Evaluating the welfare costs of the COVID-19 -pandemic in Finland with an AGE model of with Intergenerational Accounting

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1 Introduction

The COVID-19 pandemic has tested the resilience of all countries. This paper focusses on Finland. We study the distributional effects from the points of view of gender and household income in the short run, and from the point of view of intergenerational income distribution in the long run, when the economy is already facing the many challenges of an aging population. The effects of the pandemic have been smaller in Finland and other Nordic countries than in many other countries. We study the effects in 2020 and 2021 by means of a decomposition – historical – simulation, which allows us to see which sectors of the economy were most affected. We show that the economic effects in Finland thus far have stemmed from the measures taken to counter the spread of the pandemic, such as closing down public venues, restricting travel and the availability of the hospitality industry, as much as from an initial fall in exports. Finland thus differs from Sweden, which did not initially apply restrictions, and where the effects consequently stemmed to a much greater extent from effects on export industries than from the domestic markets. In both countries, though, measures have been taken to alleviate the impacts on the economy.

At the peak of the close-downs, unemployment rose by several percentage points, and by 2021, long-term unemployment accounted for an alarmingly large share of total unemployment. The effects of the pandemic have been different for men and women. This is because temporary lay-offs hit the service sectors – whose labour force is dominated by females - much harder than other sectors. Lay-offs also affected younger workers relatively more than older workers.

We also study the long-run impacts form the point of view of fiscal sustainability. By mid-2021, the Finnish economy had regained her 2019 level. This was made possible by the recovery of the export industries, but also of private consumption. Remarkably, household income grew steadily even during the pandemic, reflecting the effective safety-nets of a Nordic welfare state. But this comes with a cost – government debt is soaring, and tackling the debt is inevitably becoming an agenda. We study several possible measures the government could be taking from the point of view of inter-generational income distribution. The range from raising taxes to cutting public spending.

Our analyses utilise an intergenerational CGE model, which integrates transfer accounting to a cohort-specific modelling of households. We also distinguish between the functions of the public sectors. We model the pension system, both from the point of view of accrual of pension rights, and the financing of pensions, where Finland provides a rare example of a partially funded pension system. We also

integrate cohort-specific data on the provision of public services to household – comprising mostly health and social care and education. We integrate a detailed modelling of the public sector budgets of the pension funds and the general government in our AGE-model. The model is also used to produce a baseline for the economy, focussing on the effects of aging of the population.

The data we use is comprehensive in its coverage, encompassing and linking data on individuals' health and financial records, as well as costs of service providers and administration, and also income transfers between the different agents. This paper uses the data to calibrate demand for health care services as an outcome of welfare maximization and public and private health and social care provision in a dynamic CGE model of Finland. The paper also uses data from household income and consumption surveys to allocate income and consumption spending as well as direct taxes and tax-like expenditures to age cohorts. We also cover the pension system in detail, allowing for different types of pensions, using data from pension registers. Our approach can be easily incorporated in any CGE model that allows for some modularity particularly in the treatment of household demands.

Our approach produces several new insights into the economic implications of the pandemic, as we can relate the long-term effect to a baseline, where the government is already tackling the challenges of an aging population. Projecting the demand for social and health care services on the basis of population forecasts alone, we find that, by 2040, the Finnish population would need about a third more care services than it does at the moment. The central innovation of the study is to incorporate this projection in a CGE model with endogenous decisions made by households on the demand for care services. This is accomplished by calibrating public service provision in households' utility functions. This calibration is made possible by our register data and opens up several research questions. Thus, we can interpret the effects of aging in terms of utility: Aging constitutes a deterioration in the utility of the households that necessitates a compensating increase in the demand of care services to maintain the current level of utility. Second, our methodology provides a way of measuring the evolution of generational equality . Thirdly, we can study the implications of policies in terms of their inter-generational welfare effects.

The rest of the paper is organised as follows: The second section describes the theoretical extensions of the paper. We show how the provision of public health and social care are introduced in a CGE model as, first, consumer's choice of demand for care and, second, a choice between privately and publicly provided care. The extension allows us to offer an economic interpretation to the effects of aging and to analyse the reform in terms of efficiency and welfare. The section also with the various data sources. National Institute of Health and Welfare (NIHW) collect register data on health care and social services at the level of individuals and service providers. These registers cover the whole population and enable easy aggregation for different purposes, enabling us to project the effects of demography on the demand for services. These projections feed into the CGE model which is then used to analyse the effects of the reform from the points of view of welfare, regional growth and fiscal sustainability. Finally, we describe the use from household surveys and registers that form the basis for the generational allocation of consumption, factor and other incomes, and taxes. Similarly, we use data on the pension system to cover the accrual of pension rights and the accumulation of pension funds. The Finnish pension system is a mix of pay-as-you go and funded systems and is therefore described in some detail

The third section contains our illustrative policy experiments. Other than increasing the growth potential of the economy, the expected, increasing fiscal burden of aging can basically be met either by increasing its funding, cutting expenditures, or by increasing the public health service sectors efficiency. We focus on the first two here.

