The Costs of Fiscal Thrift

Absract

The deepening economic crisis in the euro-area has brought thrift measures to the fore of economic policy debate. Most European countries anticipate rising levels of age-related spending in the decades to come, calling for some measure of austerity to ensure fiscal sustainability, but in most of these countries, there are few signs of a resumption of economic growth. Since raising more revenue and saving on public expenditure comes with a price, a comprehensive evaluation of the structure of the whole tax system and the effects of public spending is called for.

Finland has weathered the crisis remarkably well compared to most EU-countries – or at least her public finances have – but she is also facing the problems and fiscal pressures of a rapidly declining working-age population and the growing costs of an ageing population. These concerns have lead to a lively debate on the extent of a sustainability gap, and to measures aimed at keeping the gap at bay by increasing taxes and curbing public spending.

The aim of this study is to compare the welfare costs of improving fiscal stance by raising revenue with different types of taxes, as well as by cutting public spending. We provide a framework that can be used in the evaluation of thrift. We use the Finnish economy as an example, focussing on the effects of tax hikes taking effect from 2013 on, comprising both income taxes and value added taxes. We also take into account the spending cuts taking effect in 2013. The cuts reduce government spending on certain central government functions and on education, as well as slashing certain subsidies and public investments. Our analysis introduces several extensions on standard models.

We are using VATTAGE, an AGE model of the Finnish economy, to compare the welfare effects of the policies designed to reduce Finland's budget deficits by using the concept of marginal cost of funds (MCF). 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 behaviour 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 taxation. As to the effects of cuts in public spending, unlike most AGE models that treat the public sector essentially as a burden to the economy, we have modified the model to account for the direct utility effects from free public provision of educational, health care and social services, a characteristic of most Nordic "welfare states". Under this set-up, cuts in these services will have a two-fold effect: they will reduce the welfare costs of financing public services, but they will also have a negative, direct impact on consumers' utility. A third effect is to encourage demand for privately provided services.

We shall use the concept of Marginal Cost of Funds (MCF) to try and internalize the overall welfare implications of fiscal thrift. 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), that 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. When the government raises taxes, or cuts spending, all its revenues will be affected, which we feel calls for the use of a general efficiency measure. MCF compares the welfare effects of taxes and government spending to their revenue implications.

1. Introduction

The deepening economic crisis in the euro-area has brought thrift measures to the fore of economic policy debate. Most European countries anticipate rising levels of age-related spending in the decades to come, calling for some measure of austerity to ensure fiscal sustainability, but in most of these countries, there are few signs of a resumption of economic growth. Since raising more revenue and saving on public expenditure comes with a price, a comprehensive evaluation of the structure of the whole tax system and the effects of public spending is called for.

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revenues will be affected, which we feel calls for the use of a general efficiency measure. MCF compares the welfare effects of taxes and government spending to their revenue implications.

We cover the hikes decided on by the Finnish government in the spring of 2012, which 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 include an increase in income taxes (with a static revenue target of € 260 million in 2013, rising to €560 million by 2016, an increase in all value added taxes (targeted to raise € 925 million from 2013 on, rising to 1004 million by 2016); and 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).

We also cover the spending cuts decided in 2012. The cuts aim at reducing government spending on certain central government functions and on education, as well as slashing farming subsidies and infrastructure investments. They also include cuts in 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, cancel out in an analysis focusing at the national level.

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 shows our main results on the macro level. A discussion on the efficiency and welfare results are given in section 5. Section 6 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 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

