

# What is the Price of Austerity? – A Dynamic AGE-analysis for Finland

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## **Abstract**

The current economic turmoil within the Euro area has brought fiscal stance at the core of economic debate. In most EU countries public deficits have increased and different types of “austerity packages” are considered. Typically these packages consist of tax increases and public spending cuts. In this study we assess the effects of planned Finnish public spending cuts on the local economy, on fiscal sustainability and on income inequality in short and long run. We use a dynamic AGE model to estimate the effects. The model has been extended in two major respects for the analysis of these welfare effects. First, the model covers income decile-specific employment/leisure and saving choices. Second, it takes into consideration the direct welfare effects of government spending on households. To evaluate the welfare effects of public services provision, we use recent data on income decile-specific, non-market consumption of public services. This allows us to study the welfare effects of cuts in specific, publicly provided services. We calculate the dynamic Marginal Cost of Funds (MCF) and the effects on income inequality. Our central finding is that the welfare costs, and thus the plausibility of the austerity package, depend on the type of the public spending cuts. When spending cuts concern public services that are of indirect use to the consumers, welfare effects are negligible. If public services that do provide direct utility are cut, welfare is affected much more strongly. In general, the Finnish austerity package is found to be even welfare improving according to the dynamic MCF calculations. However, it increases slightly income inequality between households.

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## **1. Introduction**

Austerity has become a European by-word for non-popular economic policies since the start of the latest financial crisis. Finland has weathered the crisis better than most EU-countries – or at least her public finances have. However, she is also facing fiscal pressures caused by the problems of a rapidly declining working-age population and the growing costs of an ageing population. These concerns have led to a lively debate on the extent of a long-run sustainability gap in public finances, and to measures aimed at keeping the gap at bay by increasing taxes and curbing public spending. This study focuses on the latter, attempting to evaluate the economic consequences of public spending cuts.

The effects of public spending cuts are a more difficult topic for AGE-analysis than might appear at first. We do not know much of the welfare gains obtained from public spending and most AGE-models do not take them into account. National account data typically considers the public sector as one of the final consumers of the goods, which finances its activities by collection of taxes and levies. In this set-up, cutting back on public spending is a good idea. It will allow taxes to be cut and resources to be re-employed in more productive uses. In reality, on the other hand, public sector actually produces (public) goods with its finances in most countries. It provides health care services, education, and the like to the citizens. For the valuation of these services, additional data is usually required. In this paper, we use consumption-survey data to model the direct utility from publically provided educational, health care, and social services. In Finland, roughly 90 per cent of health and social services are provided by the public sector, and almost all of education services. Clearly, the implications of spending cuts will appear in a different way depending on whether their welfare contributions are (can be) accounted or not.

We use the concept of Marginal Cost of Funds (MCF) to internalize the overall welfare implications of the spending cuts. Underlying our interest for using this measure is the well-known result from general equilibrium theory, found in e.g. Dahlby (2008) and Liu (2004). Interactions between different taxes, as well as changes in the cost of public sector production, will have an effect on MCF. When the government cuts on spending, all its revenues are affected. We feel that this calls for the use of a general efficiency measure. MCF compares the society wide welfare effects of government spending to their revenue implications, namely on the changes in government deficit in the case of spending cuts. In addition to the direct effect, MCF takes into account the indirect effects of public spending cuts, which stem e.g. from job creation/destruction and trade balance effects.

We use VATTAGE, a dynamic AGE model of Finland, for the analysis. VATTAGE is well suited for the analysis of fiscal policy. It includes all major tax types and covers the Finnish economy at great sector detail. For this analysis,

the model is extended to cover decile-specific employment/leisure and saving choices, based on the representative household model developed in Dixon, Honkatukia, and Rimmer (2011). We will assume perfect competition in the labour market throughout the study. This is not done because we find the assumption particularly realistic, but because it is the reference point in the theoretical literature on MCF.

We focus on the spending cuts decided by the Finnish government in early 2012. The cuts aim at reducing government spending on certain central government functions and on education. In addition, the plan slashes farming subsidies, infrastructure investments and subsidies for child care. The aim of the central government is to save roughly 500 million euros a year, with another 500 million or so to be gained by cutting transfers from the central government to the local governments. The latter, however, cancels out in an analysis focusing at the national level.

The second section gives an outline of the VATTAGE model under the new decile specification and discusses the introduction of utility-generating public services into the model. In section three, we describe the spending cuts planned by the Finnish government over the current electoral period and their effects. In section 3.2 we demonstrate the differences in the welfare and efficiency implications between 1) cuts in services that do not provide direct utility to the consumers, 2) cuts to utility-generating services. In section 3.3, we analyse the full “austerity package”, which includes both cuts to public spending as well as to some transfers to the households. Section 4 concludes.

## **2. The VATTAGE model**

### **2.1. An outline of VATTAGE**

VATTAGE is an applied, dynamic general equilibrium model for Finland that covers the whole economy. It models all major tax types including labour income taxes, capital taxes and indirect taxes of various forms. The VATTAGE database contains detailed information on commodity and income taxes as well as the expenditures and transfers of the public sector. It covers, thus, most policy instruments available to the government. The model accounts for changes in public deficit and debt and can be used to evaluate the impact of the policy shocks on public sector sustainability. Further, the government cost structure accounts for the different types of public transfers to households, including e.g. age related benefits and unemployment benefits, as well as public investments.

VATTAGE is based on the MONASH-model developed at the Centre of Policy Studies at the Monash University. MONASH-style models are used in countries ranging from China and South Africa to the United States and Australia (Dixon and Rimmer, 2002). In Europe, models based on MONASH have been

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developed for Denmark, Finland, and the Netherlands. VATTAGE is described in detail in Honkatukia (2009).

To calculate the Marginal Costs of Funds, we have extended the basic VATTAGE by allowing households to make endogenous choices between their leisure (or equivalently labour-supply), their consumption of commodities and their savings (Dixon et al, 2011). We have adopted the simplest approach. We treat leisure and savings (reserved consumption) as two more “commodities” in the household’s choice function. The household’s problem has been amended to allow for the treatment of full income, that is, income inclusive of the value of leisure. We model the 10 household income deciles separately.

