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The Marginal Cost of Funds from Different Taxes in Finland – An AGE evaluation

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Abstract

The efficiency of the overall tax system has been debated in many countries for a long time now; in Finland, the debate has been mostly motivated by concern over the sustainability of public finances in the face of the increasing cost of providing public services and pensions for an ageing population. The current economic turmoil has added urgency to the debate, as the public sector deficit has rapidly grown. The challenge is two-fold: the ageing of the population increases age-related expenses, which should be met with rising tax revenues; but it also decreases labour supply, which tends to have the effect of lowering tax revenues. However, as taxation also has an effect on the incentives to work and to invest, solving this two-fold problem calls for a comprehensive evaluation of the structure of the whole tax system. The aim of this study is to compare the welfare costs of raising revenue with different types of taxes, thus providing analyses and assessments that can be used in the evaluation of tax reforms. We focus on the effects of the tax hikes planned to take effect from 2013 on, aimed at raising an extra 1.1 billion euros in 2013, rising to 1,6 billion by 2016. The planned increases comprise income taxes and value added taxes.

We are using VATTAGE, an AGE model of the Finnish economy, to compare the welfare effects of tax increases designed to reduce Finland's budget deficits by using the concept of marginal cost of funds (MCF) for different taxes. VATTAGE is a MONASH-style model of Finland documented in Honkatukia (2009). However, unlike the original MONASH model, VATTAGE has been extended to include leisure and savings choice in the specification of household behaviour. We also allow for differences between household behavior between income deciles. These extensions are necessary for useful MCF calculations because the essence of these calculations is tax-induced distortions in choices between consumption, leisure and savings, and because the progressivity of income taxes necessitate the differentiation between households in different income brackets.

We find that MCF is lowest for the income tax increases and highest for the value added tax increase. We also find that the MCF tends to rise over time, and while the overall Tax Package has a low MCF initially, it rises to about 1.5 in the long run, implying extra revenue to have a 1.5-fold societal cost. We also find that the package tends to decrease income differences.

1. Introduction

The efficiency of the overall tax system has been debated in many countries for a long time now; in Finland, the debate has been mostly motivated by concern over the sustainability of public finances in the face of the increasing cost of providing public services and pensions for an ageing population. The current economic turmoil has added urgency to the debate, as the public sector deficit has rapidly grown. The challenge is two-fold: the ageing of the population increases age-related expenses, which should be met with rising tax revenues; but it also decreases labour supply, which tends to have the effect of lowering tax revenues. Since taxation effects the incentives to work and to invest, solving this two-fold problem calls for a comprehensive evaluation of the structure of the whole tax system. The aim of this study is to compare the welfare costs of raising revenue with different types of taxes. We focus on the effects of the tax hikes planned to take effect from 2013 on, which aim at raising an extra 1.1 billion euros in 2013, rising to 1.6 billion by 2016. We also consider a major change in the financing of the Finnish national broadcasting corporation, which will likely generate another 340 million in net revenue from 2013 on.

We will use VATTAGE – an AGE model for Finland to estimate the dynamic effects of the proposed tax structure changes and the marginal welfare cost of these changes in the collection forms of public funds. We measure the latter by using the concept of marginal cost of funds (MCF) for different taxes, which compares the welfare loss from taxation to the revenue raised.

VATTAGE is a MONASH-style model of Finland documented in Honkatukia (2009). VATTAGE is well suited for the analysis of tax structure changes as it includes all major tax types and covers the Finnish economy at great sector detail. Here, the model is extended to cover employment/leisure and saving choices, based on the representative household model developed in Dixon, Honkatukia, and Rimmer (2011). We also allow for differences between household behavior between income deciles. These extension are necessary for useful MCF calculations because the essence of these calculations is tax-induced distortions in choices between consumption, leisure and savings, and because the progressivity of income taxes necessitate the differentiation between households in different income brackets.

As VATTAGE contains 82 industries and 91 commodities, it is not always easy to see the mechanisms at work from the full-scale model. To understand the results, we develop a simple model of the full-scale model, often called a **Back-of-the-envelope model** – what is often referred to as a “model of a model” - to guide the explanation of MCF results generated from a full-scale, dynamic AGE model.

The tax hikes were decided on by the Finnish government in the spring of 2012 and account for roughly a half of an overall "austerity package" comprising spending cuts as well as increases in many tax rates. The package contains hikes in most income tax rates but it also contains some specific perks aimed at boosting innovation and the like. Here, we focus on the tax hikes, which we study in four scenarios:

1) An increase in income taxes (with a static revenue target of € 260 million in 2013, rising to €560 million by 2016
2) An increase in all value added taxes (targeted to raise € 925 million from 2013 on, rising to 1004 million by 2016)
3) An introduction of a broadcasting tax (targeted to raise € 820 million from 2013 and replacing a broadcasting fee; the removal of the fee amounts to a de facto income transfer to households of €480 million)
4) Combined effect of the Tax Package.

We shall use the concept of the MCF to study the effects of the Tax Package. Underlying our interest for measuring the efficiency of taxation and tax reforms is the well-known result from general equilibrium theory, found in e.g. Dahlby (2008) and Liu (2004), that a government should aim at a tax structure where the marginal cost of funds for each tax type is the same. The literature also suggests that the interactions between different taxes as well as the changes in the cost of public sector production induced by a tax reform will have an effect on MCF. The MCF analysis of Liu (2004) takes into account these effects by basing the estimate for MCF on public excess revenue, that is, the gross revenue less expenditure, while keeping both public sector inputs and outputs constant. Our measure for government revenue is essentially similar to Liu's, and we also fix government expenditure and investment in real terms.

The paper is organised as follows. Section 2 overviews the VATTAGE model and introduces the extensions necessary to deal with labour-supply and saving-aspects of taxation. Section 3 introduces the concept of MCF and discusses its application in CGE modelling. Section 4 develops the back-of-the-envelope equations for explaining MCF results from a full-scale dynamic CGE model. Section 5 shows our main results for the four tax scenarios. Concluding remarks are in section 6.

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 and models all major tax types including labor income taxes, capital taxes and indirect taxes of various forms. The VATTAGE database contains detailed information about commodity and income taxes as well as the expenditures and transfers of the public sector and thus covers 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 developed for Denmark, Finland, and the Netherlands. VATTAGE is described in detail in Honkatukia (2009).

To study MCF, we have extended the basic VATTAGE by allowing households in each income decile to make endogenous choices between their leisure (or equivalently labor-supply), their consumption of commodities and their savings (Dixon et al, 2011). We have adopted the simplest approach, treating leisure and saving (reserved consumption) as two more "commodities" in household choice. The household's problem has been amended to allow for the treatment of full income, that is, income inclusive of the value of leisure.

Formally, households maximize the utility from

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

subject to

$$P_{iC} * C_i + P_{iR} * R_i = Z_i + \left(\frac{P_W}{T_{iW}} \right) * N_i \tag{2}$$

and

$$L_i = H_i - B_i - N_i \tag{3}$$

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 labor income;
Z is household non-labor 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

$$P_{iC} = P_Y * T_{iC} \tag{4}$$

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

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

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

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

$$U'_{iR}(R_i) = \lambda_i * P_{iR} \tag{7}$$

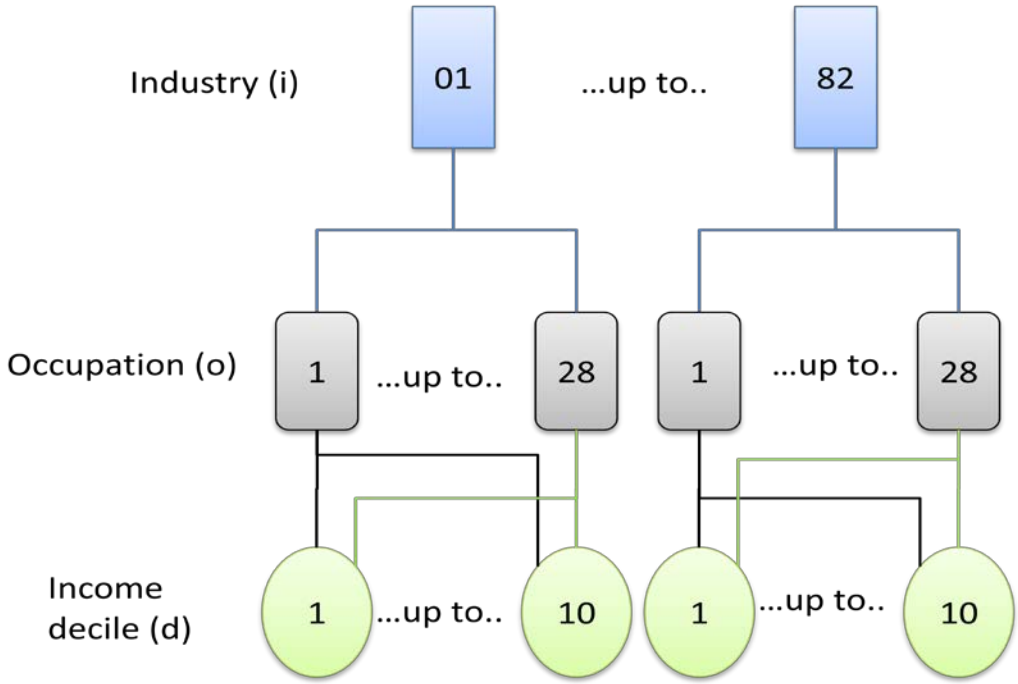
where
the superscript prime denotes derivative; and
λ is the Lagrangian multiplier which can be interpreted as the increase in utility that the household would derive from an extra dollar of income (a unit increase in Z).