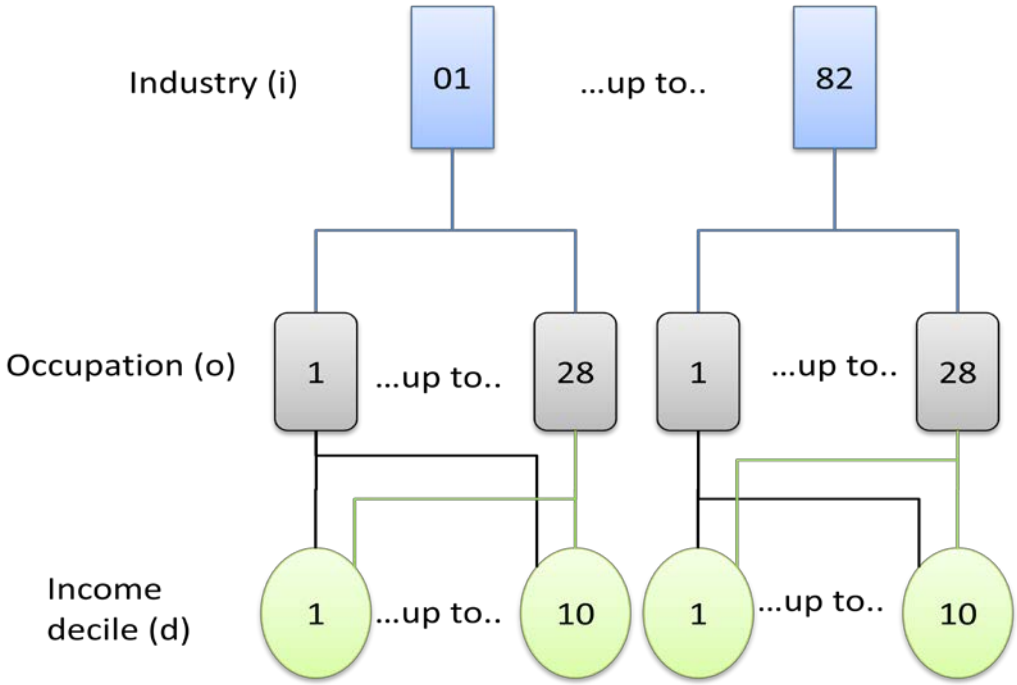
λ is the Lagrangian multiplier which can be interpreted as the increase in utility that the household would derive from an extra dollar of income (a unit increase in Z).

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).

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. This focus on these services is mandated by the availability of data, but these services are also set apart from other public spending by their being almost exclusively distributed to the consumers, whereas admisnitration and most other public spending is more directly consumed by the public sector itself. The behavioural assumption implies that

whenever public service provision is changing, consumers match their private demands of the same services accordingly, subject to changes in relative prices as well as changes in their incomes. The next section demonstrates this mechanism by studying spending in services that do provide direct utility as well as some that do not.

In various AGE models, 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 for free is not accounted for. Since in Finland the majority of education, healthcare and social services consumption is publicly funded, we include this link between government expenditure and consumer welfare to the VATTAGE model. In order to do it, we use data form 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). This 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 $\sum_i^I s_{ij} = 1$. 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 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 and Ahokas (2012)).

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 or for changes in government spending. Here, we use the definition

$$\mathrm{MCF} = 1 - \mathrm{EV} / \Delta \mathrm{R},$$

where EV is the equivalent variation resulting from the tax change and $\Delta \mathrm{R}$ is the change in revenue.

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].

The determination of labour supply and saving is rarely at the centre of the AGE analyses of taxation. 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 (or 1.32 by our definition) 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.

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 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. In March 2013, a further package was announced, which included as its main element a major reshuffle of corporate and capital income taxes, which is intended to be revenue neutral.

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 2012 Tax Package

Tax type	**Change in tax collection €**	**Description**	**VATTAGE implementation**
Income tax	260 million € per year, 560 from 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.*

The corporate tax reform of 2013 intends to shift the burden of capital income taxes more towards share-owners. Finland does not apply avoir fiscal, or dividend-imputation, and thus corporate earnings fall under double taxation. The reform intends to raise the effective tax rates faced by share-owners by removing certain thresholds, whence capital earnings will all fall under the capital income tax. Corporate tax rates, however, are to fall from 24.5 per cent to 20 per cent, potentially raising the expected post-tax rate of return and creating a powerful investment incentive.

In VATTAGE, **capital taxes** are applied to all capital incomes, whereas corporate taxes only affect the post-tax rates of return. 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. Since the reform is assume dto be revenue neutral, the rise in capital gains taxes thus cancels the fall in corporate taxes as far as tax revenues and household incomes are concerned. We assume that the corporate tax reform is implemented over a period of four years, starting in 2014.

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).

Table 3 below presents the spending cuts of 2012. We are not able to cover all of the cuts, as some of them entail changes in very specific measures affecting, for example, R&D perks applicable by a minority 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 215

million € in 2013 to 477 million by 2016. This represents roughly one per cent of overall government spending.