Formally, households in each income decile  $i \in I$  maximize utility from

$$U_{iC}(C_i) + U_{iL}(L_i) + U_{iR}(R_i) \quad (1)$$

subject to

$$P_{iC} * C_i + P_{iR} * R_i = Z_i + \left( \frac{P_w}{T_{i,w}} \right) * N_i \quad (2)$$

and

$$L_i = H_i - B_i - N_i \quad (3)$$

where

C is consumption

L is leisure

R is reserved consumption (i.e. saving)

H is total hours available for work;

B is hours in involuntary unemployment;

N is hours of employment;

$P_w$  is the pre-tax wage rate;

$T_w$  is the power of the tax on labour income;

Z is household non-labour income;

$P_R$  is the price of a unit of reserved consumption (to be discussed in subsection 2.6);

$P_C$  is the price of a unit of consumption,

and where the index  $i$  denotes decile.

In (3), we assume that involuntary unemployment is not leisure and consequently gives no utility.

The price of consumption is given by

$$P_{iC} = P_Y * T_{iC} \quad (4)$$

where

$T_{iC}$  is the power of the tax on consumption (that is,  $1 +$  ad valorem-equivalent rate of commodity taxes),  $P_Y$  is the price of GDP.

The first order conditions from problem (1) to (3) are:

$$U'_{iC}(C_i) = \lambda_i * P_Y * T_{iC} \quad (5)$$

$$U'_{iL}(L_i) = \lambda_i * P_{iW} / T_{iW} \quad (6)$$

$$U'_{iR}(R_i) = \lambda_i * P_R \quad (7)$$

where

the superscript prime denotes derivative; and

$\lambda$  is the Lagrangian multiplier which can be interpreted as the increase in utility that the household would derive from an extra dollar of income (a unit increase in  $Z$ ).

As is apparent from the demand equation, consumption of commodities, leisure and saving are now interrelated. In the original formulation of VATTAGE, the labour market specification drives the reaction of employment to taxes, and saving is affected by taxation only to the extent that households' disposable incomes change. In specifying the demand functions arising from (5) – (7), we assume that the relevant price for leisure is the nominal after tax wage rate, whereas the price of saving captures the opportunity cost of current consumption.

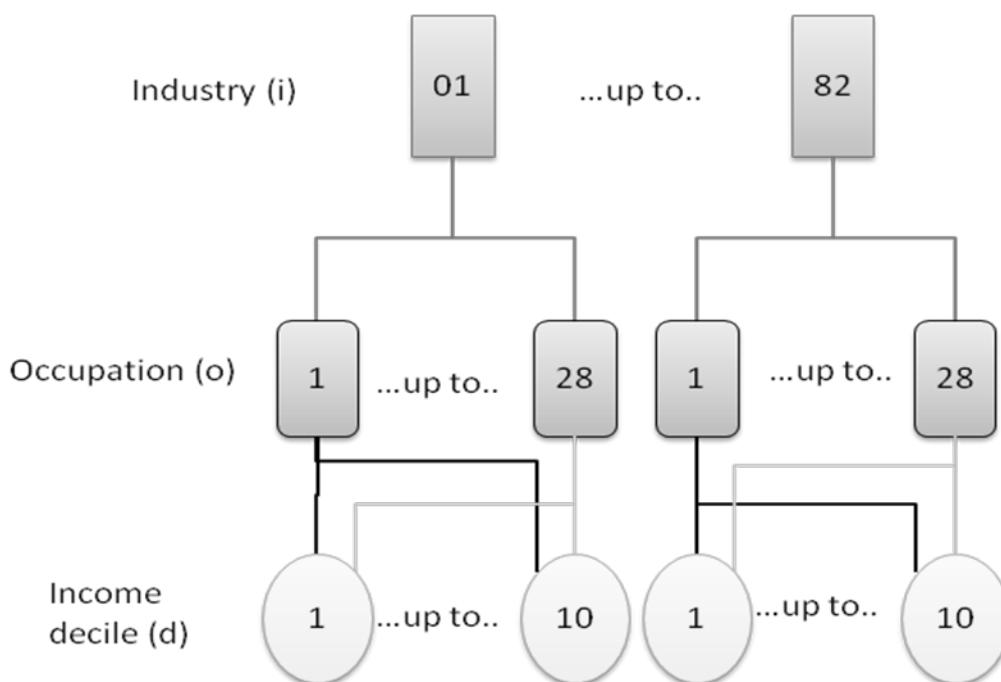
We use decile-specific consumption data from VATT's income-distribution model (TUJA). The parameters for the decile-specific consumption functions cover 91 commodities, and have been estimated using the large consumption

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databases of the income-distribution model. They are reported in Honkatukia, Kinnunen and Rauhanen (2011).

To link the consumption and labour supply choices, we have coupled the data on decile-specific consumption with data on decile-specific income. On the income side, our databases cover decile and occupation-specific labour, capital and transfer incomes. To connect this data to labour demand by the 82 VATTAGE industries, we use Finnish Longitudinal Employer-Employee database (FLEED) for industry and occupation specific labour data. This enables us to link the two data sets, as illustrated in Figure 1.

*Figure 1. Labour income by occupation and decile*



We have used the estimates of Kleven and Kreiner (2006) to calibrate the labour supply elasticities implied by the utility maximization problem in (1) to (3). Kleven and Kreiner (2006) find considerably higher elasticities for lower income deciles than for higher ones. On the average, the implied elasticity of supply is around 0.1, with the elasticity in the lowest two income deciles nearing 0.2-0.3 but being well below 0.1 for the higher-income deciles.

To account for the direct utility contribution of public services, we assume that the demand for educational, health care and social services consists of an endogenous, private demand part, and of a publicly provided, exogenous part. The focus on these services is mandated by the availability of data. However, these services are also set apart from other public spending since they are almost exclusively distributed to the consumers. In comparison, public administration and most other public spending is more directly consumed by the public sector

itself. According to a behavioural assumption, consumers match their private demand for a service if the public service provision is changing, subject to changes in relative prices and in their incomes. The section 3.2 demonstrates this mechanism by comparing the effects of 1) spending cuts to services that do not generate direct utility to consumers and 2) spending cuts in services that do provide direct utility.

In most AGE models until now, public expenditures for example on education and healthcare services are modelled as kind of sunk costs. In other words, the direct utility from these services to the consumers (who consume them mostly for free) is not accounted for. Since in Finland the majority of education, healthcare and social services consumption is publicly funded, we consider it essential to include this link between government expenditure and consumer welfare to the VATTAGE model. In order to do it, we use data from a special consumption survey of Statistics Finland on the consumption of public services by households in the different income deciles. The consumption of these public services is given a monetary value in the survey based on the production costs. Specifically, we use data on the consumption of public education, healthcare and social services by the different income deciles according to Jokimäki (2011). The survey data is used to calculate the share  $s_{ij}$  of each income decile  $i \in I$  out of the total consumption of the different public services  $j \in J$ , where  $\sum_i s_{ij} = 1$ . These shares are then linked to the data on public expenditure in services  $j$  in the VATTAGE database. Each income decile is modelled to receive their share  $s_{ij}$  of the expenditure on public services  $j$  as an additional income transfer from the government. Hence, if any spending cuts are directed to these public services, this will lower the income and welfare of the consumers in the VATTAGE model in line with reality.