We consider 1) a uniform cut on free health service provision; 2) a uniform increase in payroll taxes. It is celar that the distributional effects of these policies may be very different, yet both are here intended to improve public finances by about 1 billion euros. The final section concludes and offers some suggestions for further research.

2 The FINAGE model

The main tools in our study are the FINAGE model of the Finnish economy and the CHESS model of the Finnish health and social care provision. FINAGE is a derivative of the Monash (VU) model. The model and its precursors have been used to evaluate the effects regional policy reforms and to evaluate regional labour demand and education policies. In this study, we extend the model by including the provision of public health and social care in the households' utility function, following Honkatukia, Dixon and Rimmer (2011). A new approach here is treating the government-provided, free services as imperfect substitutes for market-provided services.

For the purposes of the current study, we aggregate the model to be compatible with household consumption data from Finnish household surveys at CPA 12 level of commodities. Industries are aggregated at a corresponding level, for which we have data on the income shares of different household types. Population is covered by age, and each cohort a neoclassical utility maximizer.

FINAGE covers the provision of health services by cohort. Formally, we model household demands as consisting of demand for ordinary goods X_{NH} and care services X_H, which, in turn, consist of private and government-provided services (to accommodate the fact that households actually do purchase some services from the private sector already. We assume that the private and government-provided public services are imperfect substitutes, and it is this assumption that makes it possible for the government to influence the demand for the public service by setting a tax or price on its use. Finally, we model the fact that the public services are practically free for the consumer by assuming reimbursement by the government

Maximize $U\left(\frac{X_H}{A_H}, X_{NH}\right)$

subject to $X_H = CES(X_{Private H}, X_{GovH})$

and $Y = P_{Private H}X_{Private H} + P_{GovH}X_{GovH} + P_{NH}X_{NH} - GovOutlayH + Refund$

where

$P_{Private H} = P_H$, $GovOutlayH = P_H X_{GovH}$

$P_{GovH} = P_H * T_{GovH}$ $Refund = P_{GovH}X_{GovH}$

A spending cut reduces the "gift" from the government, causing the consumer to compensate by increasing the demand for private health services. However, she has less purchasing power for doing that as the government also cuts the refund.

To calibrate the provision of health services we use the register-based data from the CHESS model. This model (Centre of Health Economics and Social Sciences within the NIHW) is an off-spring of the EU aging working group projections and is used for determining the baseline growth of social and health care volumes in connection with the assessment of fiscal sustainability. It has recently been extended to cover the health and social care sectors not only at the national level, but also at the regional level. The model is utilizing the detailed, region, age and gender-specific register data on the prevalence of treatments and care over the entire Finnish population. While the model does not optimize the

provision of health services, it does give a good first guess on how the aging of the population will change public expenditure on health care and social services. The model can also shed light on the possible effects of reforms via productivity gains in different parts of the country. In this study, we use the model's prediction as the baseline for care demand by the households.

It is conceivable that the effects of policies differ by cohort. It is difficult to summarise these effects, and here, we use a simple welfare index to measure the effects of the policies on overall welfare while at the same time accounting for the effects on regional differences. The index is simply

$$W = (\frac{1}{1-\alpha})\sum_{D0}^{D9}(U_i^{1-\alpha})$$

Where U denotes utility measured in terms of the consumption index above in each of the counties. By varying the weighing parameter, we can cover views on the relative importance of welfare effects from the utilitarian to Rawlsian.

Generational data

FINAGE models households as consisting of one representative household for each yearly age-cohort. This household enjoys the whole variety of public services and income transfers accruing to that cohort and is the recipient of the cohort's share of other incomes, as well as subject to the cohort's taxes. The approach is based on household survey data in terms of consumption distribution but it also utilizes national transfer accounts. The system of National Accounts (SNA) provides information on aggregate economic resources but not on distribution among generations or age-groups. National Transfers Accounts (NTA) is a methodology and a framework for collecting, combining and analyzing cross-sections of intergenerational and life cycle reallocation variables that is consistent with the System of National Accounts (Lee and Mason, 2011).

The essence of NTA is to estimate private as well as public consumption and labor income by age and gender, and to calculate the difference of the two, called life-cycle deficit (LCD). NTA methodology uses micro-economic data to estimate age distributions of income and consumption. SNA data is used as aggregate control variables into which the National Transfer (flow) Accounts are calibrated (Mason, Lee, Tung, Lai, and Miller 2009). The age profiles are estimated from individual or household surveys and administrative records. The age profiles are adjusted proportionately to match aggregate totals reported in SNA. Details of these procedures are described in United Nations (2013).

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:

$$Y_l + Y_a + T_g + T_f = C_g + C_f + S_g + S_f = \text{net national disposable income}, \quad (1)$$

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. Net public transfers (T_g) and net private transfers (T_f) are net current transfers from the rest of the world. Consumption (*C*) includes both public (*g*) and private (*f*) consumption as well as net savings (*S*).

