroeconomic development. This can be done by weighting the population presented in Figure with the lifecycle-specific consumption and wage income according to equation (). We ascribe monetary weight to demographic change, which naturally connects demographic change to the annual national accounts.

6. DEMOGRAPHY AND EXTERNAL BALANCE

The ratio between consumption and wage income and the development of net lending that depicts the external balance have been each other's mirror images in the s (Figure). In the early s, net lending relative to the national accounts was remarkably positive. Finland financed foreign countries or, in other words, saved per cent in foreign claims relative to the net national accounts. Consumption ranged approximately per cent above the wage income. The difference had to be covered either by capital income or foreign net income transfers. At the end of the review period, this ratio had grown by approximately percentage points. At the same time, net lending turned negative, which meant that part of the demands of the economy was covered by foreign debt.

The ratio between consumption and wage income is reviewed in Figure , both based on the aggregates of the national accounts (unbroken line) and with the change in demography weighted with the lifecycle profiles (dotted line). The development of the lifecycle-weighted demography depicts the significance of demography for the change in the ratio between consumption and wage income. The difference observed in the ratio between consumption and wage income and the weighted demography depicts the decision-based reactions of financial actors to changes in the economic environment. The change that has occurred during the review period corresponds almost exactly with the development of the money-weighted demography.

Figure 3. External balance and the weighted economic support ratio of the Finnish economy



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

The current accounts are the combined savings surplus of the private and the public sectors in the national accounts. Finns' willingness to save is affected, in part, by the success of the export industry, as income generated through it can be used to accumulate assets. The collapse in export after the financial crisis can be seen in a growing consumption relative to the wage income as citizens try to balance their consumption relative to the change in income. The attempt to balance consumption is partly evident in weaker current accounts. The reaction relating to this income shock is dampening and we are returning to the level of consumption relative to wage income projected by the demographic change.

In addition to changes in income, the economy's saving depends on its age structure. The ageing of the population reduces the savings rate. People in their active and most productive working age are prone to save – in Finland particularly through the pension system – while savings (both private and those in pension providers) are dissaved at retirement. The recent demographic change has fortified this development on a macroeconomic level. According to an export-led economic development (Kajanoja, ; Maliranta and Vihriälä), the change in the external balance is seen as the result of a contracted export sector. In our interpretation, in which the starting point of the review period is the same as for Kajanoja (), we emphasize the effect of domestic absorption factors on the external balance. We particularly emphasize the significance of demography in the

determination of these factors. A reduction or slow-down in the growth of the number of working-age people due to ageing reduces the investment rate since the upkeep of a sufficient production capacity per employed person is reduced (Cutler *et al*). This improves the external balance. Since the external balance has severely weakened in the review period, the assessment of this impact has been ignored in this connection. Braude () has emphasised that the age structure affects not only through the savings rate but also through the wealth effect.