## 2.2. Baseline scenario

The literature on MCF suggests that welfare costs are scale-dependent. This means that the baseline scenario of the economy matters for the results of the analysis. VATTAGE baseline is constructed to conform to medium-term official forecasts at the macro level. However, at the sector level, it is based on an extensive study of the structural trends of the economy, as well as on a very large scale forecasting project encompassing dozens of sectoral and regional experts. This section gives a brief description of the procedures followed in forming the baseline.

The structural trends concern changes in demand patterns by commodity and user type (domestic consumption, exports to EU and elsewhere, investments, and the public sector) that stem from a historical analysis on the development of the Finnish economy (Honkatukia and Marttila 2011). In the historical analysis, VATTAGE uses data on the actual changes in demand, production, relative

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prices and the tax structure over a period of the time to decompose the observed changes in the economy into contributions by structural variables. For example, historical analysis allows us to show that the largest contribution to the 37.3 per cent GDP growth from 1995 to 2004 stemmed from employment, which alone would have explained a 15.7 per cent increase in GDP. More importantly, we find that technological change – mainly primary factor productivity growth – explained 8.3 per cent of GDP growth. Trade and domestic prices together explained more than 10 per cent of GDP's growth. The historical analysis is conducted at commodity and industry level and allows us to obtain trends for the development of factor productivity and demand patterns, which can be used in forecasting the baseline for the future.

The baseline forecast uses also macro and, to an extent, industry level forecasts from other studies. We use macroeconomic forecasts for the early years of the scenario, and population and age-related expenditure forecasts for the whole scenario. The main medium-term macroeconomic assumptions in our scenario conform to the medium term forecast of the Ministry of Finance and the EU Ageing Working Group. In the longer run, macroeconomic developments are determined by population trends. They affect public demand for services and other public expenditures, as well as private consumption. Industry-level developments depend on productivity trends and commodity-level export trends. The baseline also evaluates the development of public sector debt and deficit, given policy measures already taken. The sector-specific baselines have been developed in the context of a long term foresight project, where we have benefitted from the scrutiny and comments of dozens of sectoral and regional experts and interest groups (Honkatukia, Ahokas and Marttila (2010); Ahokas and Honkatukia (2011)).

### **2.3. Marginal Cost of Funds (MCF) in VATTAGE**

We measure the efficiency implications of the spending cuts by calculating the Marginal Cost of Funds. MCF can be operationalised easily by the standard welfare measures already in place, as long as the appropriate revenue implications are reported.

The concept of marginal cost of funds, while related to excess burden considerations, takes into account the effects that arise when existing tax systems are modified or when there are changes in public spending. Often, there are both types of effects. The importance of these interactions is emphasized by Dalhby (2008). He notes that changes in even one tax rate can have effects on the collection of other taxes due to the interdependency of different tax types. Similarly, public spending in the form of a public projects or cash transfers also affects the revenue collected from taxes. Perhaps even more importantly, the value of public transfers to households and to other sectors of the economy depends on the changes in the relative prices caused by the tax changes. The



advantage of MCF is that it summarizes the overall effects from a welfare point of view and takes into account the effects of these interactions.

MCF is usually defined as a money-metric measure of the loss of welfare resulting from the collection of extra revenue. Surprisingly, there seems to be several definitions for MCF. Here, we use the definition

$$\text{MCF} = \left( \frac{-\text{EV}}{\Delta\text{R}} \right)$$

where EV is the equivalent variation resulting from the fiscal policy change and  $\Delta\text{R}$  is the change in revenue. In the spending cut context, we measure the revenue implications with changes in government deficit/surplus and, alternatively, with changes in national saving.

Under this definition, the MCF for a pure tax increase would be greater than one. This indicates that the collection of additional revenue involves a welfare cost. For a spending cut, however, it is possible that  $\text{MCF} < 1$ , which implies that the policy is welfare improving. It is also possible that MCF is negative, whence it needs to be further specified whether the welfare effect is a Pareto improvement (positive welfare effect and positive change in tax revenue/public sector surplus) or deterioration (negative welfare effect with negative change in tax revenue).

### **3. The effects of the spending cuts**

#### **3.1. The Finnish “Austerity package”**

Table 1 below presents the Finnish planned spending cuts and indicates the scenarios where their impacts are evaluated. We are not able to cover all of the cuts, as some of them entail changes in, say, the corporate tax structure and perks to individual investors. But even at this level, our analysis encompasses more than 90 per cent of the planned cuts. Most of the policies are phased in gradually, with the overall saving target rising from 215 million € in 2013 to 477 million by 2016. This represents roughly one per cent of overall government spending in Finland. We continue by analysing first the effects of scenario 1 and 2 in section 3.2. Section 3.3 includes the analysis of the full ‘austerity package’, i.e scenario 3. It includes all items in table 1.

Table 1. The Finnish “Austerity” package

<i>Spending type</i>	<i>Change in spending €, 2013-2016</i>	<i>Notes</i>	<i>Scenario</i>
Farm subsidies	-52 million € per year	Cuts take the form of increases in direct (negative) product taxes; cuts start at 2 million €	Scenario 3
Road maintenance	-30 to - 58 million € per year	Capital tax up from 28% to 30%	Scenarios 1 and 3
Transfers to households	-60 million € per year	Modelled as lump-sum taxes	Scenario 3
Central government	-44 to -167 million € per year	Modelled as change in value of govt spending	Scenario 1 and 3
Education	- 109 to – 140 million € per year	Modelled as change in value of govt spending; these services provide direct utility	Scenario 2 and 3

Source: Ministry of Finance

### 3.2. Cuts in road maintenance and central government versus cuts in education

In this section, we consider the effects from cuts in spending on services that provide direct utility for the consumer as opposed to others, which do not. The austerity package contains examples of both; free education is one of the most significant contributions to the overall welfare of the Finnish consumer, whereas the benefits of road maintenance and central government are less directly observed. In other words, we compare the effects of scenario 1 and 2.