Aggregate net transfers, aggregate consumption and aggregate net savings in NTA are directly drawn from SNA. Two remaining aggregate variables, labor and asset income, are obtained after adjusting some SNA variables. The definitions and adjustments are discussed in more detail, e. g., in United Nations (2013).

In NTA, the national aggregates in Equation (1) are allocated by age. By rearranging the terms, taking age into account and writing transfers in terms of gross flows, we can express the main equation of a NTA flow account by age:

$$\underbrace{c_f(x)+c_g(x)-y_l(x)}_{\text{Lifecycle deficit}} = \underbrace{\underbrace{y_{a,f}(x)-s_f(x)+y_{a,g}(x)-s_g(x)}_{\text{Asset reallocations}} + \underbrace{\underbrace{\tau_g^+(x)-\tau_g^-(x)}_{\text{Net public transfers}} + \underbrace{\tau_f^+(x)-\tau_f^-(x)}_{\text{Net private transfers}}}_{\text{Net transfers}}}_{\text{Age reallocations}} \quad (2)$$

In Equation (2), small case letters refer to age-specific components of the aggregate variables in Equation (1). Age at the end of a calendar year is denoted with x, c(x) is consumption (private and public) at age x, $y_l(x)$ is labor income, $y_{a,g}(x)$ and $y_{a,f}(x)$ are net capital incomes, $s_g(x)$and $s_f(x)$ are net savings in public and private sector respectively, $\tau_g^+(x)$ is received and $\tau_g^-(x)$ given public transfers, $\tau_f^+(x)$ and $\tau_f^-(x)$ are corresponding private transfer variables.

The economic life cycle by age, as described in Equation (2), reflects many behavioral and non-behavioral factors that influence the relationship between age, consumption and labor income. Average labor income at each age depends on hours worked, labor force participation, the age profile of wages and the many cultural, political, social, and economic factors that influence each of these elements of labor income. In a similar fashion, average consumption at each age is influenced by many forces such as historical events, preferences, prices (including interest rates), and political systems.

At the aggregate level, the economic life cycle also reflects the population age structure. In young populations, the aggregate economic life cycle is dominated by a large life-cycle deficit and economic resource needs of the young. Over the course of the demographic transition, the population's age and the life-cycle deficit of the old become increasingly important.

We have used two separate series of micro-economic survey datasets to estimate age-specific private consumption, earnings, capital income and public money transfers. The first dataset series is Household Budget Surveys (HSB) for 2012. The other one consists of large samples of annual Income Distribution Statistics (IDS). Both data are collected using several administrative registers and personal interviews. Data on the cross-section of earnings and public received and paid money transfers is available annually. Consumption data, for both private and publicly provided goods, is available only for selected years. The missing years have been interpolated. Please see the appendix for a more detailed description of this data).

Private Consumption

Using Household Budget Survey we allocate privates consumption to different cohorts. The statistics contain data describing households' use of money for diverse purposes. Consumption expenditure is classified according to the international COICOP-HBS classification. The main consumption groups are: 1) food, 2) beverages and tobacco, 3) clothing and footwear, 4) housing and energy, 5) furnishings and household maintenance, 6) health, 7) transport, 8) communications, 9) recreation and

culture, 10) education, 11) hotels, restaurants and cafes and 12) mmiscellaneous goods and services. There is also plenty of information about households' characteristics and their possession of durable goods, dwellings, liabilities and income. Household income can be broke down also by gender and age.

Public Consumption

The main age-related public consumption items, i.e., items of individual public consumption, are education, health and social services. The latter include children's daycare and long-term care of the elderly or the handicapped. The public service data is based on enrolment by age and unit production costs of different types of services per individual, including information on gender and age.

Disposable Income

Income Distribution Statistics (IDS) describe income of households in detail: wage and salary income, entrepreneurial income of households, capital income and the income transfers received and paid by households. Disposable income, which is the key concept in these statistics, is formed from these income components. Data is also produced on the debts, housing, housing expenses, daycare charges and other matters that have a bearing on the subsistence of households.

Income formation can be described as follows: factor income consists of labour income, entrepreneurial income and property income. Entrepreneurial income is partly taxed as capital income and partly as earned income. In NTA, one third of entrepreneurial income is assumed to include capital income. Capital income consists of interest income and dividends, imputed net rents of owner-occupied dwellings and other capital income (e.g. rental income and capital gains). Imputed net rents of owner-occupied dwellings in IDS are part of property income. In SNA, the rents are part of entrepreneurial income.

When we add transfers received by household to factor income we get gross income. In this study, transfers received have been classified into seven sub-groups: pensions, income maintenance during illness, family policy transfers, unemployment security, other age-related transfers, other transfers, and inter-households' transfers received. In this age distribution context, child benefits and home care subsidies are allocated to the children.

When deducting taxes and tax-like charges from gross income, we receive disposable income. This type of income consists of state taxes (from earned and capital income), municipal taxes, wealth and property taxes, social security and employment pension contributions, and inter-household transfers paid. Also, a full imputation system of corporation taxation has been applied, which means that double taxation of dividends was eliminated. Many untaxed income components e.g., capital gains, also became subject to taxation.