Table 3. The Finnish "Austerity package"

Tax type	Change in spending € 2013-2016	Notes
Farm subsidies	-52 million € per year	Cuts take the form of increases in direct (negative) product taxes; cuts start at – 2 million €
Road maintenance	-30 to - 58 million € per year	No information available on the effects of cuts to efficiency in the transport sectors
Transfers to households	-60 million € per year	Modelled as change in lump-sum transfers
Central government	-44 to - 167 million € per year	Modelled as change in value of government spending
Education	- 109 to – 140 million € per year	Modelled as change in value of governmentt spending; these services provide direct utility

Source: Ministry of Finance

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4. 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. Household demand for commodities falls by 0.3 on impact and by as much as 1.5 per cent in the long run; the demand for leisure is also falling, which shows up as an increase in labour supply. As labour supply increases, so does employment and therefore the overall effect on the GDP is small. Moreover, as the increase in labour supply implies falling real wages, exports gain, improving by more than 2 per cent by 2020.

Figure 3 shows the combined effects of the 2012 taxes and spending cuts. It is clear the tax reform dominates the cuts, but there are still some interesting differences between the cases. First, as public demand falls, it frees up resources for the exports to grow slightly more. Second, private demand falls slightly more than under tax cuts only, since households compensate for the loss of public services by increasing their demand for these services; this cuts their purchasing power further.

Figure 4 shows the combined effects of the 2012 and 2013 measures. Clearly, the reform of corporate and capital taxation creates a large stimulus for the economy, if it will affect investment in all sectors. For the moment, it is unclear, whether the effect will be as large in the domestic service sectors, where firm-sizes are often smaller than in the tradables sectors, and we suspect our estimate here to present something of an upper bound for the effects of the corporate tax reform.

Figure 2. Change in expenditure aggregates (2012 taxes)