To commence with the latter, figure 2 shows the general macroeconomics effects of spending cuts in scenario 1. It is apparent that one of the largest effects concerns government spending, which decreases by some 0.35 per cent compared to the baseline by year 2024. As we assume competitive labour markets, the resources vacated from the public sector find their use in the rest of the economy. That benefits exports, which grown by some 0.5 per cent compared to the baseline. The consumption effects in the figure are presented with and without the direct utility from public services to households. As road maintenance and central government administration do not affect the direct utility of consumers, the consumption of goods falls by around the same amount no matter whether the public services are included in the consumption basket or not.

Figure 3 reports the effects on savings and on the external balance of the economy. The cuts in government spending diminish domestic absorption, implying that exports must increase to make full use of the economy’s resources. Thus the trade balance improves by about €140 million by 2016. The spending

cuts amount to €17 million by 2016, but the government deficit is only reduced by €81 million. There are several reasons for this, but primarily it results from the fall in the overall price level as wages are pushed down. Consequently, government saving increases by only about half as much as spending is cut. Government spending is also crowding out household's savings in the sense that households save less to accommodate for the fall in their incomes. Interestingly, the welfare cost of these cuts is far smaller than the change in government surplus, as presented in Figure 4, and therefore the MCF from these cuts shows a relative welfare improvement.

We consider next the effects of spending cuts on education. Figures 5-7 provide the same information for scenario 2 than what was presented in figures 2-4 for scenario 1. In figure 5, the macroeconomic effects are presented. The effects are relatively similar to those presented for scenario 1. A clear distinction can be seen, though, in the consumer's consumption effects. When public services' value is included in the consumption basket, consumption decreases significantly more than when the public services are excluded. Consumers compensate for the falling public provision of education services by increasing their demand for the private provision of these services. This results in decrease in real income that affects also the demand for other consumption goods.

The overall effect on government spending, presented in figure 6, amounts to -€29 million by 2016, with government deficit falling by €136 million. This is equivalent to a 0.25 per cent fall compared to the baseline by 2016. The fall in government spending also shows as a fall in household savings as consumers increase their demand for privately provided education services and compensate for the decrease in real incomes by saving less. National savings increase, again, by around half of the value of decrease in government deficit. The trade balance improves also under this scenario, but less than in scenario 1. This time the welfare loss to the consumers, shown in figure 7, matches or exceeds the surplus collected by the government. It reflects the direct utility losses from the cuts in educational spending. The MCF in this scenario hovers around 1 in the short run, although it starts to rise after 2016.

The distributional effects of these policies to household incomes differ even more markedly than the overall effects. These effects are presented in figures 8 and 9 for scenario 1 and 2, respectively. From figure 8, it is clear that spending cuts on road maintenance and central government have small welfare effects and almost no effects on income distribution. Education, in figure 9, has relatively larger effects, which are also more unevenly distributed across the households. The figures report the change in the Gini-coefficients. In the education case, it points to increase in income inequality since public education services are consumed proportionately more by the lower (poorer) household deciles.

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Figure 2. Macroeconomic effects (scenario 1)

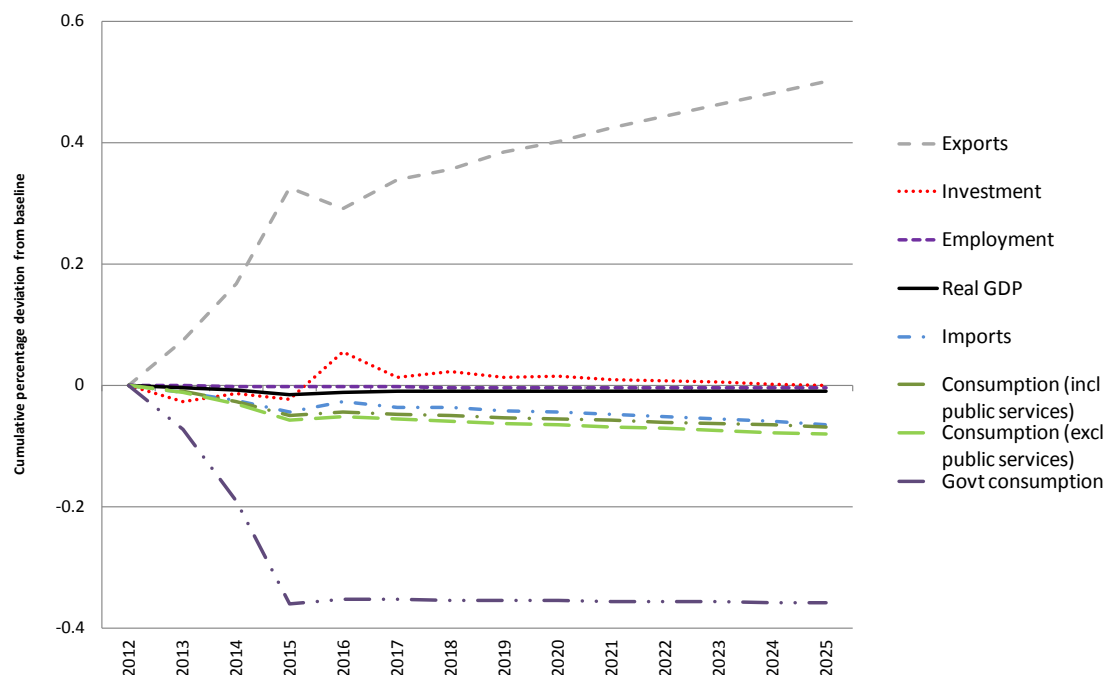


Figure 3. Effects on savings and external balances (scenario 1)



Figure 4. Effects on government revenues and welfare (scenario 1)