Pension system

Finally, we use register-based data about the pension system. Our aim here is two-fold: we want to capture the distributional effects of changes in the system, but we also want to study the implications on the accrual of pension rights, contributions to the pension funds and, ultimately, the sustainability of the pension system.

Public pension expenditure represents more than half of the total volume of public transfers. Finnish statutory pensions are made up of partly - funded earnings-related pensions and tax-financed national pensions. The national pension guarantees a minimum income for pension recipients with no other pension income, or it supplements small earnings-related pensions. Private voluntary pensions play a

relatively minor role in the total pension provision in Finland. Earnings-related pensions are defined - benefit in the sense that the size of the pension expenditure determines the contribution level and the need for other financing.

Annual earnings from work or self-employment, and accrual rate determines the pension rights. The accrual rate is 1.5 % of earned income. Both pension rights and benefits are index linked, with 80-20 weights on wages and consumer prices respectively during working years and 20-80 weights after retirement, irrespective of retirement age. The pension at the start of retirement is adjusted by life expectancy coefficient. It is a factor considering the increasing longevity on the capital value of the pension annuity. You can earn pension rights up to the age your insurance obligation ends, which is five years after your retirement age. Working longer you can earn higher pension.

Retirement age depends on the year of birth. The earliest retirement age is currently 63 years and 9 months. It increases three months per year to reach 65 in 2025. In 2027 retirement age starts to track the change in life expectancy. At present the insured is entitled to a normal old-age pension at the age of 63 year and 9 months, but he or she can continue to work up to the age of 68. There is a 0.4% monthly delay bonus to your accrued pension.

Longevity adjustment

The adjustment coefficient is a ratio of two present values of a unit pension, calculated at two different periods. The present value of a unit pension, which begins in period *t* and is calculated forward from age 62, is as follows.

The Finnish earnings-related part of the public pension scheme is partially funded with assets worth of double of the wage sum. Two thirds of these assets are owned by private-sector pension providers. Funds are invested both domestically and internationally in commercial assets. The state and local government pension schemes were originally based on a pure pay-as-you-go system but started funding pensions in late 1980's in order to curb the increase in pension contributions. The aim of this fund is to gather assets so that the cost burden caused by the pensions of the post-war baby-boomers can be lessened in the years when the pension expenditure is at its highest. In this study we treat pension institutions as a single buffer stock fund, which has prefunded 25 % of its liabilities.

Earnings by gender and age

Finally, we have used Eurostat data on wage incomes and numbers of workers by gender and industry.

3 The effects of the pandemic

Figure 1 shows a decomposition of quarterly GDP growth during the pandemic in Finland Finland weathered the pandemic relatively well, as the strict but periodic shut-downs of risky sectors of the economy (mainly the trade and travel related services and also public transport) and of course the increasing availability of vaccines kept mortality at bay. There was also wide-spread consensus about compensation for the worst-affected (economically) sectors, which helped to ease the effects of shut-downs. The economy reached pre-Covid levels were by the end of 2021. But the decomposition does not really address the question of the costs of the pandemic. Below, we compare the realized growth to a counter-factual baseline that assumes growth to have continued on the "trend" it was on at the beginning of 2020. This allows us to calculate welfare measures for households and also to address the question of distributional effects from gender and age perspectives.