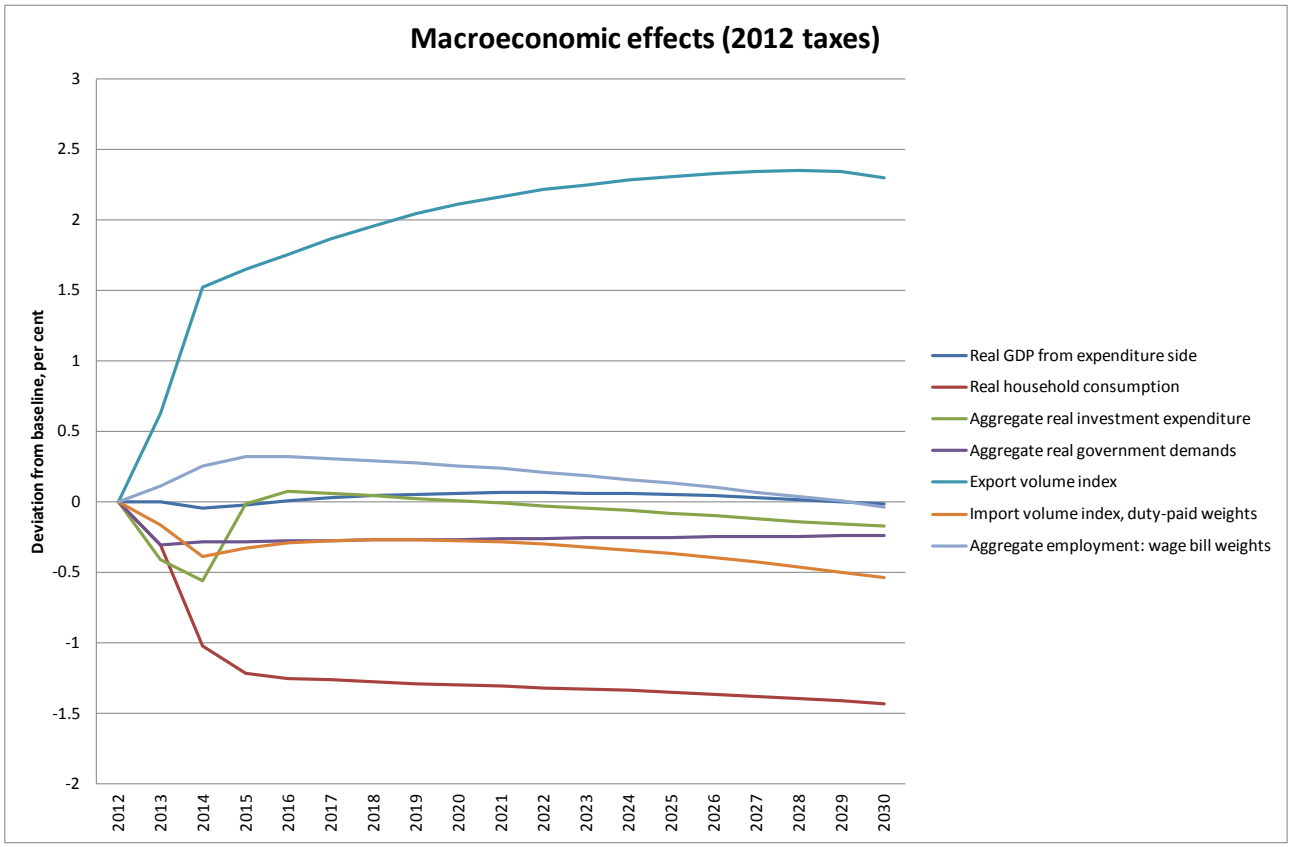


Figure 3. Change in expenditure aggregates (2012 taxes and spending cuts)