As is apparent from the demand equations, consumption of commodities, leisure and saving are now interrelated, whereas in the original formulation of VATTAGE, the labor 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.

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

Figure 1. Labor income by occupation and decile



To calibrate the labor supply elasticities implied by the utility maximization problem in (1) to (3), we have used the estimates of Kleven and Kreiner (2006), who find considerably higher elasticities for lower income deciles than for higher ones. On the average, the implied elasticity of supply is here 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.

Decile-specific consumption data stems from VATT's income-distribution model. The parameters for the decile-specific consumption functions cover 91 commodities, and have been estimated using the large consumption data bases of the income-distribution model. They are reported in Honkatukia, Kinnunen and Rauhanen (2011).

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 a very large scale foresight effort encompassing dozens of sector 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 (domestic consumption, exports to EU and elsewhere, investment, and the public sector) that stem from a historical analysis of 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 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, while 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 also uses 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 development is determined by population trends, which affect public demand for services and other public expenditures, as well as private consumption, whereas industry-level development depends 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 sector and regional experts and interest groups (Honkatukia, Ahokas and Marttila (2010); Ahokas and Honkatukia (2010)).

3. The Concept of Marginal Cost of Funds

The large literature on the excess burden of taxation suggests that the costs of raising revenue differ across tax instruments. But as argued by Creedy (2000), measures of excess burden are often concerned with comparisons of distortionary and non-distortionary (such as lump-sum) tax systems. In practice, however, changes in the tax system often involve collecting increased revenue with an existing, distorted tax system to finance increased public spending, for example.

In the analysis of optimal tax structure, the use of marginal cost of funds (MCF) based analysis has become popular. Similarly, applied general equilibrium modelling has gained strong momentum especially in analysing the dynamic effects of large policy changes. Dalhby (2008) points out that changes on just one tax rate can affect the collection of other tax types due to the common interdependence of the different tax types. Similarly, public spending in the form of a public projects or cash transfers also affects the revenue collected from taxes. The analyses of different types of policy changes with dynamic AGE models have also revealed that the effects of policies can be significantly different in the long run compared to the short run. In the long run all production factors are usually rather flexible, while in the short run particularly capital and nominal wages show rigidity. For these reasons we have selected to use a dynamic AGE model also for the analysis of marginal cost of funds.

The concept of marginal cost of funds, while related to excess burden considerations, is a broader concept that takes into account the type of effects that may arise when existing tax systems are modified, or when there are changes in public spending. Often, there are both types of effects.

MCF is defined as a money-metric measure of the loss of welfare resulting from the collection of extra revenue. Here, we use the definition

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

where EV is the equivalent variation resulting from the tax change and ΔR is the change in revenue.

The equivalent variation is often normalised by deducting the change in tax revenue (R) from EV in the denominator in the above equation, in order to account only for the changes in consumer's welfare consequential to the tax structure change, but not the increase in public spending itself (Chisari & Cicowiez, 2010). In this case, MCF can be either negative or positive. Here, we shall exogenise real government spending by assuming the extra revenue is used to pay back government debt. This does not isolate our measure completely from other government policies, since the price of public expenditure can be expected

to differ under different tax regimes. Perhaps more importantly, the value of public transfers to the households and the other sectors of the economy is dependent on the changes in relative prices caused by the tax changes. But while this makes the definition of revenue targets difficult, it does not pose a problem for the welfare measure, since the measure should take these effects into account.

An example of the application of the MCF concept in the context of AGE modelling to measuring the potential effects of a tax change is Go *et al.* (2005), which studies the effects of a value-added tax reform in South Africa. They compare the effects of an increase in VAT and income taxes on different households, finding marked differences in MCF across household types. Crucially, they assume no changes in factor supplies, government spending or the government's budget balance. Revenue is re-distributed in a lump-sum fashion, whence, as they point out, MCF is more of a measure of the overall inefficiency of the economy than that of just the tax system[1].

Working on Argentina, Chisari *et al.* (2007) study the impacts of the taxes under different regulatory systems. Using the alternative definition for MCF, they adopt similar assumptions to Go *et al.* and find MCFs ranging from 0.1. to 0.5 for income taxes, -0.1 to 0.13 for capital income taxes, and 0.127 to 0.206 for value added taxes.

In the AGE studies cited above, the determination of labour supply and saving is not at the centre of the analysis. This is somewhat surprising, because the theoretical literature on MCF considers the effects on labour-leisure choice extensively. As Dahlby (2009) shows, labour markets affect the costs of taxation in several ways. First, the effects of income taxes depend on the supply and demand elasticities for labour. They also depend on labour/capital ratios, as part of the burden of labour taxes is actually borne by capital, depending on whether the price of labour inputs is affected. The latter, in turn, depends on the labour market specification, that is, whether wages are competitive, or whether there are wage rigidities.

The empirical literature on MCF also suggests that labour supply matters. A study by Kleven and Kreiner (2006) estimates MCFs from income taxes for several European countries, finding MCFs ranging from 0 to 0.32 for a proportional increase in income taxes, when they consider labour supply elasticities for the intensive margin (that is, for hours worked). Tax reforms have been also studied econometrically in several other European countries, but to our knowledge, the concept has not been introduced in recent European AGE applications.

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[1] $MCF = -EV / \Delta R$ is sometimes also referred to as marginal welfare cost of taxation (Creedy, 2000).

Our study for Finland is similar in spirit to the South Africa and Argentina studies in the sense that it uses an AGE model for evaluating the costs of different tax regimes. However, the calculation of the marginal cost of funds with a dynamic, applied general equilibrium models is still not common, while the use of static, applied GE models for MCF calculations was started already a long time ago (Ballard et al ,1985). More importantly, where we differ from the earlier studies is that we introduce endogenous labour/leisure choice and endogenous saving decisions, allowing us to consider effects that are excluded from the earlier analyses by the model formulation, and bringing our model closer to the theoretical literature on MCF.

4. The effects of increased taxation

4.1 The Finnish "austerity package"

The Finnish government agreed on a large policy package in March 2012 comprising several measures for the current electoral period. Broadly, the package aims at reducing the perceived sustainability gap of public finances. While estimates on the gap vary, the financial crisis drew the overall public sector from a surplus in 2008 to a deficit of about 8 billion by 2011. The "austerity package" aims at raising about 8 billion by cutting public spending and by raising overall taxation, with the latter initially accounting for about 1 billion a year but rsising to 1.7 billion by 2016. The package also includes tax incentives for innovation and investment. Related, but not included in the package itself, is a major overhaul of the funding of the Finnish National Broadcasting Corporation (YLE), which hitherto has been based on a (compulsory) fee, to be replaced by a broadcasting tax from 2013.

VATTAGE covers most of the taxes in the tax package directly, but it is not clear a priori where the innovation and investment incentives would get utilized, since they expressly aim at creating new activity. Therefore, we concentrate on the more straightforward parts of the Tax Package. These are collected in Table 1.

Table 1. The Tax Package

Tax type	Change in tax collection €	Description	VATTAGE implementation
Income tax	260 million € per year, 560 form 2014	Income taxes apply to all wage incomes as well as transfer incomes and is subject to progression. Capital incomes are taxes at a uniform rate	Income deciles specific changes in income taxes were calculated from microdata with VATT's TUJA-micro simulation model.
Value added taxes (VAT)	+1200 million € per year	All VAT rates raised by 1 percentage point	VATTAGE database covers VAT in detail
Broadcasting tax	+820 million € per year	National broadcasting fee replaced by a tax; consumers gain €480 million from removal of the fee	€480 million distributed to consumers as a lump-sum transfer; Broadcasting tax modeled as an income tax

Source: Ministry of Finance

Both the income tax and the broadcasting tax scenario pose the challenge of handling tax progression. In Finland, as in other Scandinavian countries, the **income tax rates** are progressive (i.e. depend on the income level). In VATTAGE, income tax rates can be defined only for the 10 different income

deciles, not by the detailed progression function. Therefore, the changes in the income deciles specific average income tax rates were first calculated with household level microdata and VATT's micro simulation model. Table 2 below shows the calculated changes in the average income tax rates for household income deciles.

Table 2. Change in the average income tax rate per household income decile

Household income decile	Change in 2013	Change in 2014
1	-0.02	0.02
2	0.01	0.07
3	0.16	0.26
4	0.24	0.34
5	0.26	0.35
6	0.28	0.34
7	0.36	0.42
8	0.42	0.50
9	0.47	0.54
10	0.57	0.42
All	0.38	0.40

Source: VATT, TUJA microsimulation model

** Income tax rate is specified as the average income tax percentage over a representative household in each household level income decile.*

In VATTAGE, **corporate taxes and capital taxes** are summed up to the same capital tax rate (tax_k_r). All corporate after-tax profits are assumed in the model to be redistributed to the households since there is no information on the (future) dividend payout ratios. In practice, the dividend payout ratios have varied heavily from year to year and only a part of the dividends of Finnish companies are redistributed nowadays to Finnish households. Here, we concentrate on the capital income taxes, avoiding the problem related to double taxation. We assume in the income tax scenario a uniform increase in capital income tax rates consistent with the average increase in all income taxes in Table 1 of about 0.40 per cent.

The planned additional increase of 1 percentage points in all **value added taxes (VAT)** and in the above mentioned **excise taxes** are assumed to be implemented in 2013. VATTAGE takes in to account both the value added taxes and excise taxes among the producer's intermediate consumption tax rate and in the consumer's consumption tax rate. The changes are commodity-specific, affecting all users of a commodity in equal proportion (that is, possible initial differences in commodity tax rates between users remain in place in the simulations).