Figure 1

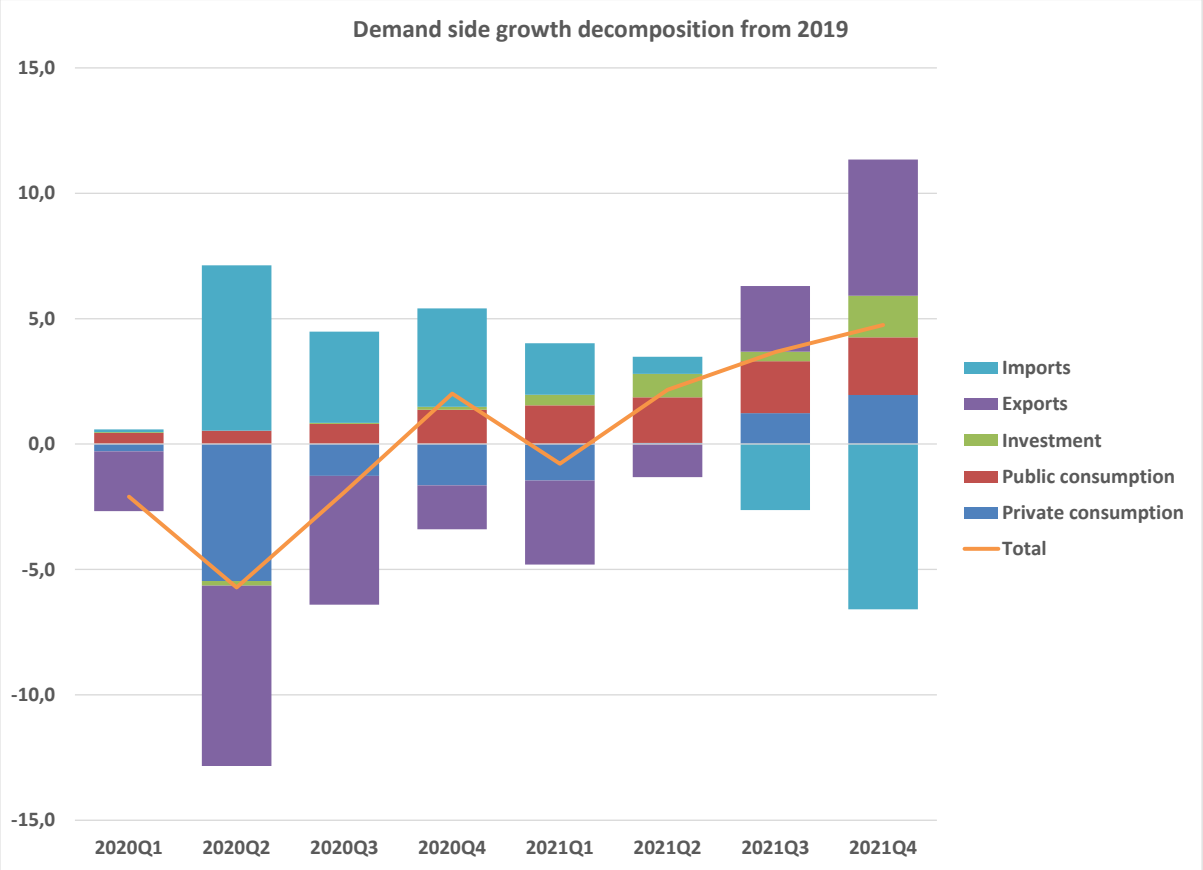


Figure 2 shows the effects of the pandemic as deviations from the counter-factual baseline where the economy would have continued to grow at a pace of some 1,9 per cent a in 2020 and almost as fast in 2021. For the export sectors, we follow other studies and assume that there is a dip in world market demand for exports, affecting Finnish export industries as well. In the domestic market, we model the pandemic as under-utilisation of resources and rationing of consumption of travel and accommodation, culture and transport services. Once the restrictions are removed, the capacity of the economy in these sectors is more or less intact, as shown in figure 3. We also take into account that automatic stabilizers in the form of assistance to affected households saw to it that aggregate household disposable income kept growing through 2020 and 2021 even though household consumption could not because of the restrictions.