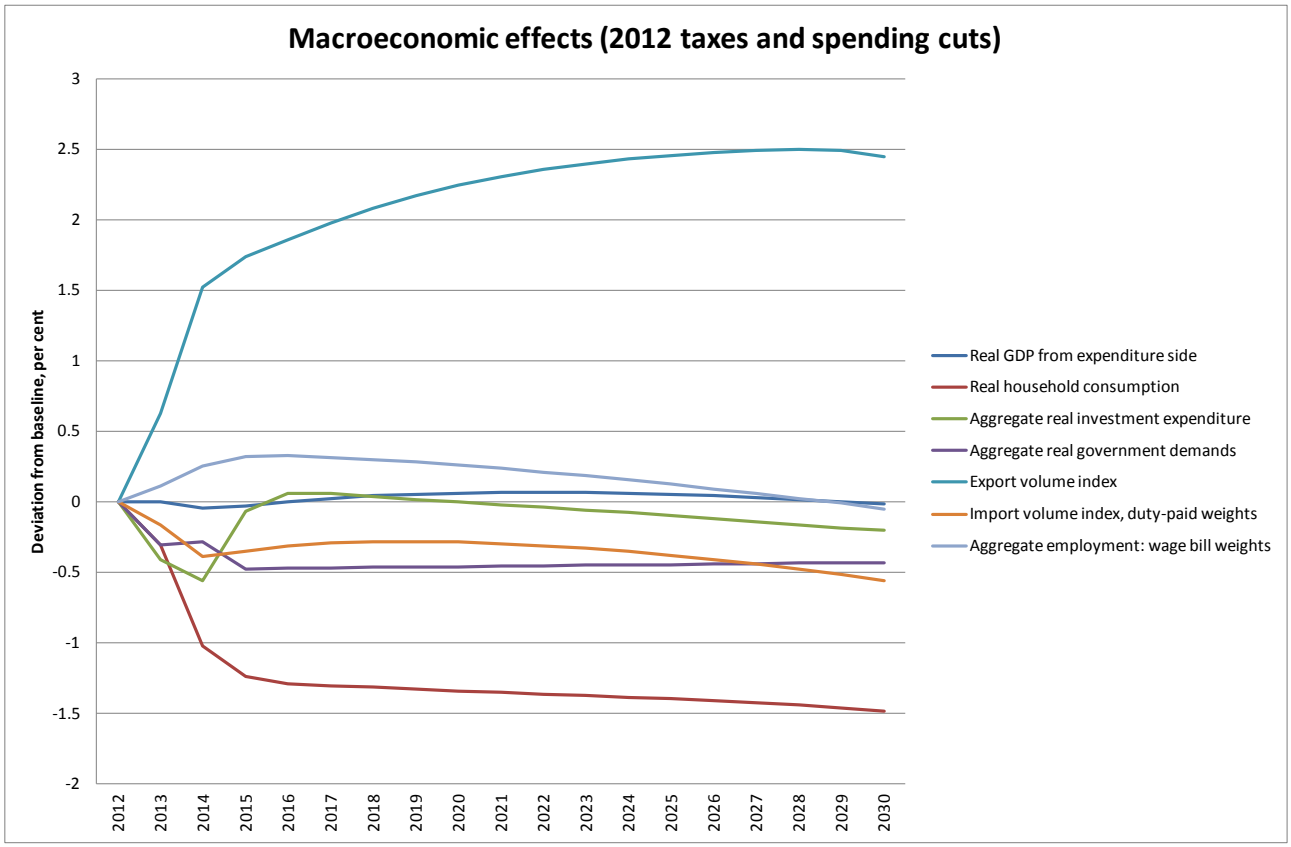


Figure 4. Change in expenditure aggregates (All 2012 and 2013 measures)