7. AGEING POPULATION AND STRUCTURE OF INDUSTRY

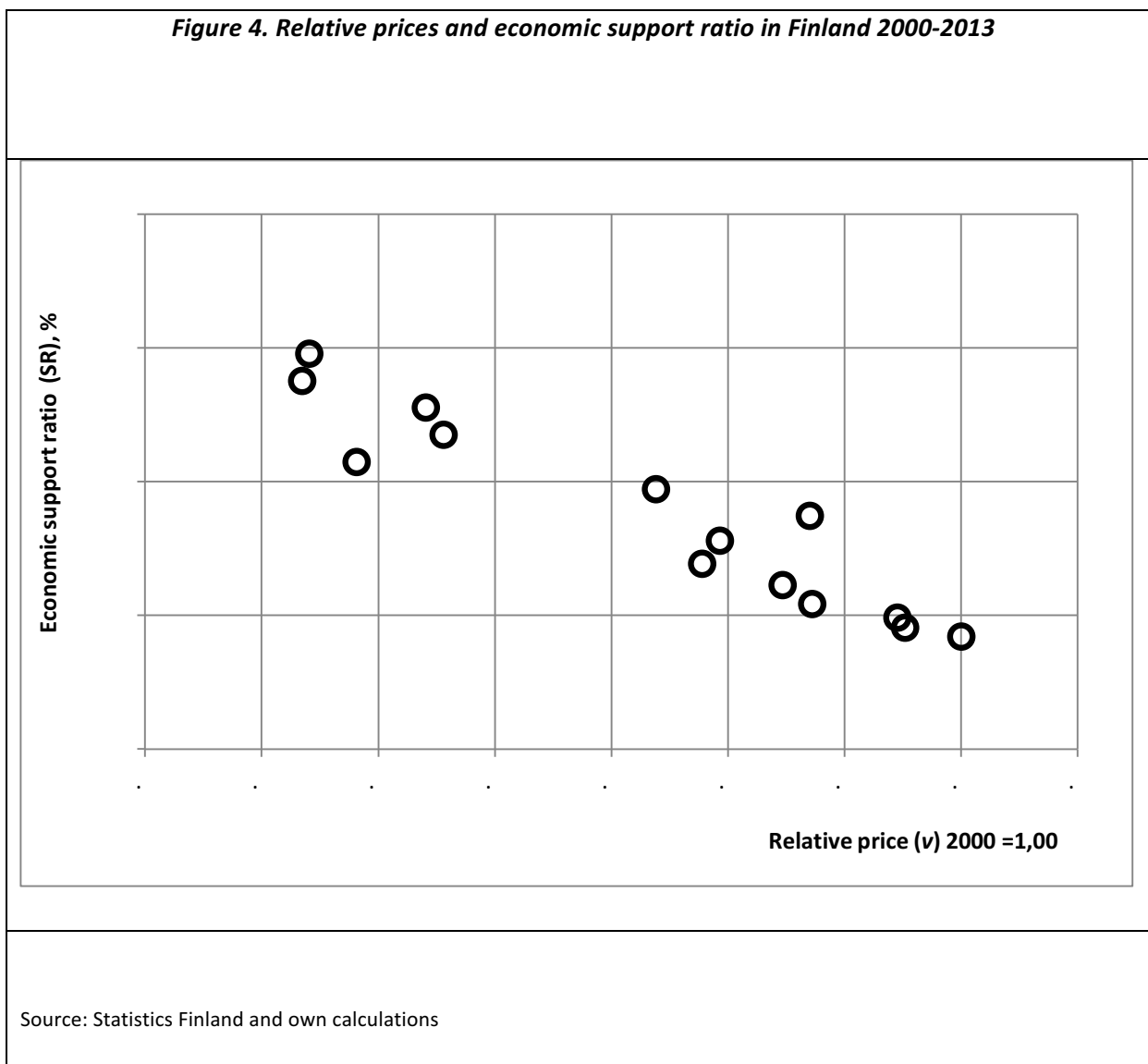
The change in demography affects the relative price between the open and the closed sectors by changing the balance between demand and supply via savings and wealth effects. In addition to these mechanisms, the change in age structure affects the structure of demand. Compared to that of the working-age population, a larger portion of the consumption of the elderly is targeted at economic services protected from foreign competition.

The relative price of the open and closed sectors is a central determinant of the real exchange rate. If the rate of exchange of export and import prices is given, the relative increase in prices in the closed sector is directly reflected as a revaluation of the real exchange rate. Already in the s, the differences in the growth of productivity in the open and the closed sectors were seen as important explanatory factors of the revaluation of the real exchange rate (Balassa ; Samuelson). As a rule, it is easier to increase the productivity in the production of commodities in the open sector than in the service-intensive closed sector. Before long, the wage differentials between the sectors will be fixed due to the labour force mobility. In order for the closed sector to maintain its profitability, it has to raise its prices to compensate for the gaps in productivity. As such, the gaps in productivity are in harmony with the economy's long-term balanced development (Obstfeld and Rogoff , -). In addition to the gaps in productivity, the changes in the structure of demand can affect the relative prices (Braude ; Groneck and Kaufmann).

The realised change in relative productivity has its implications for relative prices. During the recession, the prices of the sheltered sector have continued rising compared to the prices of the open sector. The pace at which the comparative change has occurred has become more moderate due to the narrowing of the change in the productivity gap. On the other hand, if the change in productivity were the only explanatory factor of the change in the price proportion, the relative prices of the open sector would have risen recently since the total factor productivity has developed more unfavourably in the tradable than in the non-tradable sector. We offer a complementary explanation for changes in relative prices based on demographic change and life cycle patterns of production and consumption constructed in National Transfer Accounts for Finland.