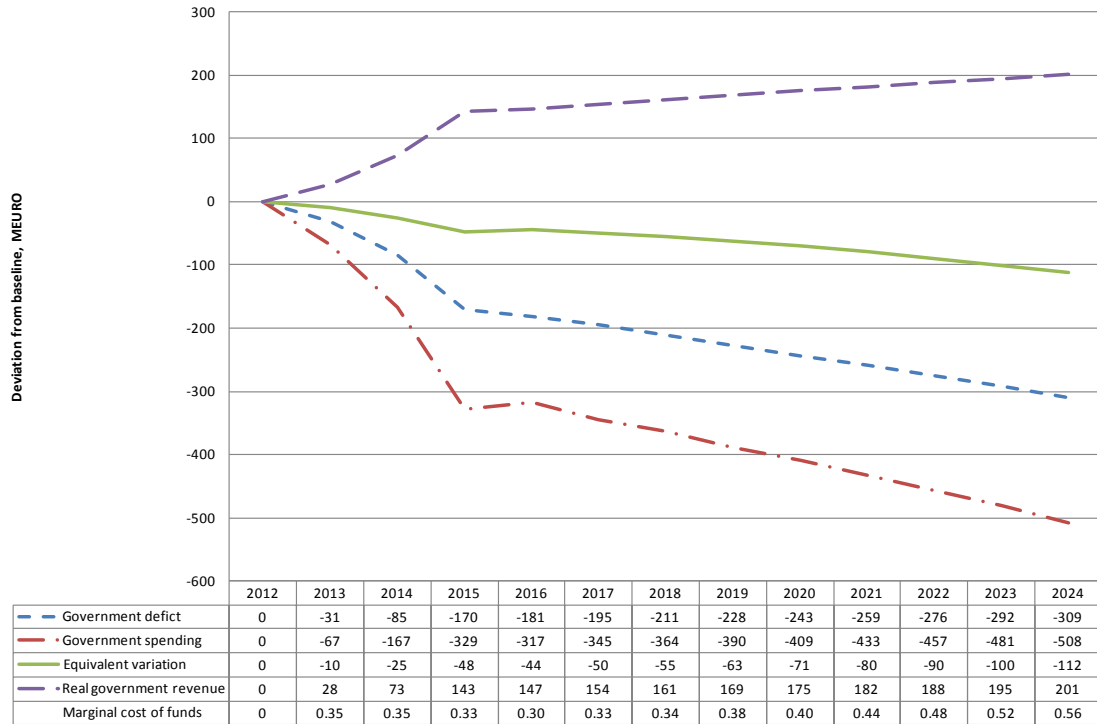
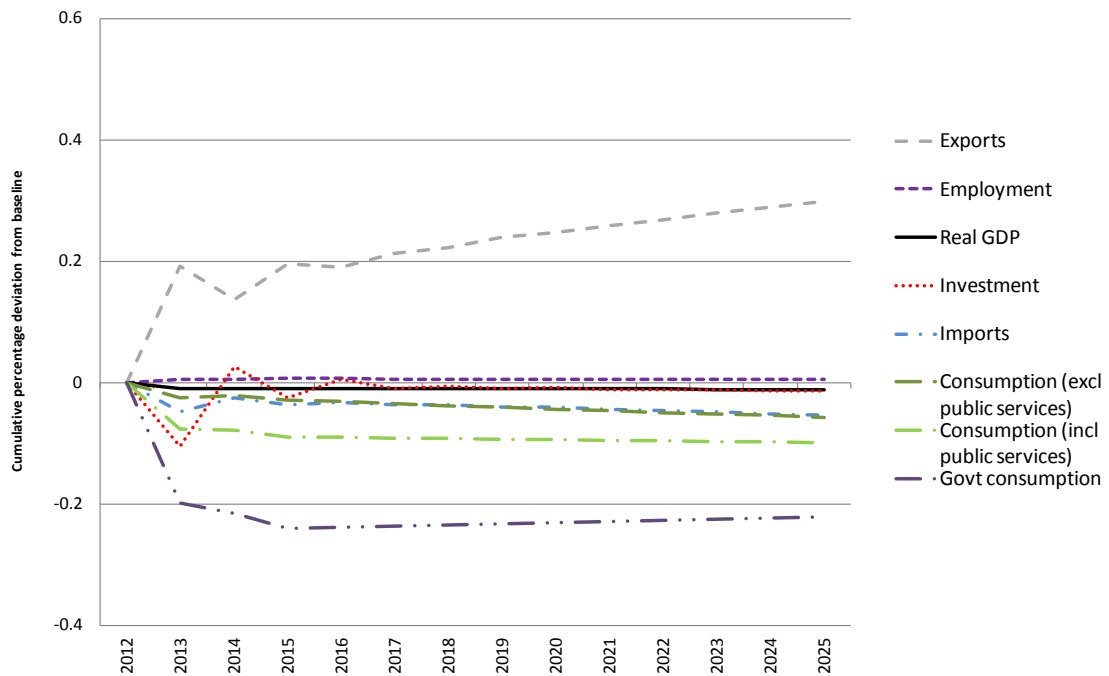


Figure 5. Macroeconomic effects (scenario 2)



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Figure 6. Effects on savings and external balances (scenario 2)



Figure 7. Effects on government revenues and welfare (scenario 2)

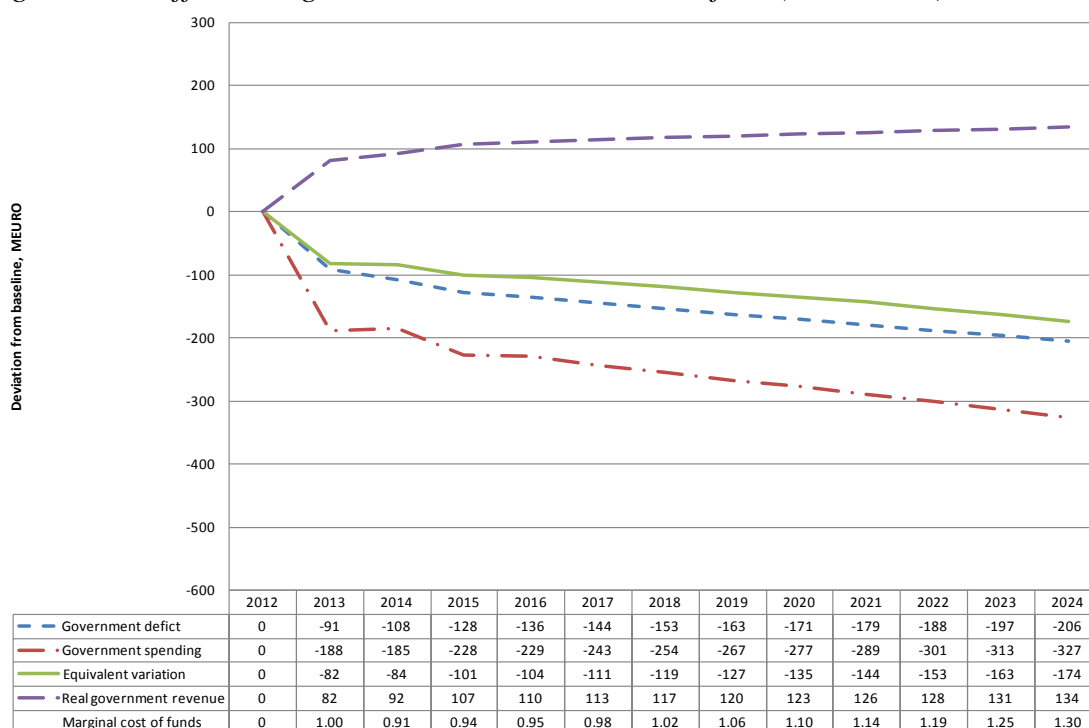


Figure 8. Effect on equivalent variation per income decile (scenario 1)