4.2 A back-of-the-envelope model of the effects of income tax cuts

One of the key findings of the MCF literature is that labor supply responses have a large impact on the efficiency of the tax system. In this section, we first study the labor supply responses in VATTAGE to changes in income taxes, and then to the full Tax Package. To see what the responses depend on, we use a stylized model of the full simulation model, a back-of-the-envelope (BOTE) model, to see what the crucial mechanisms are and how they can be expected to work in the full simulation.

The link between labor supply decisions and production can be illustrated with a simple back-of-the-envelope model of the full model. For simplicity, we shall only consider value added, which, for the whole economy, is given by

$$Y = A * F(K, L) \quad . \tag{8}$$

VATTAGE assumes that investment takes time, whence, in the short run, we can focus on the short run production function

$$Y = A * F\left(\frac{K}{L}\right) \tag{9}$$

We assume that labor is paid its value marginal product, which is given by

$$W = \frac{P_g}{T_g} * A * f\left(\frac{K}{L}\right) \tag{10}$$

where

W is the nominal before-tax wage rate;
P_g is the price deflator for GDP;
T_g is the power of indirect taxes applying to production in Finland, power of a tax being defined as (1 + ad valorem-equivalent rate of indirect taxes); and
$A * f(K/L)$ is the marginal product of labor derived from the constant-returns-to-scale production function, Y= A*F(K,L).

Thus the real pre-tax wage level is given by

$$\frac{W}{P_c} = \frac{P_g}{T_g} * A * f\left(\frac{K}{L}\right) * \frac{1}{P_c} \tag{11}$$

where

W is the nominal pre-tax wage rate;
T_w is the power of the tax on labor income (1+ tax rate on labor income); and
P_c is the price deflator for consumption.

Consumer prices are linked to the price of GDP by $P_c = P_g * T_c$, where T_c is the power of consumption taxes (1+ad valorem equivalent rate).

With a CES production function, the short-run changes in the marginal product of capital are given by

$$\%\Delta f = -\frac{S_k}{\sigma} l \tag{12}$$

where l is the percentage change in employment, S_k is the capital share in returns to primary factors and σ is the elasticity of substitution between capital and labor.

The consumer's utility maximization problem implies that labor supply is linked to the demand for leisure, with the price of leisure being given by the after-tax real wage, and of full income, which in turn is also affected by real wages. Thus we have a link between labor supply and real wages, which is of the form

$$l = \varepsilon * (w - p_c - t_w) \tag{13}$$

where ε is the elasticity of demand for labor supply with respect to pre-tax real wages, and w, p_c, and t_w are the percentage changes in the nominal wage level, consumer prices and the power of wage taxes, respectively. ε depends on the share of labor income, as well as the elasticity of substitution between leisure and other consumption. We have calibrated the latter to imply an average supply elasticity of 0.1, following Kleven et al. (2006).

Substituting (13) and (12) in (11), we have, for the percentage change of the pre-tax real wages,

$$w - p_c = C_1 * \left(t_g + t_c - a - C_2 * t_w \right), \tag{14}$$

where

$$C_1 = \frac{-1}{\left(1 + \frac{S_k * \varepsilon}{\sigma} \right)}, \tag{15}$$

and

$$C_2 = \frac{S_k * \varepsilon}{\sigma}, \tag{16}$$

and where σ is the elasticity of substitution between capital and labor and t_c the percentage change in the power of consumption taxes. Under our specification,

with a capital share from value added at around 0.35, the value of C_1 is roughly -.84, whereas C_2 is roughly 0.18.

Equation (14) gives a concise BOTE formula for understanding the aggregate effect of changes in taxes on real wages. We can use this for interpreting the results, and also for forming a prior for the expected simulation results.

To study how a cut in income taxes may affect labor supply, we first simulate the effects of income taxes alone, with the tax rate on labor and transfer income rising by about 0.4 per cent on the average in 2013 and 2014.

The results of this simulation for the first years of the policy are shown in Table 3. From the table, it can be seen that the policy raises the power of labor taxes by 0.56 per cent in 2013, and by 1.14 per cent from 2014. It also has an effect on the average power of consumption taxes. This is due to distributional effects both in consumption patterns and over deciles. The overall consumption of highly taxed commodities changes less than consumption on the average. Based on equation (14), we expect real after tax wages to fall, which according to equation (13) should cause an increase in labor supply. As the table shows, this is what happens in the full simulation. Finally, based on equation (9), we can then also calculate the effect on GDP.

Table 3. BOTE for results of income tax increases

	2012	2013	2014	2015	2016	2017
Tg	0.00	0.00	0.01	0.00	0.00	0.01
Tl	0.00	0.56	1.14	1.14	1.14	1.14
Tc	0.00	0.04	0.05	0.04	0.04	0.04
Technological change	0.00	-0.06	-0.12	-0.13	-0.14	-0.15
Pre-tax real wage (BOTE)	0.00	0.00	0.01	0.02	0.01	0.00
Pre-tax real wage (SIM)	0.00	-0.13	-0.25	-0.27	-0.31	-0.33
Post-tax real wage (Bote)	0.00	-0.56	-1.13	-1.12	-1.13	-1.14
Post-tax real wage (SIM)	0.00	-0.69	-1.38	-1.39	-1.43	-1.46
Labour supply (BOTE)	0.00	-0.06	-0.11	-0.11	-0.11	-0.11
Labour supply (SIM)	0.00	-0.01	-0.01	-0.01	-0.01	-0.02
Employment (SIM)	0.00	-0.01	-0.01	-0.01	-0.01	-0.01
Real GDP (BOTE)	0.00	-0.09	-0.18	-0.19	-0.20	-0.21
Real GDP (SIM)	0.00	-0.06	-0.13	-0.14	-0.15	-0.16
Consumption (SIM)	0.00	-0.37	-0.74	-0.75	-0.80	-0.84
Investment (SIM)	0.00	-0.47	-0.42	-0.09	-0.24	-0.21
Exports (SIM)	0.00	0.59	0.92	0.78	0.95	1.03
Imports (SIM)	0.00	-0.23	-0.37	-0.31	-0.36	-0.38

The effects on the GDP components shown in Table 1 can be understood starting from the labor supply response. Consider the GDP identity

$$Y = C + I + G + X - M \ . \qquad (15)$$

Recalling the short-run production function in equation (9), from the fact that less labour is now available it follows that GDP (Y) must fall in the short run (since the capital stock is fixed). From the decrease in incomes it is also clear that consumption (C) falls. Both of these effects contribute to an decrease in investment (I). However, since GDP changes only a little (value added only increases slightly because of the small labor input contribution), but consumption falls relatively more, there must be an increase in (X-M) (i.e. exports less imports), since we assume that government demand (G) is fixed.

From table 3, it is clear that BOTE overestimates the labor supply response. This is due to the fact that the simple BOTE formula for labor supply does not consider the effects on disposable income due to the effects on the overall price level (which rises as the economy expands as a result of the tax cut boosting consumption).

The BOTE also misses effects stemming from income distribution. The full simulation takes into account the effects of income tax progression, as well as differences in the supply elasticities of labour between the deciles. In the actual simulation, both of these effects are important, since the taxation of mid- and high-income deciles, whose labor supply elasticities have been estimated to be lower than average, rises more than that of the low-income deciles, whose supply elasticities are thought to be higher than average. Overall, these effects accentuate the labor supply response; indeed, when we run the same simulation in the single-household VATTAGE, using the average elasticity of supply for labor, the labor supply effect is smaller than under the decile specification.

Table 4 shows our results for the overall Tax Package. The BOTE still predicts the changes in post-tax real wages and GDP reasonably well, again, it exaggerates fall in labor supply, since it does not recognize the effect on household incomes of changes in transfer incomes. Crucially, the incomes of the lowest deciles depend to a much lower degree on labor incomes and to a higher degree on age-related and other transfers than those of the higher income deciles. The income effects on consumption (of both commodities and leisure) are therefore more negative in the lower income deciles than in the higher ones.

Table 4. BOTE for results of the full Tax Package

	2012	2013	2014	2015	2016	2017
Tg	0.00	0.12	0.11	0.11	0.12	0.12
Tl	0.00	1.47	1.46	1.47	1.47	1.47
Tc	0.00	0.67	0.60	0.60	0.60	0.60
Technological change	0.00	-0.27	-0.34	-0.38	-0.43	-0.47
Pre-tax real wage (BOTE)	0.00	-0.69	-0.69	-0.73	-0.77	-0.80
Pre-tax real wage (SIM)	0.00	-1.44	-1.53	-1.69	-1.79	-1.90
Post-tax real wage (Bote)	0.00	-2.16	-2.15	-2.20	-2.23	-2.27
Post-tax real wage (SIM)	0.00	-2.87	-2.95	-3.11	-3.22	-3.32
Labour supply (BOTE)	0.00	-0.22	-0.22	-0.22	-0.22	-0.23
Labour supply (SIM)	0.00	-0.01	-0.01	-0.01	0.00	0.00
Employment (SIM)	0.00	-0.01	0.00	0.00	0.00	0.00
Real GDP (BOTE)	0.00	-0.38	-0.45	-0.49	-0.54	-0.58
Real GDP (SIM)	0.00	-0.28	-0.35	-0.38	-0.43	-0.47
Consumption (SIM)	0.00	-1.60	-1.65	-1.79	-1.90	-2.03
Investment (SIM)	0.00	-2.08	-0.38	-0.98	-0.85	-0.94
Exports (SIM)	0.00	2.47	1.53	1.93	1.99	2.24
Imports (SIM)	0.00	-1.04	-0.78	-0.92	-0.97	-1.07