There is a clear dependency between the relative prices (v) of the open and closed sectors and the economic support ratio in the review period (Figure 4). The economic support ratio has weakened by 10 percentage points at the same time as the rate of exchange was revaluated by nearly 10 per cent.

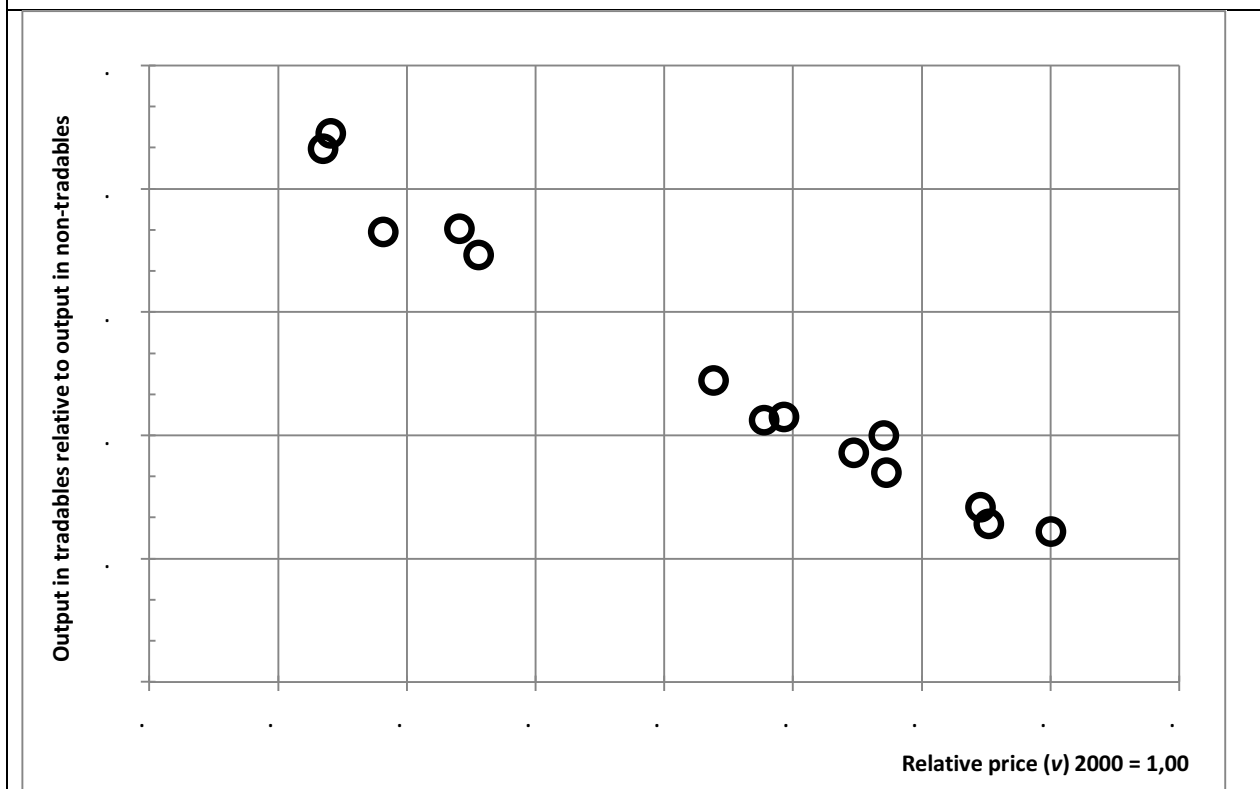
Figure 4. Relative prices and economic support ratio in Finland 2000-2013



The price ratio under review has been adjusted with the relative change in productivity in order to avoid a spurious correlation between the variables. The productivity-adjusted relative price of the open sector has been reduced by nearly 10 per cent in the review period (Figure 4). In 2009, the year following the financial crisis, the relative price fell by approximately 10 percentage points. Later it recovered slightly, only to continue its decline. However, it would appear that the financial crisis caused only a sudden shift in an otherwise predisposed change in the price ratio.