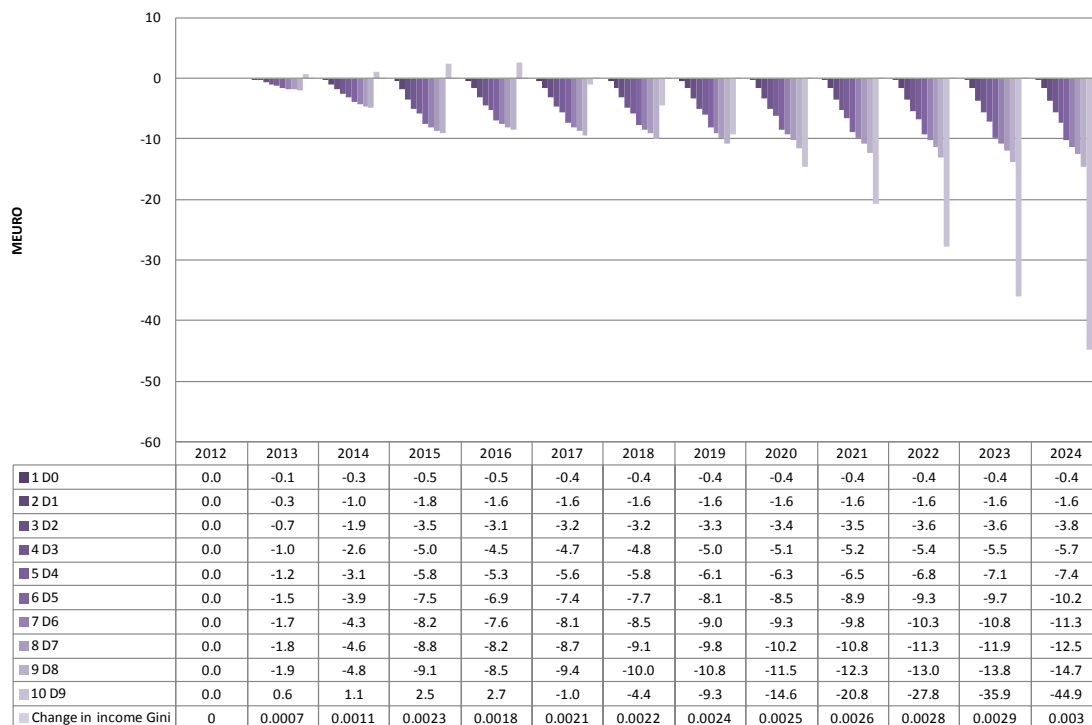
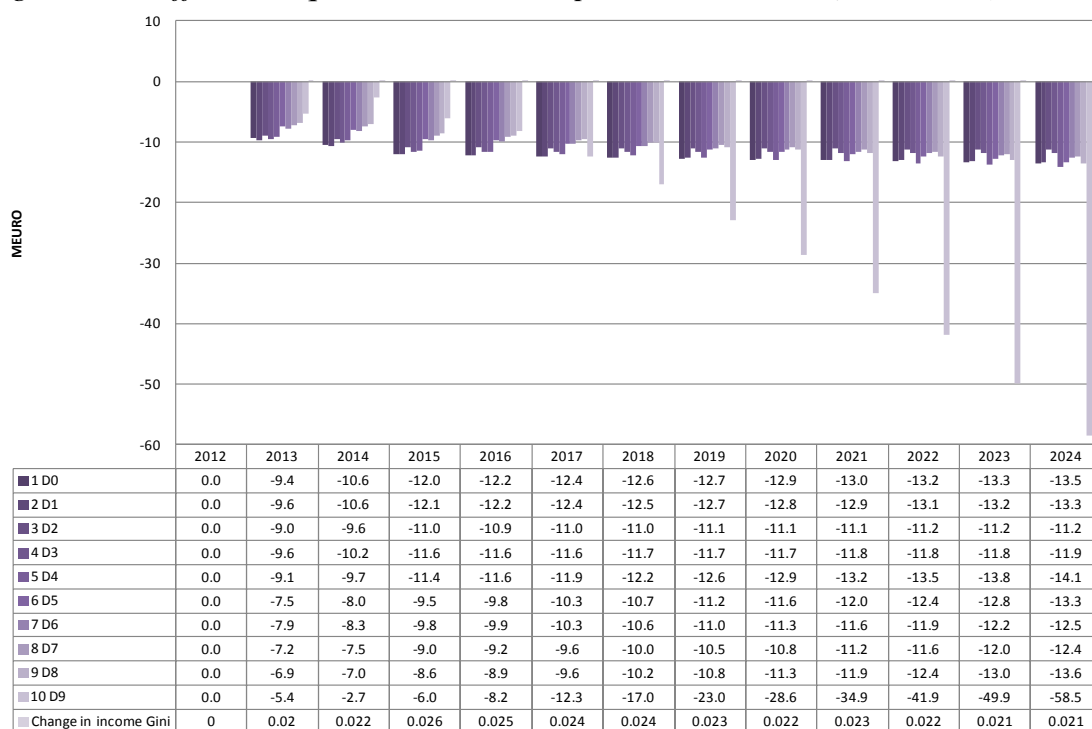


Figure 9. Effect on equivalent variation per income decile (scenario 2)



### **3.3. Effects of the full austerity package**

This section considers the full austerity package, which covers all the spending cuts shown in table 1, including cuts in farming subsidies and transfers to households. The full package affects thus incomes directly and negatively in addition to the effects studied the previous section.

The macroeconomic effects of the package are presented in figure 10. Government consumption falls by almost half a per cent by 2016. Real GDP is nevertheless not much affected. Employment increases slightly (falling incomes are making leisure more expensive and thus increase labour supply) and exports take up the slack in the economy as price competitiveness benefits from a fall in real wages. Imports and consumer consumption decrease slightly due to the fall in real wages.

Figure 11 shows that the value of government spending falls by €17 million by 2016. It slightly exceeds the given target of €477 million in (table 1) for the package. Government deficit, however, falls only by about €300 million as other tax revenues are affected by the changes in the economy. External balance is improved, markedly even. However, government saving is crowding out private saving, which falls by 94 to 150 million euros between 2013 and 2016.