5. The macroeconomic effects of the tax proposal

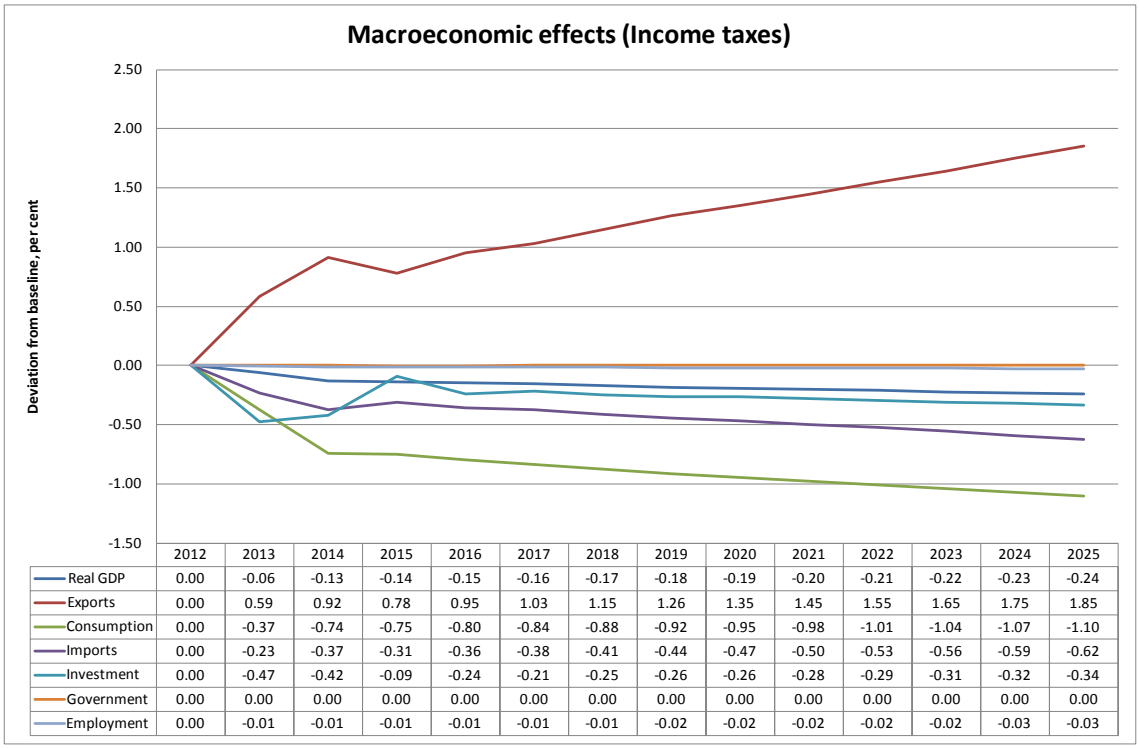
We now turn to the macroeconomic effects of the tax scenarios. Figure 2 shows effects of raising income taxes on GDP expenditure aggregates in Figure 2 in deviation form (i.e., the level change in policy expressed in percentage changes). The results can be understood with the help of equations (9) and (15); the fall in employment leads to a fall in value added according to (9); in (15), the fall in household incomes leads consumption to fall, which also discourages investment; since GDP is falling by less than domestic absorption, the trade balance must improve.

Figure 3 shows the effects of the value added tax increase. Assuming uniform increases in VAT rates, the incidence will be fairly evenly borne by households and enterprises in terms of revenue collected. The rise in the powers of both consumption and production imply a fall in real wages, and thus, under perfect competition in the labour markets, the change in real GDP is small with VAT increases as well.

Figure 4 shows the effects of the introduction of the broadcasting tax. This tax is designed to raise toughly the same revenue as the VAT increase, but it also involves the removal of the current broadcasting fee, and thus its effects on consumption are somewhat smaller than for the VAT tax increase.

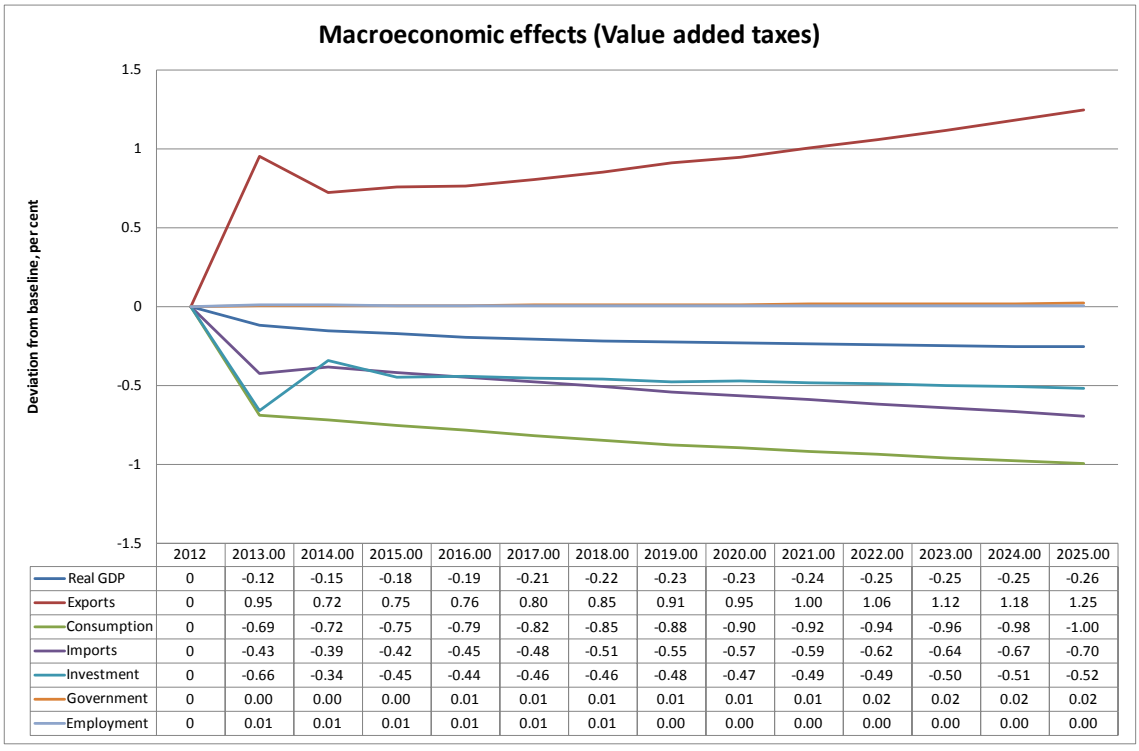
Figure 5 shows the combined effects of all the taxes we've studied. There is an overall fall of 0.43 per cent in GDP, with investment and consumption falling by 0.85 and 1.9 per cent by 2016. Exports, in contrast, are improving 2 per cent by 2016.

Figure 2. Change in expenditure aggregates in policy (Income taxes)



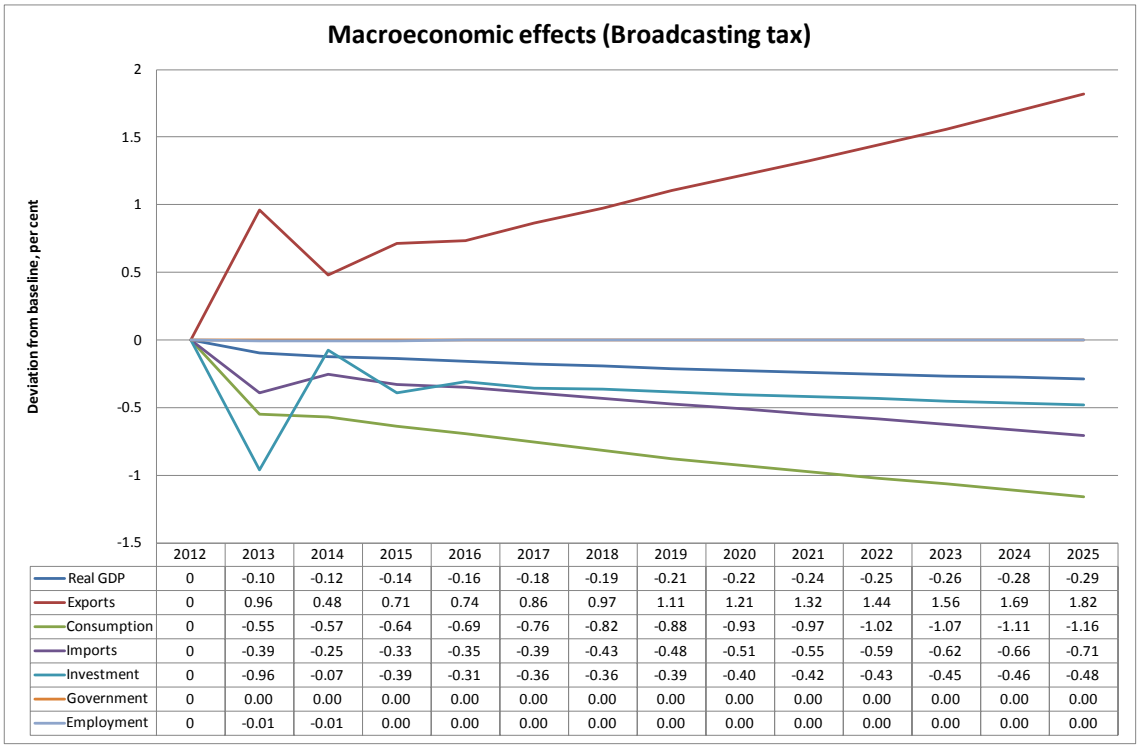
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Real GDP	0.00	-0.06	-0.13	-0.14	-0.15	-0.16	-0.17	-0.18	-0.19	-0.20	-0.21	-0.22	-0.23	-0.24
Exports	0.00	0.59	0.92	0.78	0.95	1.03	1.15	1.26	1.35	1.45	1.55	1.65	1.75	1.85
Consumption	0.00	-0.37	-0.74	-0.75	-0.80	-0.84	-0.88	-0.92	-0.95	-0.98	-1.01	-1.04	-1.07	-1.10
Imports	0.00	-0.23	-0.37	-0.31	-0.36	-0.38	-0.41	-0.44	-0.47	-0.50	-0.53	-0.56	-0.59	-0.62
Investment	0.00	-0.47	-0.42	-0.09	-0.24	-0.21	-0.25	-0.26	-0.26	-0.28	-0.29	-0.31	-0.32	-0.34
Government	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Employment	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03