³ The relative price v is the open sector's price index adjusted with productivity relative to that of the closed sector. In the productivity adjustment, price index has been divided by the sector's total factor productivity index.

Figure 5. Change in price ratio and production in the open and closed sectors



Source: Statistics Finland and own calculations

There is a strong and an expected connection between the change in price ratio and production structure. The closed sector was approximately per cent larger than the open sector at the beginning of the century, but now the closed sector is more than twice as big as the open sector. The relative change has been considerably large taking into consideration the period in which it has been realised. A jump resulting from the financial crisis is also visible in the covariation of the relative price and production. As with the price ratio and the economic support ratio, the crisis has only accelerated the underlying trend.

When we review the relative sizes of the industries, a good question to ask is whether Finland's economy was in balance in the year in the first place (Sauramo). According to Sauramo, the Finnish Markka was linked to the ERM through the EMU process at a very low exchange rate in . Due to the resulting favourable competitiveness, the share of export of the total productivity reached a record-high level in the early s. Part of the adjustment of the change in the price ratio and the production structure in the s may be a reaction that was free from the pressure of change due to demography in a disproportionate production structure at the turn of the century. The ratio of these factors is an open research question.

8. PROJECTED DEMOGRAPHY AND LIFECYCLE DEFICIT

The results of the demographic projections by various actors mean that, in all probability and measured with all indicators, the traditional demographic dependency ratio will weaken at an accelerated rate in the next twenty years. Around mid-century, it will stabilise at a level that corresponds to that of the early 1970s. Contrary to the early 1970s, the majority of the dependents will now consist of elderly people rather than children (Riihelä, Vaittinen and Vanne 2014).

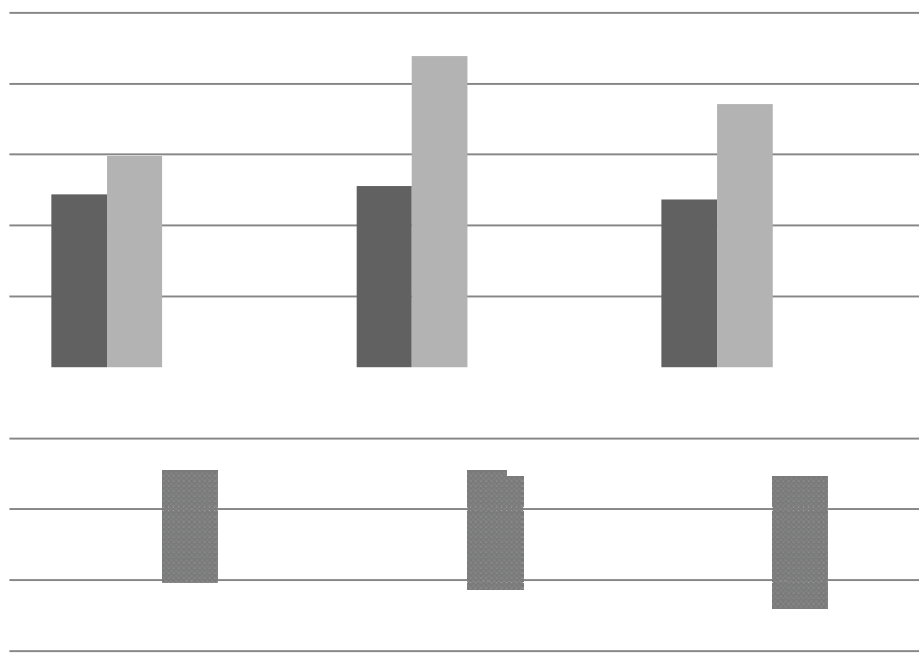
How the components of the age structure affect the economic dependency ratio can be estimated by reviewing the lifecycle deficit of equation (1) per age group. A simple way to indicate demographic changes is to adjust the observed lifecycle profiles with existing demography projections and, based on that, consider the economic implications of demography (Lee 1993; Lee *et al.* 1997; Prskawetz and Sambt 2004). Utilising the population projection of Statistics Finland (OSF 2014) and the lifecycle profiles of Figure 1, we can project how the lifecycle deficit would change in 2050 as a result of demography alone, without changes in consumption or the age structure of production.