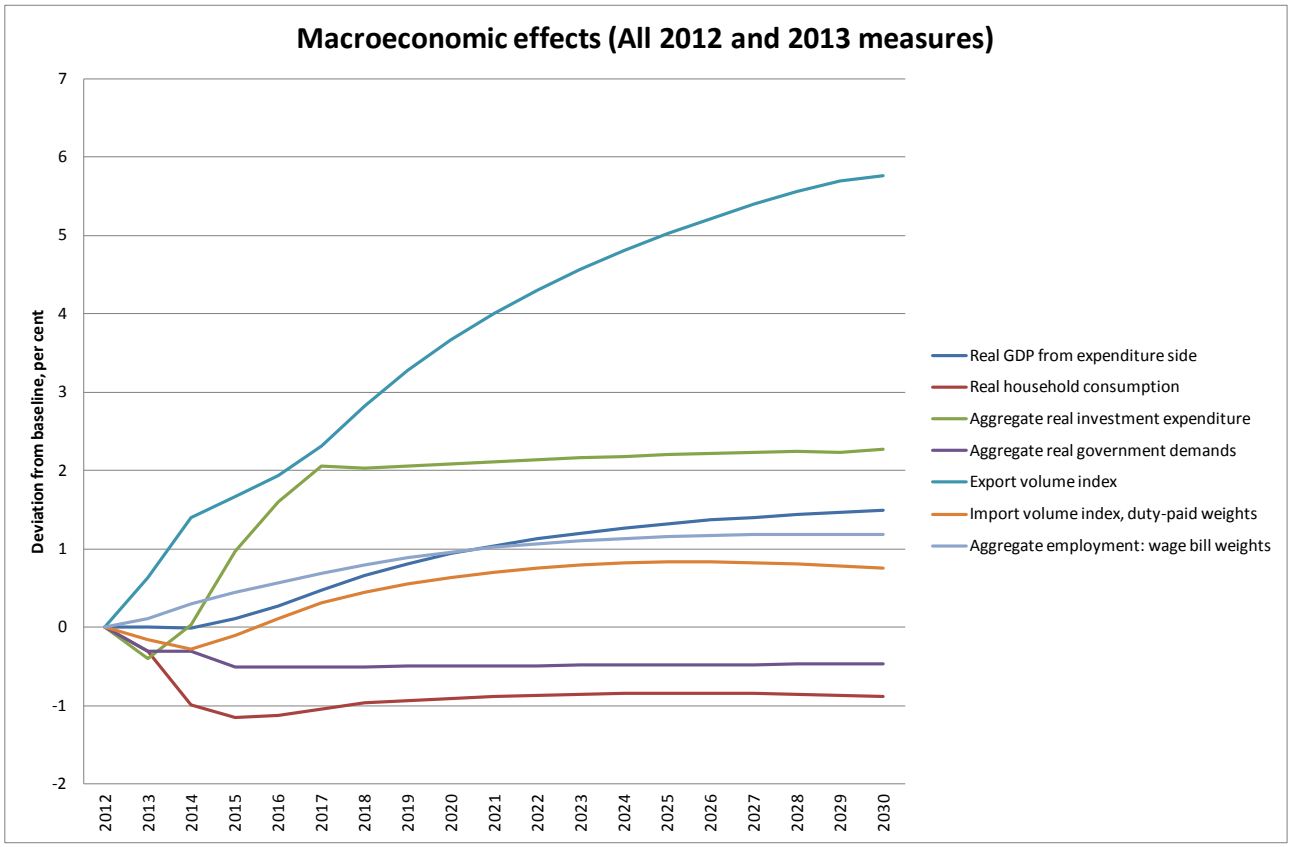


Figure 5 shows the contributions of income aggregates to GDP change for the 2012 tax reform. The reasons for the small, overall GDP effects is clear from the decomposition – the increase in labour supply compensates for the losses caused mainly by decreases in consumption. In time, though, the effect of labour supply vanishes as investment catches up and real wages adjust. The change in the structure of the economy will remain and is seen in the growing contribution of technology, due to the increased growth of – at least historically – relatively more efficient tradables sector of the economy.

The effects of the 2012 spending cuts are more apparent from the expenditure side of the economy, shown in figure 6, from which is it is easy to see that the public sector's contribution is negative. The figure also shows the effect of exports to be slightly larger as resources get redirected from the public sector to the rest of the economy.

Figure 7 shows the decomposition of GDP changes to income aggregates for the combined 2012 and 2013 measures. It is readily apparent that the corporate tax reform boosts investment and largely compensates for the negative effects of the 2012 reforms. Figure 8 shows how the reform is benefitting not only exports and investment, but is also reducing the negative effects on private consumption (as households' wage incomes increase).

Figure 5. Contributions of income aggregates (2012 taxes)