Figure 3. Change in expenditure aggregates in policy (Value added taxes)



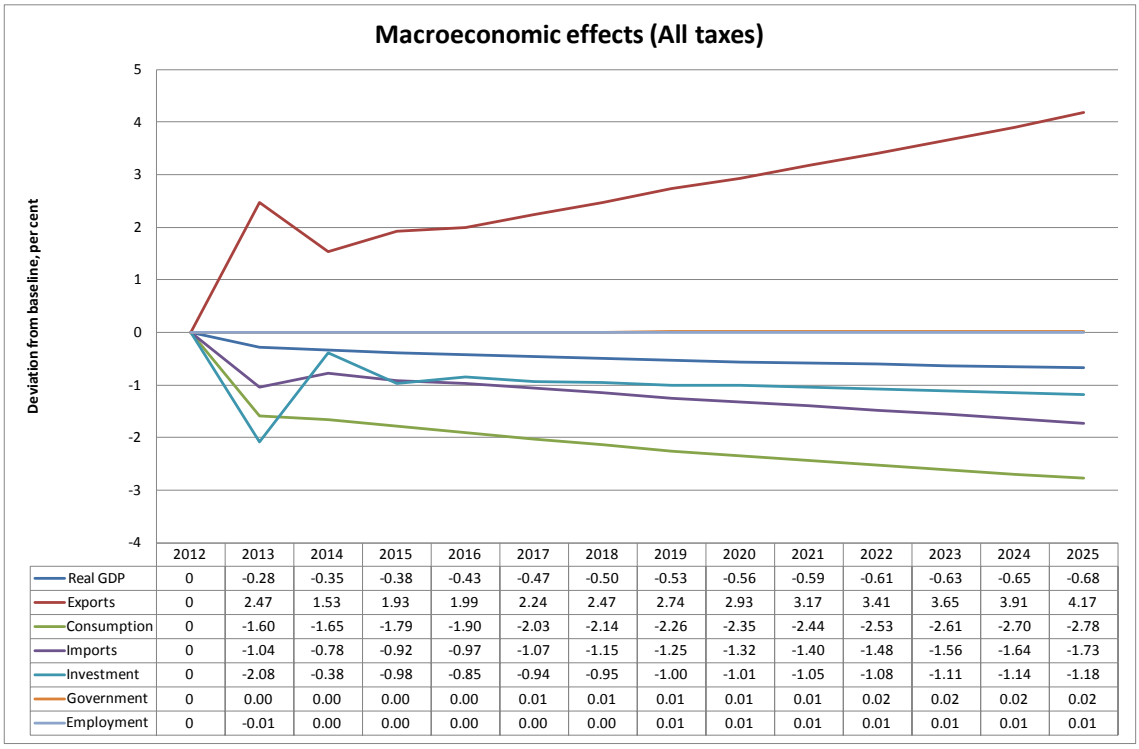
	2012	2013.00	2014.00	2015.00	2016.00	2017.00	2018.00	2019.00	2020.00	2021.00	2022.00	2023.00	2024.00	2025.00
Real GDP	0	-0.12	-0.15	-0.18	-0.19	-0.21	-0.22	-0.23	-0.23	-0.24	-0.25	-0.25	-0.25	-0.26
Exports	0	0.95	0.72	0.75	0.76	0.80	0.85	0.91	0.95	1.00	1.06	1.12	1.18	1.25
Consumption	0	-0.69	-0.72	-0.75	-0.79	-0.82	-0.85	-0.88	-0.90	-0.92	-0.94	-0.96	-0.98	-1.00
Imports	0	-0.43	-0.39	-0.42	-0.45	-0.48	-0.51	-0.55	-0.57	-0.59	-0.62	-0.64	-0.67	-0.70
Investment	0	-0.66	-0.34	-0.45	-0.44	-0.46	-0.46	-0.48	-0.47	-0.49	-0.49	-0.50	-0.51	-0.52
Government	0	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
Employment	0	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 4. Change in expenditure aggregates in policy (Broadcasting tax)



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Real GDP	0	-0.10	-0.12	-0.14	-0.16	-0.18	-0.19	-0.21	-0.22	-0.24	-0.25	-0.26	-0.28	-0.29
Exports	0	0.96	0.48	0.71	0.74	0.86	0.97	1.11	1.21	1.32	1.44	1.56	1.69	1.82
Consumption	0	-0.55	-0.57	-0.64	-0.69	-0.76	-0.82	-0.88	-0.93	-0.97	-1.02	-1.07	-1.11	-1.16
Imports	0	-0.39	-0.25	-0.33	-0.35	-0.39	-0.43	-0.48	-0.51	-0.55	-0.59	-0.62	-0.66	-0.71
Investment	0	-0.96	-0.07	-0.39	-0.31	-0.36	-0.36	-0.39	-0.40	-0.42	-0.43	-0.45	-0.46	-0.48
Government	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Employment	0	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figure 5. Change in expenditure aggregates in policy (All taxes)



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Real GDP	0	-0.28	-0.35	-0.38	-0.43	-0.47	-0.50	-0.53	-0.56	-0.59	-0.61	-0.63	-0.65	-0.68
Exports	0	2.47	1.53	1.93	1.99	2.24	2.47	2.74	2.93	3.17	3.41	3.65	3.91	4.17
Consumption	0	-1.60	-1.65	-1.79	-1.90	-2.03	-2.14	-2.26	-2.35	-2.44	-2.53	-2.61	-2.70	-2.78
Imports	0	-1.04	-0.78	-0.92	-0.97	-1.07	-1.15	-1.25	-1.32	-1.40	-1.48	-1.56	-1.64	-1.73
Investment	0	-2.08	-0.38	-0.98	-0.85	-0.94	-0.95	-1.00	-1.01	-1.05	-1.08	-1.11	-1.14	-1.18
Government	0	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
Employment	0	-0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Overall, the tax increases appear to slash domestic consumption and favour exports. This is confirmed in by the decomposition of the effects shown in Figures 6 and 7. Figure 6 shows that initially, the fall in GDP is due to a fall in indirect tax revenues, but over time, with structures adjusting, it is mainly due to a fall in primary factor contributions; with employment hardly changing it is then the fall in investment that leads GDP to fall. This is perhaps as expected, since the government is increasing its saving by collecting more revenue, not its investment. Firms, on the other hand, face increasing costs of materials, discouraging investment. Households, in turn, face increasing living costs. Figure 7 shows how most of the fall in GDP is explained by a fall in investment and consumption.

In our set-up, however, there is more to the story. From figure 8, the total effect of the tax increases is to cut the budget deficit by 2.9 billion by 2016 and to increase government saving by 2.7 billion, thereby even exceeding the revenue target for the tax increases.

However, consumers respond to their falling purchasing power by saving 1.5 less than in the baseline, and thus national saving only increases by 1.2 billion. Thus the tax measures are successful from the government's point of view but do not improve the country's overall position quite as much. Nevertheless, from Figure 8, it is clear that the external balance is also improved. The increased national saving is then mainly used to pay back government debt.