Figure 2

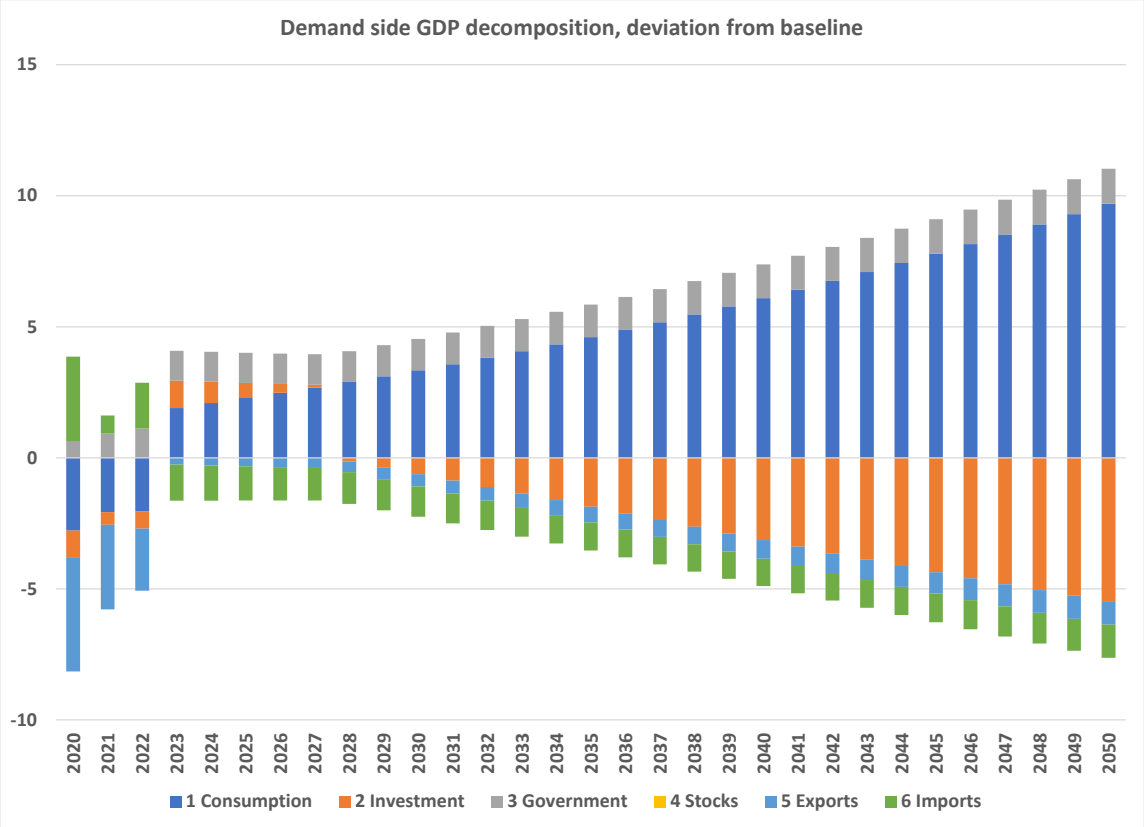
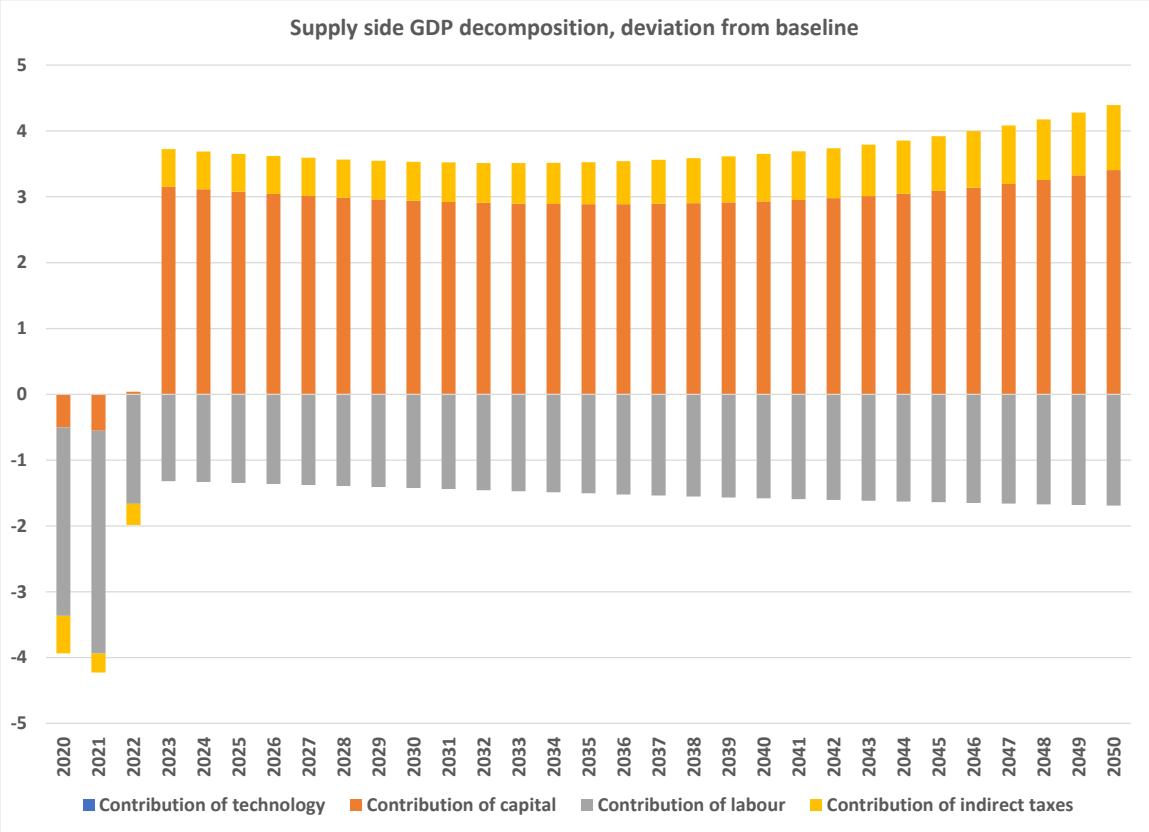


Figure 3



An interesting feature of the recovery from the pandemic has been that there has emerged a sudden labor-shortage in most every sector of the economy. Our counter-factual scenario shows that labour supply may have fallen – as household incomes have been rising regardless of the temporary layouts – which is showing up in increased wage bids. This is reflected in figure 4, which indicates that wage bills may be on the rise after the pandemic. As an interesting aside it may be noted that several labour unions in Finland are striking or about to do so at the time of this writing.

Figure 4

We have calculated the equivalent variation of the pandemic relative to the counter-factual baseline in figure 5. It shows, firstly, that the monetary effects for men are bigger than for women for the working age population, because men's income shares are larger in almost every age group. As an aside, performing this calculation, we also noted that men's average wages exceed those of womed in almost every age group (even in Finland). For older generations, the result is reversed because the share of women grows after about 70 years of age.

Finally, because of the generous leveling out of the effects of the pandemic, the public sector deficit is settling to a non-sustainable path. A very rough simulation shows that the public sector debt to GDP ratio, which is often used as a measure of sustainability, would exceed 100 per cent in the 30's. One of the corrective measures being considered is a cut in the growth of health care expenditures. Here. We simulate the effect of a tentative policy of cutting health care expenditures from their baseline growth by roughly 100 million a year, so that the yearly expenditure level would by a billion euros lower by 2035. Figure 6 shows that this would harm the youngest and the oldest age groups which are more dependent on public services and also on transfer incomes, whereas working-age population would be able to compensate this at the market and even actually benefit.