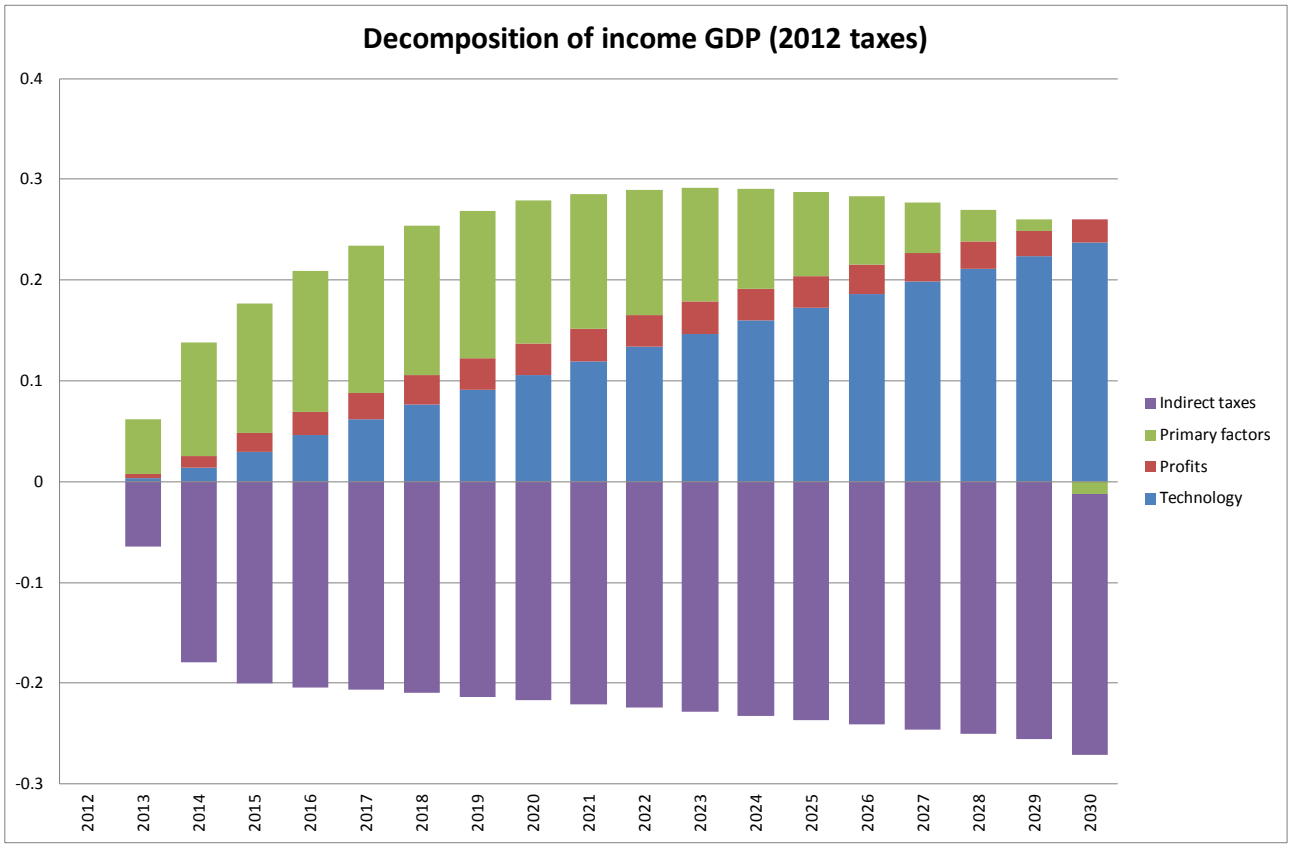


Figure 6. Contributions of expenditure aggregates (2012 taxes and spending cuts)

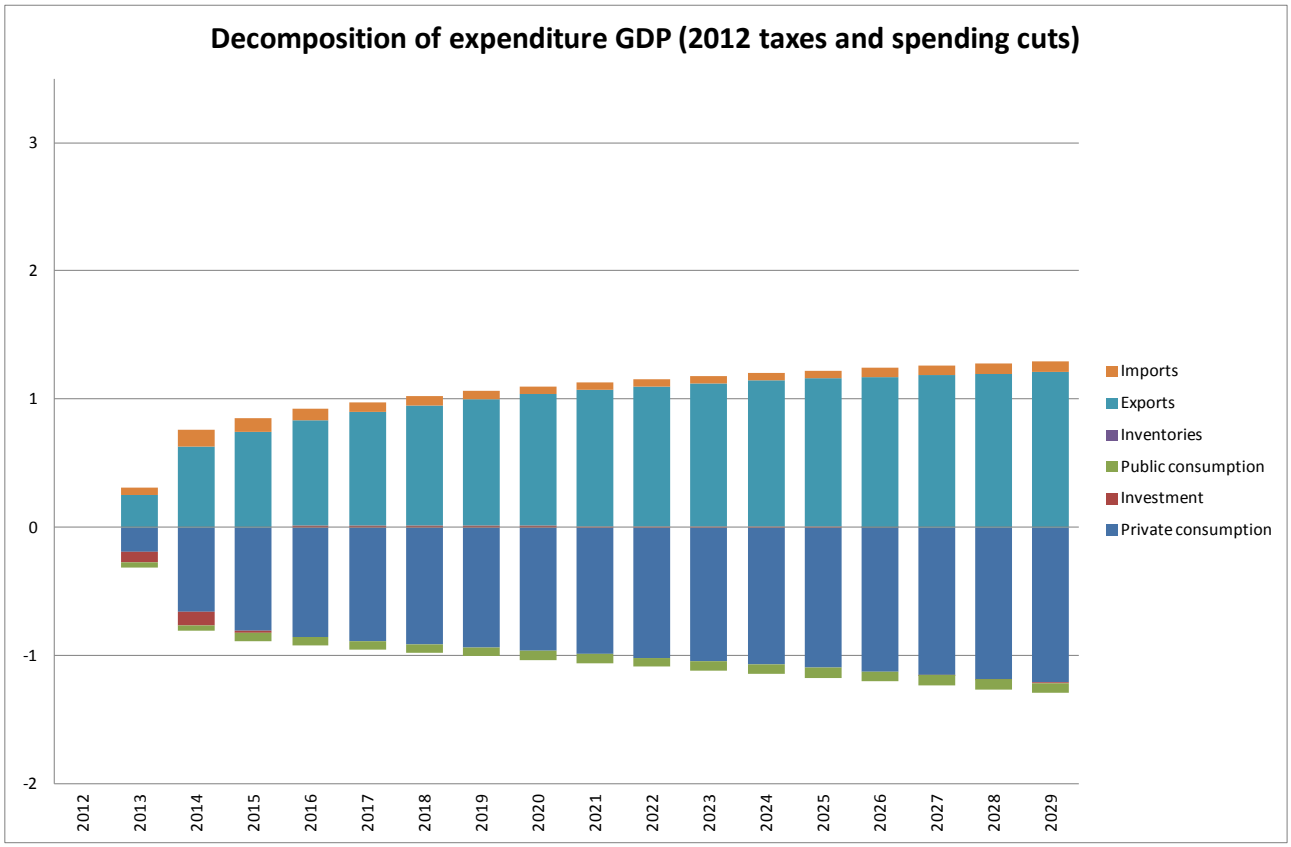


Figure 7. Contributions of income aggregates (All 2012 and 2013 measures)