From figure 12 can be seen that government revenue – the real surplus – initially increases only slightly, whereas the effect on consumers is felt immediately. Thus, the MCF of the whole package is quite high in the beginning, but it then falls rapidly to reach 0.8 by 2016. This implies that the reform is welfare-improving in the end. It involves proportionally smaller societal costs than what the level of additional revenue is. On closer inspection, it is also clear that this effect is largely caused by cuts in services that do not provide direct utility, as well as by cuts in subsidies.

The household income effects and the effect of the Gini-index, presented in figure 13, are similar to the effects in scenario 2. The direct cuts to household transfers and to the public services providing direct utility to consumers decrease the income of the poorest households proportionately most. This decreases income inequality over time.



Figure 10. Macroeconomic effects (scenario 3)

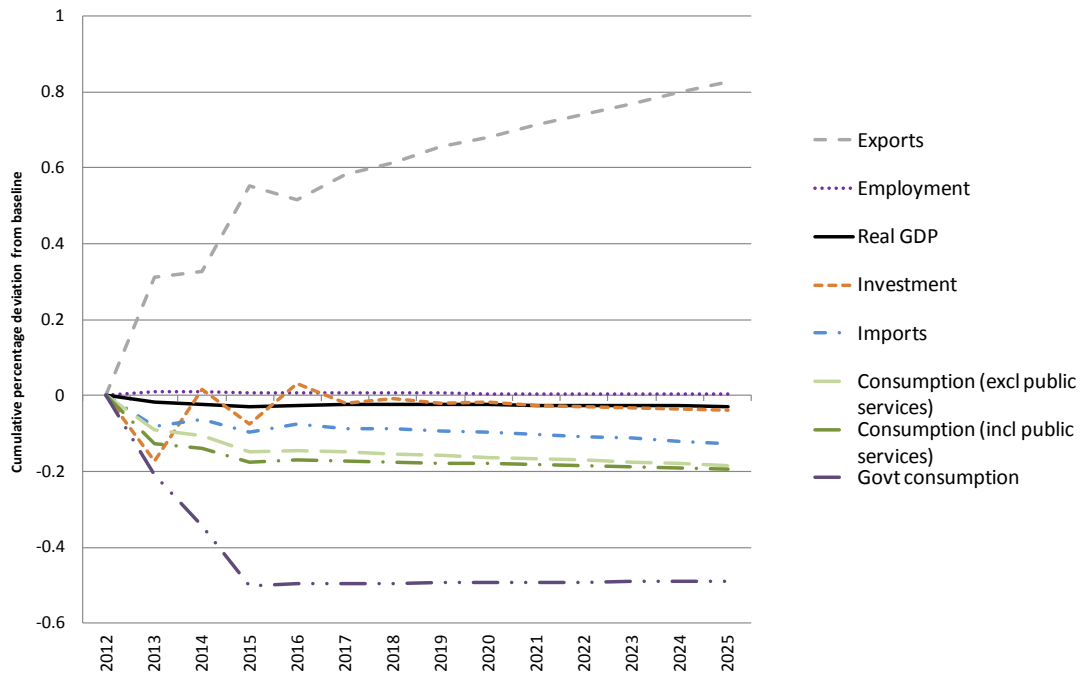
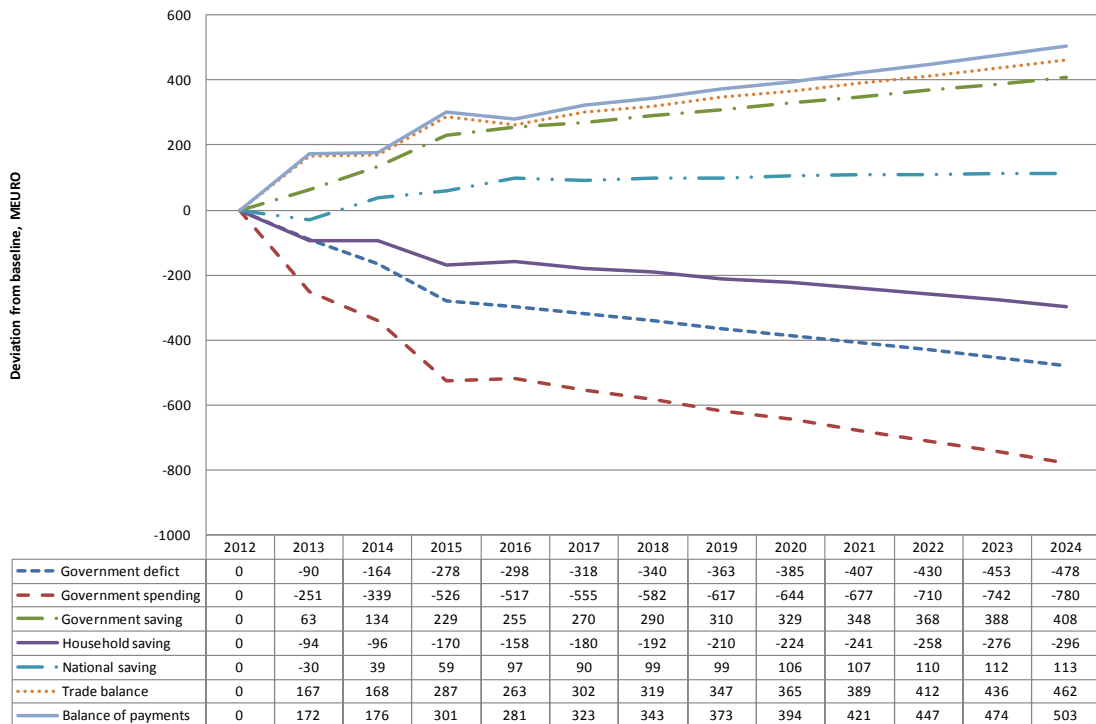


Figure 11. Effects on savings and external balances (scenario 3)



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Figure 12. Effects on government revenues and welfare (scenario 3)