Figure 5

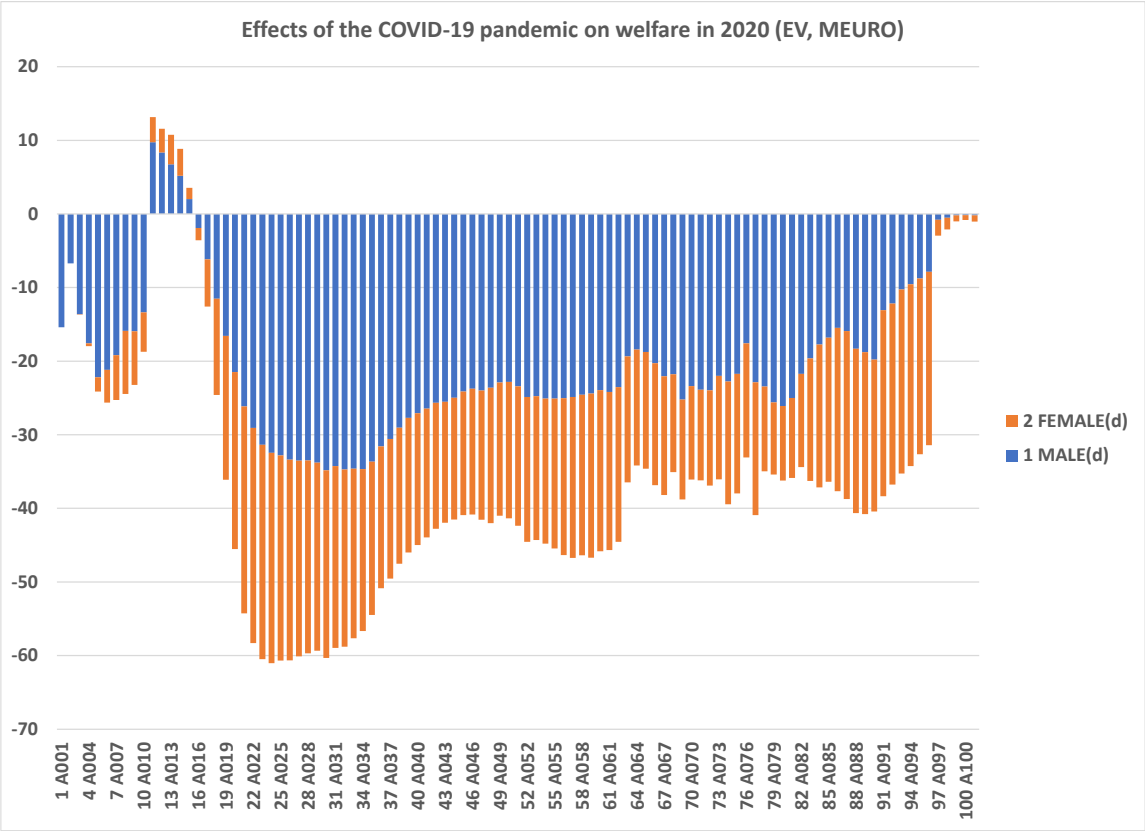


Figure 6

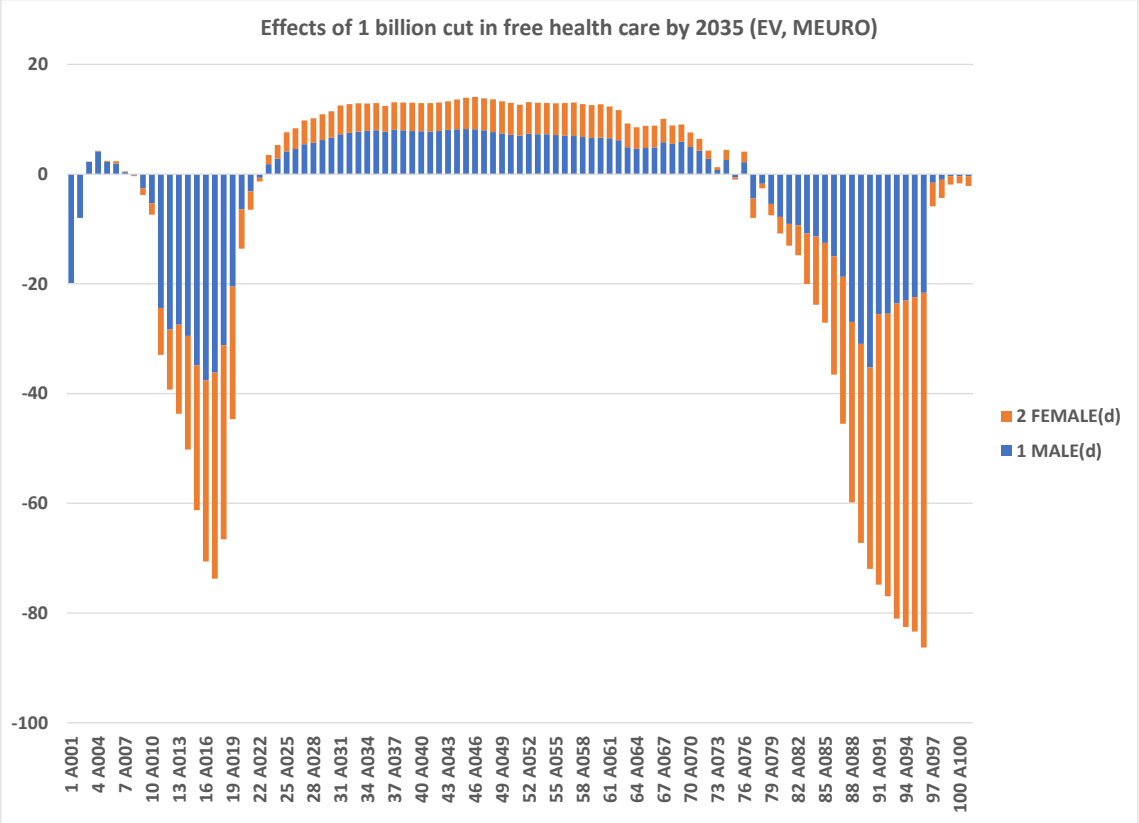
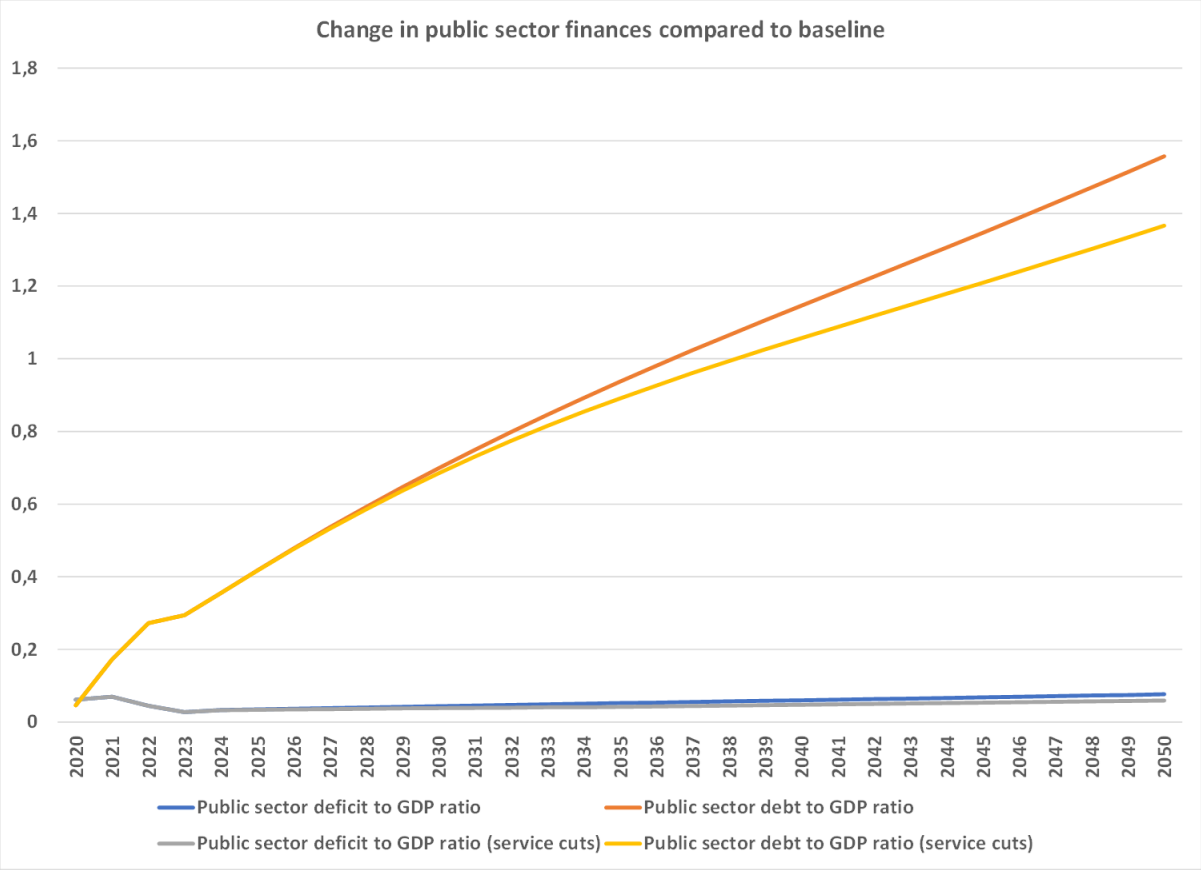


Figure 7



4 Conclusions

The ageing of the population is expected to build pressure on the sustainability of public finances in Finland. This paper has studied the macroeconomic and welfare effects of one of the tentative policies aimed at improving the fiscal stance of the broad public sector (covering both social security and pension funds and the government sectors) after the COVID-19 pandemic.

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IKärakenne