The main reason for the large change in government deficit compared to the revenue target of 1.9 billion points to a well-known difficulty in measuring the effects of tax changes. It is caused first and foremost as the tax increases cause wages and prices to fall, whence the government saves in nominal expenditure. In terms of actual income and commodity tax revenue,

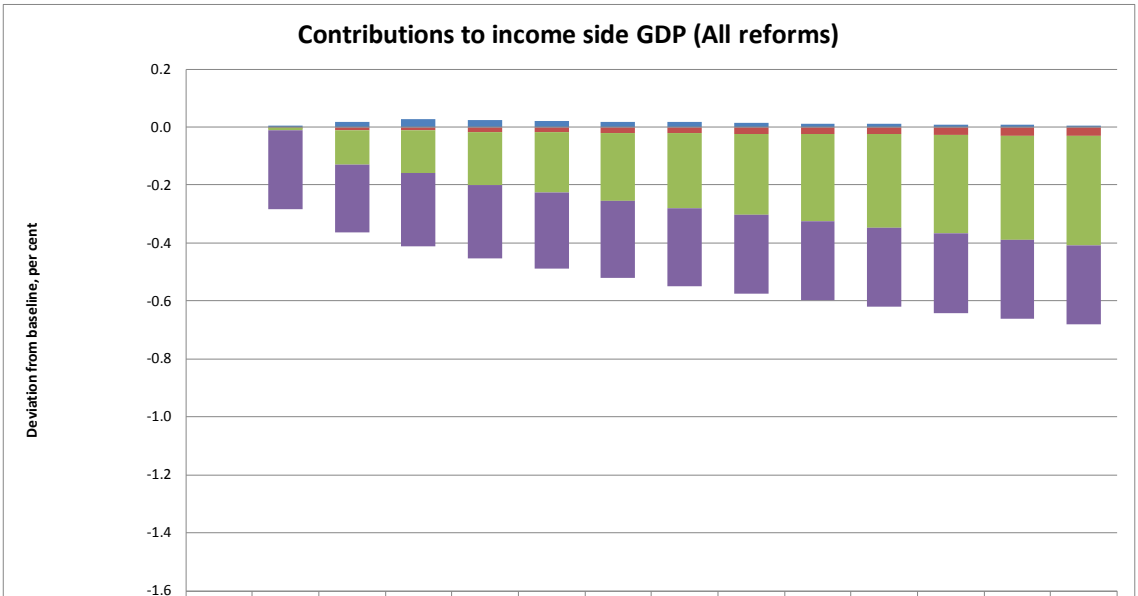
It is interesting to compare the effects of the different tax scenarios from the point of view of their effects on welfare. This is done in Figures 9 to 12, which show the effects on real welfare measured with the Equivalent Variation (aggregated over income deciles). The figures also show changes in real government surplus and real national saving, on the basis of which we can calculate the MCF for each scenario. We find that MCF is lowest for the income tax increases and highest for the value added tax increase. The broadcasting tax settles between the two others. We also find that the MCF tends to rise over time, and while the overall Tax Package has a low MCF initially, it rises to about 1.5 in the long run, implying extra revenue to have a 1.5-fold societal cost.

Figures 9 to 12 also show the nominal revenues from direct (mostly income) and commodity taxes, demonstrating that while the overall effects of the Tax Package are small when compared to government surplus and national saving, the costs

would appear much higher if compared to changes in the revenue from specific taxes.

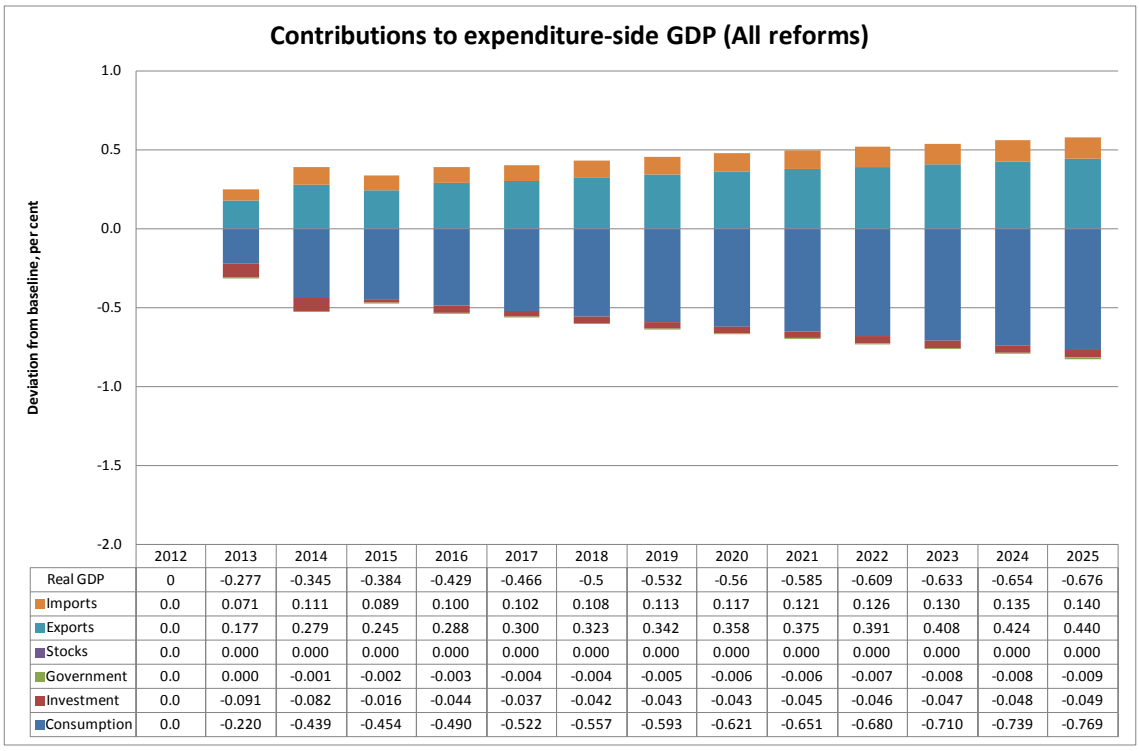
The Tax Package contains several elements that can be expected to have distributional effects. Because of income tax progression, the higher –earning deciles should be relatively more affected than the lowest income deciles. However, the incidence of increased consumption taxes is not necessarily clear a priori; there are elements, energy taxes, for example, where previous studies have found evidence of regressive effects, but as the increases also apply to services, whose consumption shares in the higher earning deciles are higher than in the lowest deciles, one could also expect some opposite effects. In figures 9 to 12, we have measured distributional effects in terms of equivalent variation calculated on the basis of both consumption and leisure. This is a broader measure than consumption-based measures alone, since it takes into account the effects of the proposal on labor supply as well as those on consumption. The distributional results are summarized as changes in consumption and income Gini-coefficients, showing a tendency to decrease in comparison to their baseline values. The Tax Package thus appears diminish income differences (This is clear from decile-specific EVs, which show that more than half of the welfare loss is borne by the two highest-income deciles).

Figure 6. Contributions of income aggregates on GDP in policy (All taxes)



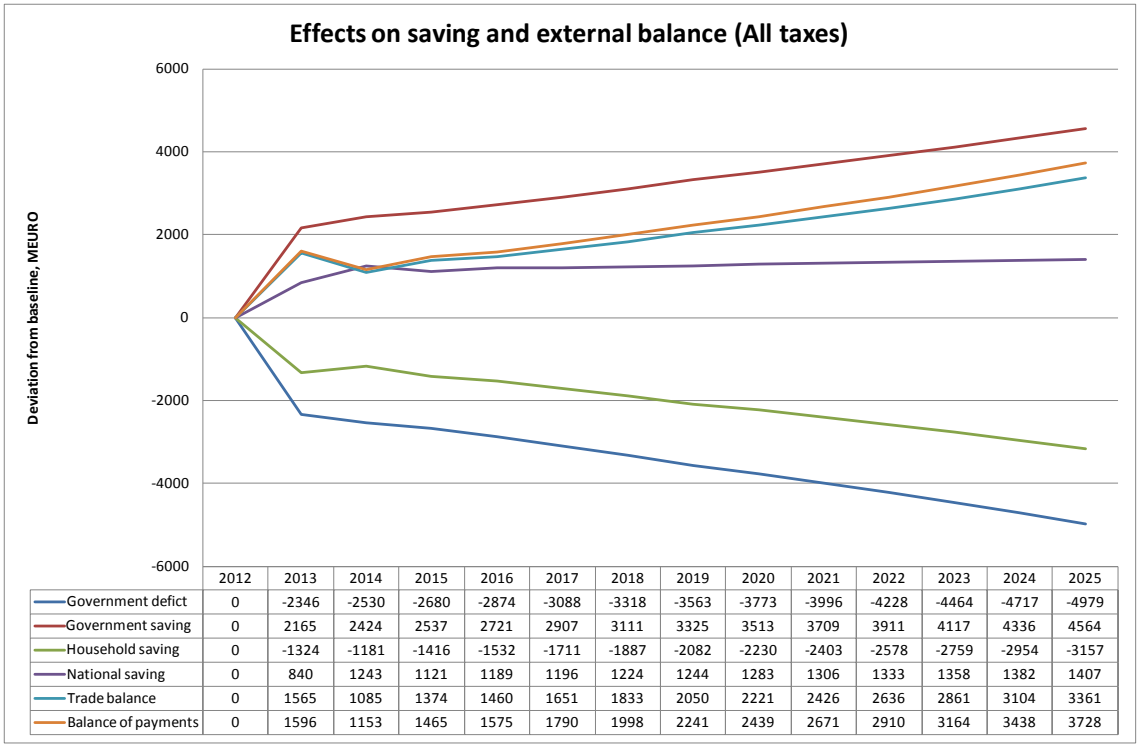
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Real GDP	0.0	-0.277	-0.345	-0.384	-0.429	-0.466	-0.500	-0.532	-0.560	-0.585	-0.609	-0.633	-0.654	-0.676
Indirect taxes	0.0	-0.272	-0.232	-0.253	-0.254	-0.261	-0.265	-0.269	-0.271	-0.273	-0.274	-0.274	-0.274	-0.274
Primary factors	0.0	-0.009	-0.120	-0.145	-0.183	-0.209	-0.235	-0.259	-0.281	-0.301	-0.321	-0.340	-0.359	-0.377
Other cost tickets	0.0	-0.001	-0.010	-0.012	-0.016	-0.018	-0.020	-0.021	-0.023	-0.024	-0.025	-0.027	-0.029	-0.031
Technological change	0.0	0.006	0.017	0.026	0.024	0.022	0.019	0.017	0.015	0.013	0.011	0.009	0.007	0.006

Figure 7. Contributions of expenditure aggregates on GDP in policy (All taxes)