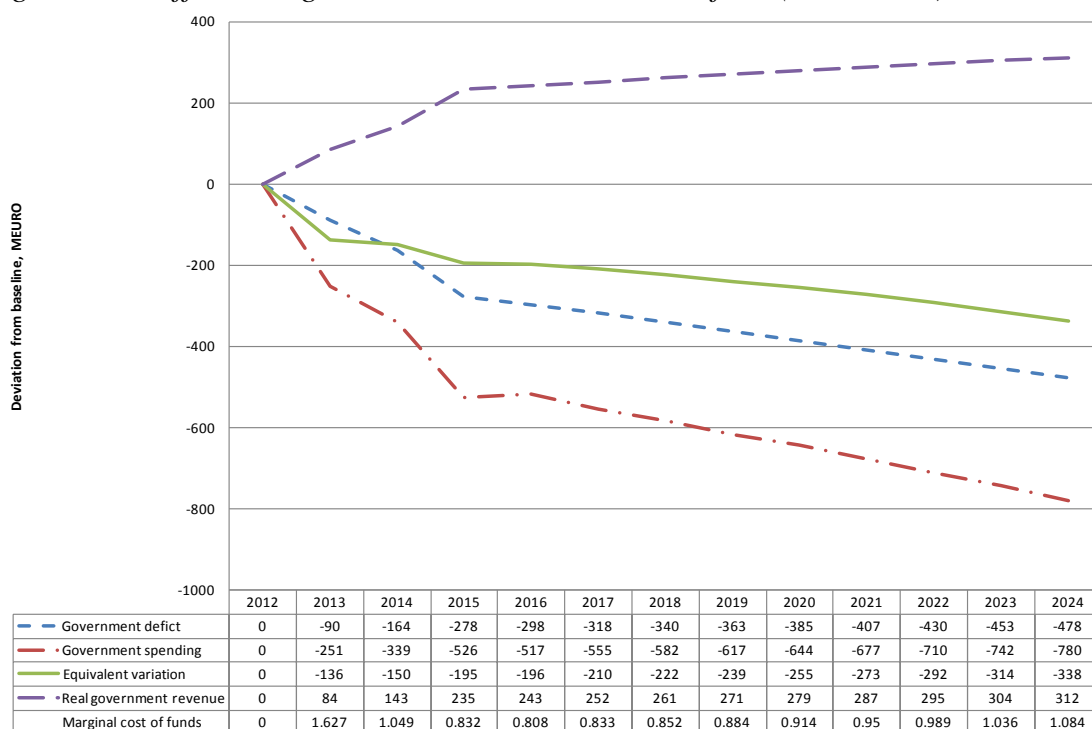
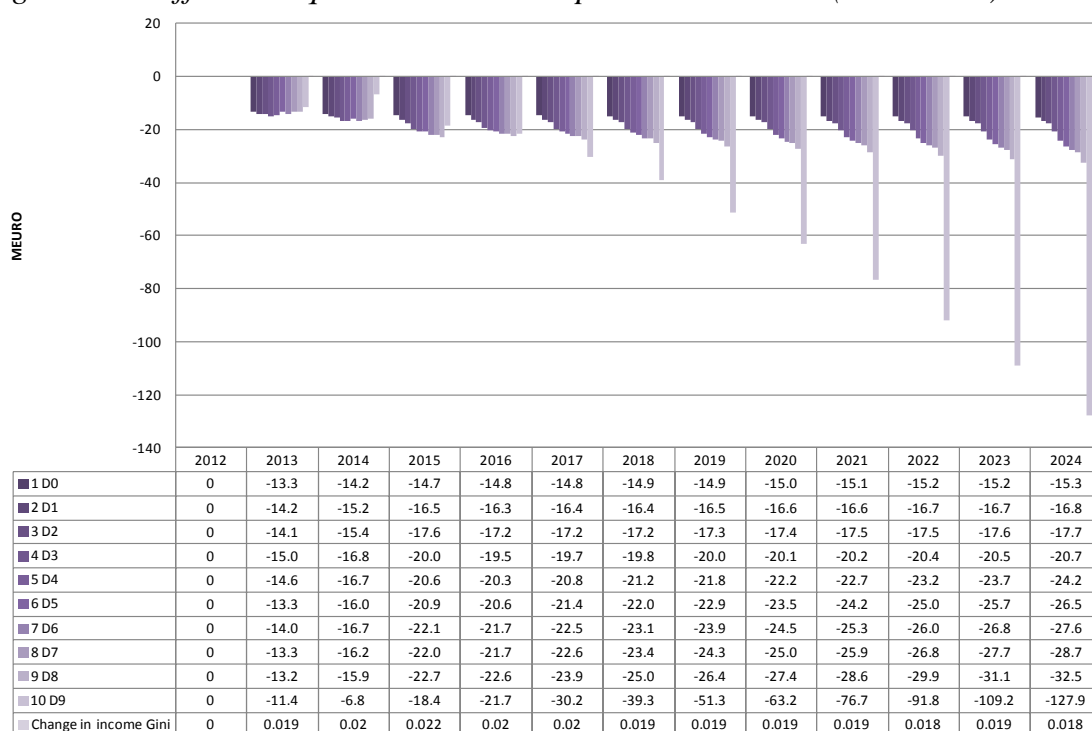


Figure 13. Effect on equivalent variation per income decile (scenario 3)



## 4. Conclusions

We study the effects of public spending cuts aimed at improving the budgetary position of the central government in Finland. The reform we study covers about one per cent of the government budget. We have chosen to make use of the concept of MCF to summarise the welfare effects on the economy in general. The VATTAGE model used for the analysis covers most of the issues in the theoretical literature. In terms of the macroeconomy, our assumptions imply that the labour markets adjust immediately to changes in labour demand. Hence, there is not much change on the supply side of the economy. Essentially, resources that become redundant in the public sector find their use in the private sector without delay, with real wages adjusting accordingly.

We nevertheless find that there are interesting welfare effects taking place. Our central finding is that the welfare costs, and thus the plausibility of the package, depend on whether public services utility effects are included in the calculations or not. When spending cuts concern only services that do not provide direct utility to the consumers, the welfare effects are negligible. On the other hand, if services that do provide utility are cut, welfare is affected more strongly. This is clearly of general importance, since negligence of these effects would produce misleading results. Furthermore, these effects also show up at the macro level. The consumption of all goods is affected if consumers compensate for the fall in the provision of public services by increasing their market demand for private production of these services, which in turn will impact their disposable incomes. The household's income inequality, measured by the Gini-index, is also affected somewhat negatively. The real incomes of the poorest households, which consume more public services, decrease proportionately more than wealthier household's incomes.

Finally, we find the familiar effect that increased government saving – achieved here by spending cuts – is crowding out household savings, as consumers compensate for falling incomes by saving less. This reduces the effectiveness of austerity as a tool for improving the external balance of the economy. However, with regards to the Finnish austerity package, we find that the external balance improves. This is due to the rapid adjustments in the labour markets which allow the non-government sectors to expand. The Marginal Cost of Funds of the full Finnish austerity package is below 1 in the medium-run, which indicates that the package is still even welfare improving. In the long-run, however, the full package creates small welfare losses.

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