With the current working lives and age profiles of wages and consumption, 25 per cent of consumption will be financed with capital income relative to wages in 2050 (Figure 1). This equals the average value of capital income proportioned to the wage sum of the 1970s. In the projection, the deficit of the young will grow by an ample one percentage point. The growth in the surplus of the working-aged will compensate for this deficit. The 1.5 percentage-point growth of the lifecycle deficit is almost completely due to the growth in the deficit of the elderly. This, in turn, is a result of the increasing public-sector health and care services (Vaittinen and Vanne, 2014). The situation is similar in other high-income-level countries, in which the population is ageing (Lee *et al.* 1997).

The lifecycle deficit is not an actual sustainability indicator of the economic development and can thus not be ascribed a single-valued target level. How large a proportion of the economy's total consumption can be financed with capital income depends partly on how the income is divided between wage and asset income. In the 1970s, the average share of capital income of the disposable income of the economy was 25 per cent relative to the wage sum.

In the corresponding time frame, the lifecycle deficit was financed with the sum of the capital income which, relative to the wage income, amounted to 25 per cent on average. Approximately half of the capital income was thus used to finance consumption and half of it was saved. However, in the long run, the lifecycle deficit cannot be so large that the economy, with the given investment level, is run into debt to foreign countries. In 1970-2000, the Finnish economy increased its foreign net borrowing, which is possible on a temporary but not permanent basis.

Figure 6. Lifecycle deficit in 2030 with different working lives



Source:

In our alternative projection, we review a situation in which the employment rates in 2030 would be the same as in Sweden in 2012 (Eurostat 2014). By taking the mortality of the working-age population (here aged 15-74 years) into account, the expected time in employment of a 20-year-old person at the beginning of his or her working life (Hytti and Valaste 2009, 38) can be calculated. With the expected life expectancy of Finnish citizens and the employment rates of the Swedes, the working lives in Finland would be extended by 2.5 years.

A contracted lifecycle deficit due to extended working lives is mainly a result of the fact that extended working lives reduce the deficit at old-age. This is the case for two reasons. On the one hand, the extended working lives will reduce the need for income transfers to the ageing population. On the other hand, it will increase the wage sum relative to the income transfers. The old-age lifecycle deficit would be reduced by approximately 7 percentage points in 2030 if the working lives were to be extended by 2.5 years. Income transfers account for approximately 2.5 percentage points of the reduction.

If working lives were extended by 2.5 years, the lifecycle deficit would be at approximately the same level as it was in 2012, when the current account was in deficit and the level of domestic demand was upheld by running into debt abroad. According to our estimates, working lives should be extended by five years by 2030 (Riihelä,

Vaittinen and Vanne (2007, 2008) in order for the current lifecycle profiles to be harmonious with the external balance of the economy.

9. CONCLUSIONS

The already realised changes to demography have had perhaps surprisingly large macroeconomic implications. Even without the crash of Nokia and the waning forest industry, the surplus of the current accounts would have been significantly reduced. It is also possible that we would have incurred more foreign debt even without industrial structural changes.

The ageing of the population creates pressure for, among other things, changes in consumption, in the financing and demand structures, and in the price ratios of consumption. The initial adjustment has been done through the current accounts. Previous saving in the economy is not adequate to finance the more rapidly growing gap between consumption and income with capital income. In the long term, the adjustment must be done by, on the one hand, extending working lives and, on the other, adjusting consumption.

A great part of the future lifecycle deficit will stem from a growing need of currently publically-produced health and care services attributed to the ageing population (Vaittinen and Vanne 2007). It has been known for a long time that these liabilities are growing. Yet, in the 1990s, the gross tax rate and the public savings ratio with the given expenditure level were reduced by five percentage points relative to GDP. Now the aim is to reduce the deficit by extending working lives.

The aim of the pension reform that will come into effect in 2017 is to postpone retirement. The current government platform also includes a number of measures which are believed to increase labour supply. With the current consumption profiles, the change in labour supply must be extensive in order to avoid the need to adjust consumption, in one way or another, to a sustainable level *vis-à-vis* the long-term development.

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