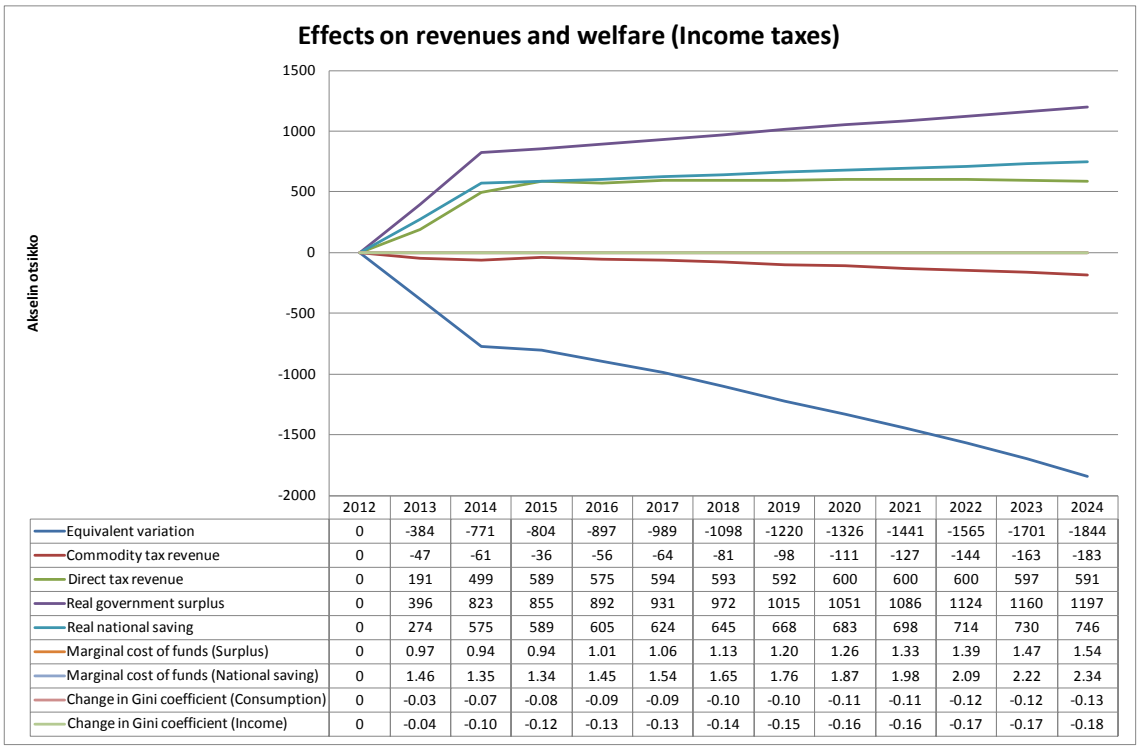
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Real GDP	0	-0.277	-0.345	-0.384	-0.429	-0.466	-0.5	-0.532	-0.56	-0.585	-0.609	-0.633	-0.654	-0.676
Imports	0.0	0.071	0.111	0.089	0.100	0.102	0.108	0.113	0.117	0.121	0.126	0.130	0.135	0.140
Exports	0.0	0.177	0.279	0.245	0.288	0.300	0.323	0.342	0.358	0.375	0.391	0.408	0.424	0.440
Stocks	0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Government	0.0	0.000	-0.001	-0.002	-0.003	-0.004	-0.004	-0.005	-0.006	-0.006	-0.007	-0.008	-0.008	-0.009
Investment	0.0	-0.091	-0.082	-0.016	-0.044	-0.037	-0.042	-0.043	-0.043	-0.045	-0.046	-0.047	-0.048	-0.049
Consumption	0.0	-0.220	-0.439	-0.454	-0.490	-0.522	-0.557	-0.593	-0.621	-0.651	-0.680	-0.710	-0.739	-0.769

Figure 8. Changes in saving aggregates and external balance (Mio euro)



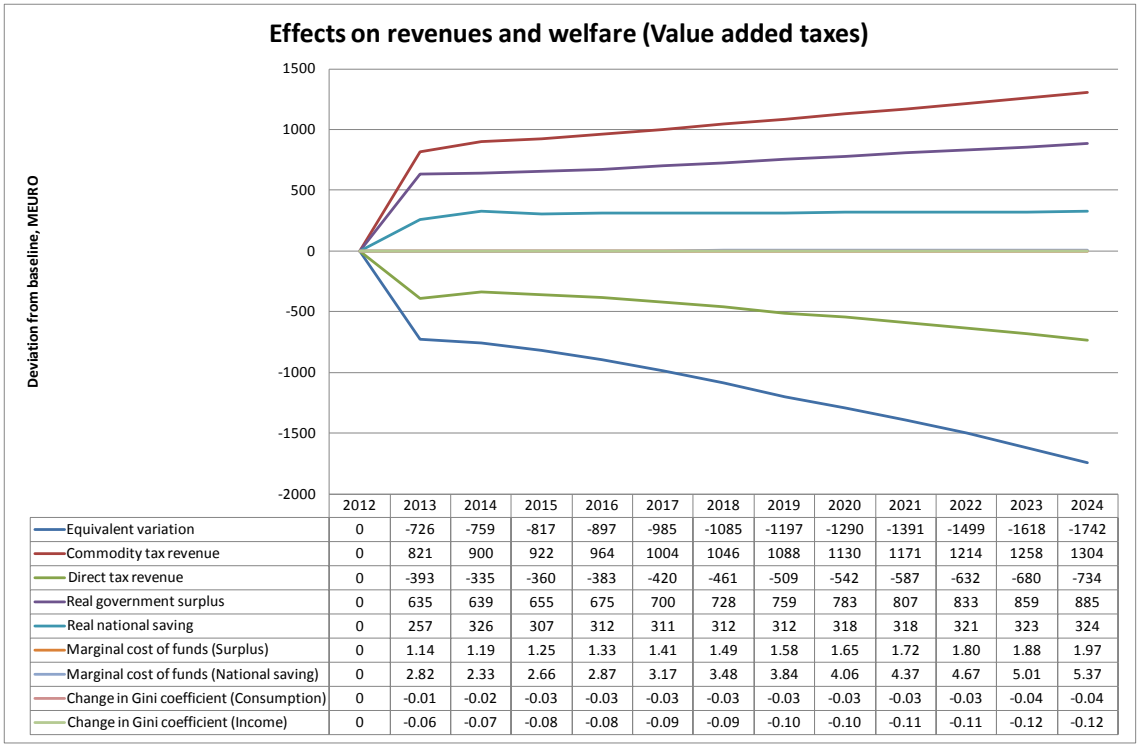
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Government deficit	0	-2346	-2530	-2680	-2874	-3088	-3318	-3563	-3773	-3996	-4228	-4464	-4717	-4979
Government saving	0	2165	2424	2537	2721	2907	3111	3325	3513	3709	3911	4117	4336	4564
Household saving	0	-1324	-1181	-1416	-1532	-1711	-1887	-2082	-2230	-2403	-2578	-2759	-2954	-3157
National saving	0	840	1243	1121	1189	1196	1224	1244	1283	1306	1333	1358	1382	1407
Trade balance	0	1565	1085	1374	1460	1651	1833	2050	2221	2426	2636	2861	3104	3361
Balance of payments	0	1596	1153	1465	1575	1790	1998	2241	2439	2671	2910	3164	3438	3728

Figure 9. Effects revenues and welfare (Income taxes)



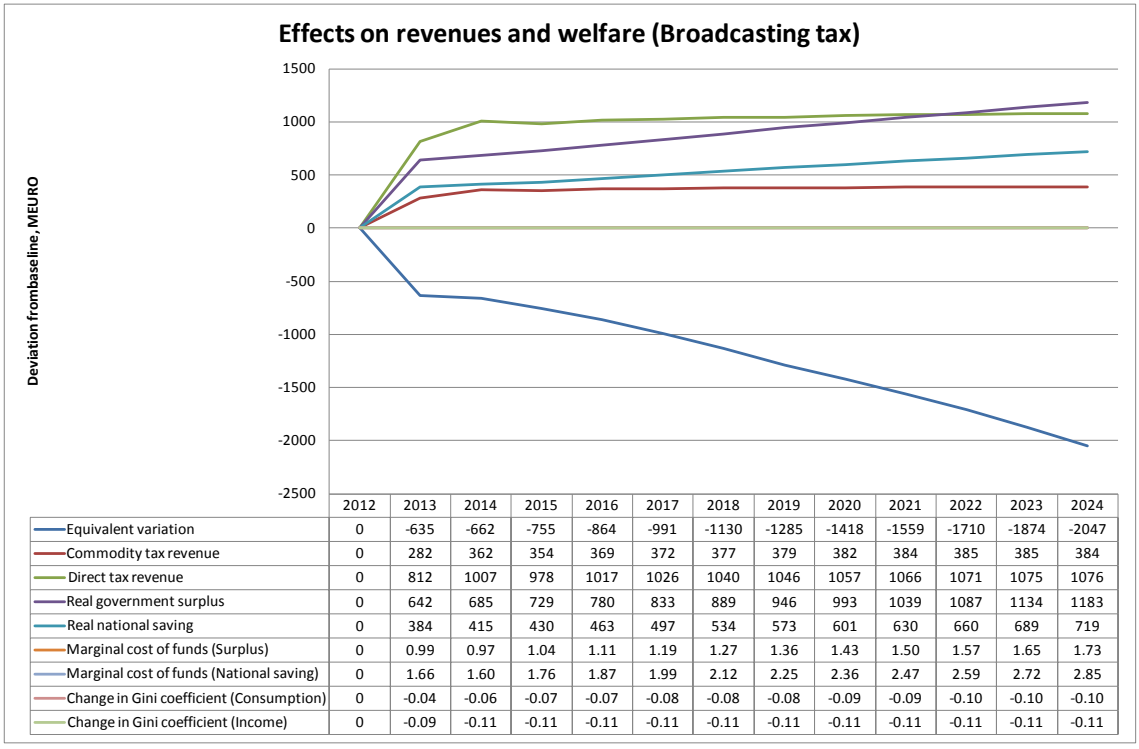
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Equivalent variation	0	-384	-771	-804	-897	-989	-1098	-1220	-1326	-1441	-1565	-1701	-1844
Commodity tax revenue	0	-47	-61	-36	-56	-64	-81	-98	-111	-127	-144	-163	-183
Direct tax revenue	0	191	499	589	575	594	593	592	600	600	600	597	591
Real government surplus	0	396	823	855	892	931	972	1015	1051	1086	1124	1160	1197
Real national saving	0	274	575	589	605	624	645	668	683	698	714	730	746
Marginal cost of funds (Surplus)	0	0.97	0.94	0.94	1.01	1.06	1.13	1.20	1.26	1.33	1.39	1.47	1.54
Marginal cost of funds (National saving)	0	1.46	1.35	1.34	1.45	1.54	1.65	1.76	1.87	1.98	2.09	2.22	2.34
Change in Gini coefficient (Consumption)	0	-0.03	-0.07	-0.08	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12	-0.13
Change in Gini coefficient (Income)	0	-0.04	-0.10	-0.12	-0.13	-0.13	-0.14	-0.15	-0.16	-0.16	-0.17	-0.17	-0.18

Figure 10. Effects revenues and welfare (Value added taxes)



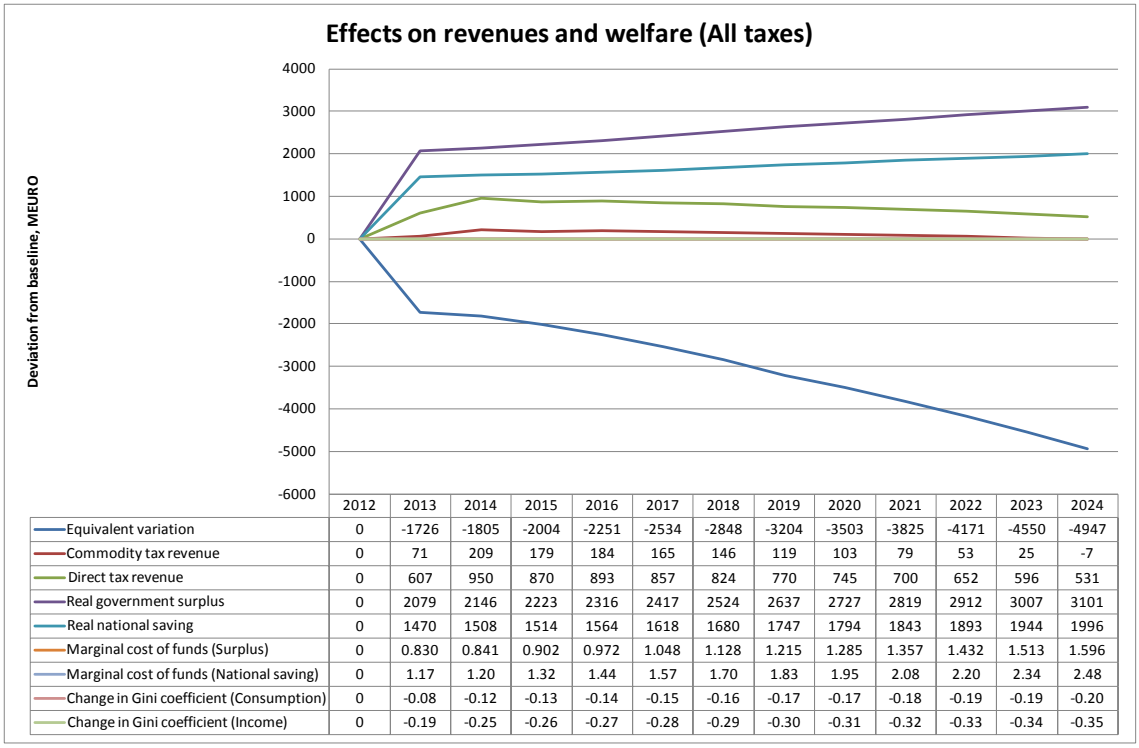
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Equivalent variation	0	-726	-759	-817	-897	-985	-1085	-1197	-1290	-1391	-1499	-1618	-1742
Commodity tax revenue	0	821	900	922	964	1004	1046	1088	1130	1171	1214	1258	1304
Direct tax revenue	0	-393	-335	-360	-383	-420	-461	-509	-542	-587	-632	-680	-734
Real government surplus	0	635	639	655	675	700	728	759	783	807	833	859	885
Real national saving	0	257	326	307	312	311	312	312	318	318	321	323	324
Marginal cost of funds (Surplus)	0	1.14	1.19	1.25	1.33	1.41	1.49	1.58	1.65	1.72	1.80	1.88	1.97
Marginal cost of funds (National saving)	0	2.82	2.33	2.66	2.87	3.17	3.48	3.84	4.06	4.37	4.67	5.01	5.37
Change in Gini coefficient (Consumption)	0	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.04	-0.04
Change in Gini coefficient (Income)	0	-0.06	-0.07	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.11	-0.11	-0.12	-0.12

Figure 11. Effects revenues and welfare (Broadcasting tax)



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Equivalent variation	0	-635	-662	-755	-864	-991	-1130	-1285	-1418	-1559	-1710	-1874	-2047
Commodity tax revenue	0	282	362	354	369	372	377	379	382	384	385	385	384
Direct tax revenue	0	812	1007	978	1017	1026	1040	1046	1057	1066	1071	1075	1076
Real government surplus	0	642	685	729	780	833	889	946	993	1039	1087	1134	1183
Real national saving	0	384	415	430	463	497	534	573	601	630	660	689	719
Marginal cost of funds (Surplus)	0	0.99	0.97	1.04	1.11	1.19	1.27	1.36	1.43	1.50	1.57	1.65	1.73
Marginal cost of funds (National saving)	0	1.66	1.60	1.76	1.87	1.99	2.12	2.25	2.36	2.47	2.59	2.72	2.85
Change in Gini coefficient (Consumption)	0	-0.04	-0.06	-0.07	-0.07	-0.08	-0.08	-0.08	-0.09	-0.09	-0.10	-0.10	-0.10
Change in Gini coefficient (Income)	0	-0.09	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11	-0.11

Figure 12. Effects revenues and welfare (All taxes)



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Equivalent variation	0	-1726	-1805	-2004	-2251	-2534	-2848	-3204	-3503	-3825	-4171	-4550	-4947
Commodity tax revenue	0	71	209	179	184	165	146	119	103	79	53	25	-7
Direct tax revenue	0	607	950	870	893	857	824	770	745	700	652	596	531
Real government surplus	0	2079	2146	2223	2316	2417	2524	2637	2727	2819	2912	3007	3101
Real national saving	0	1470	1508	1514	1564	1618	1680	1747	1794	1843	1893	1944	1996
Marginal cost of funds (Surplus)	0	0.830	0.841	0.902	0.972	1.048	1.128	1.215	1.285	1.357	1.432	1.513	1.596
Marginal cost of funds (National saving)	0	1.17	1.20	1.32	1.44	1.57	1.70	1.83	1.95	2.08	2.20	2.34	2.48
Change in Gini coefficient (Consumption)	0	-0.08	-0.12	-0.13	-0.14	-0.15	-0.16	-0.17	-0.17	-0.18	-0.19	-0.19	-0.20
Change in Gini coefficient (Income)	0	-0.19	-0.25	-0.26	-0.27	-0.28	-0.29	-0.30	-0.31	-0.32	-0.33	-0.34	-0.35

6. Conclusions

In the current study, we have studied the tax bits of the Finnish Austerity Package, which aims at raising altogether an extra 8 billion during the electoral period by increasing taxes and cutting public spending. We have used the concept of Marginal cost of funds to compare the effects of different taxes in the Tax Package, weighing the welfare cost against changes in the overall public sector surplus or national saving. We find that MCF is lowest for the income tax increases and highest for the value added tax increase. We also find that the MCF tends to rise over time, and while the overall Tax Package has a low MCF initially, it rises to about 1.5 in the long run, implying extra revenue to have a 1.5-fold societal cost. We also find that the package tends to decrease income differences.

We have assumed throughout that labour markets are competitive. This is a standard assumption in the theoretical literature on MCF, but obviously wage rigidities would raise the welfare costs in the short run significantly. The advantage of the assumption is that it enables us to see the effects on labour supply and employment. Without wage rigidities, these are very small, but there are differences between the deciles that ultimately are reflected in the distributional results that show the Tax Package to level income distribution somewhat.

In some respects, our study also demonstrates the ambiguity in defining a tax reform. As in many other studies, we have assumed real public consumption of commodities and services, as well as public investment not to respond changes in taxation. But even so, nominal public expenditure does depend on these changes, and consequently we find that the welfare cost appears very different when measured against revenue from specific taxes, real public sector surplus, or national saving. The broadest measures suggest that welfare costs are not very high initially, but obviously they depend also on our assumption of perfectly competitive labour markets, which allow domestic prices to adjust immediately. Over time, however, the welfare costs tend to rise, reflecting first and foremost the fall in investment caused by the package.

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