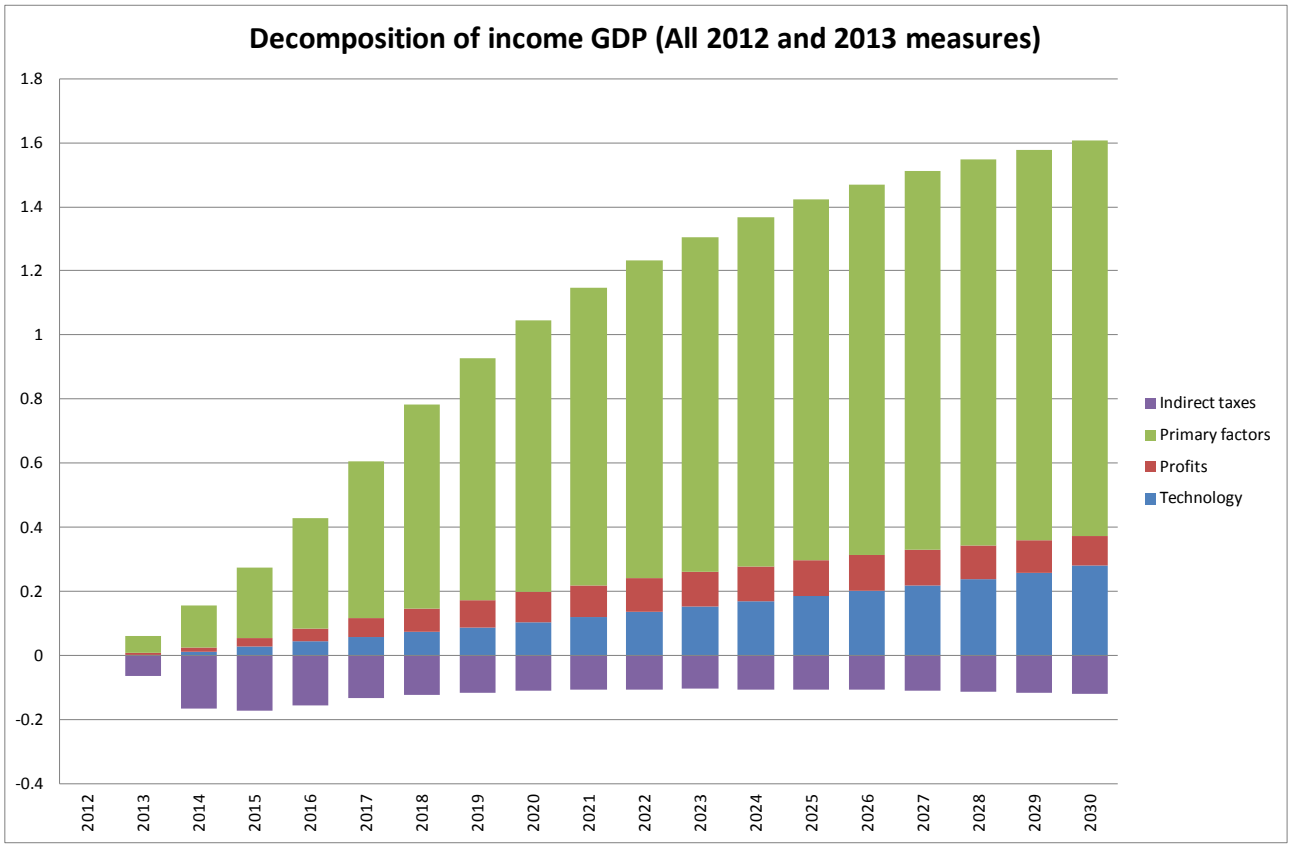
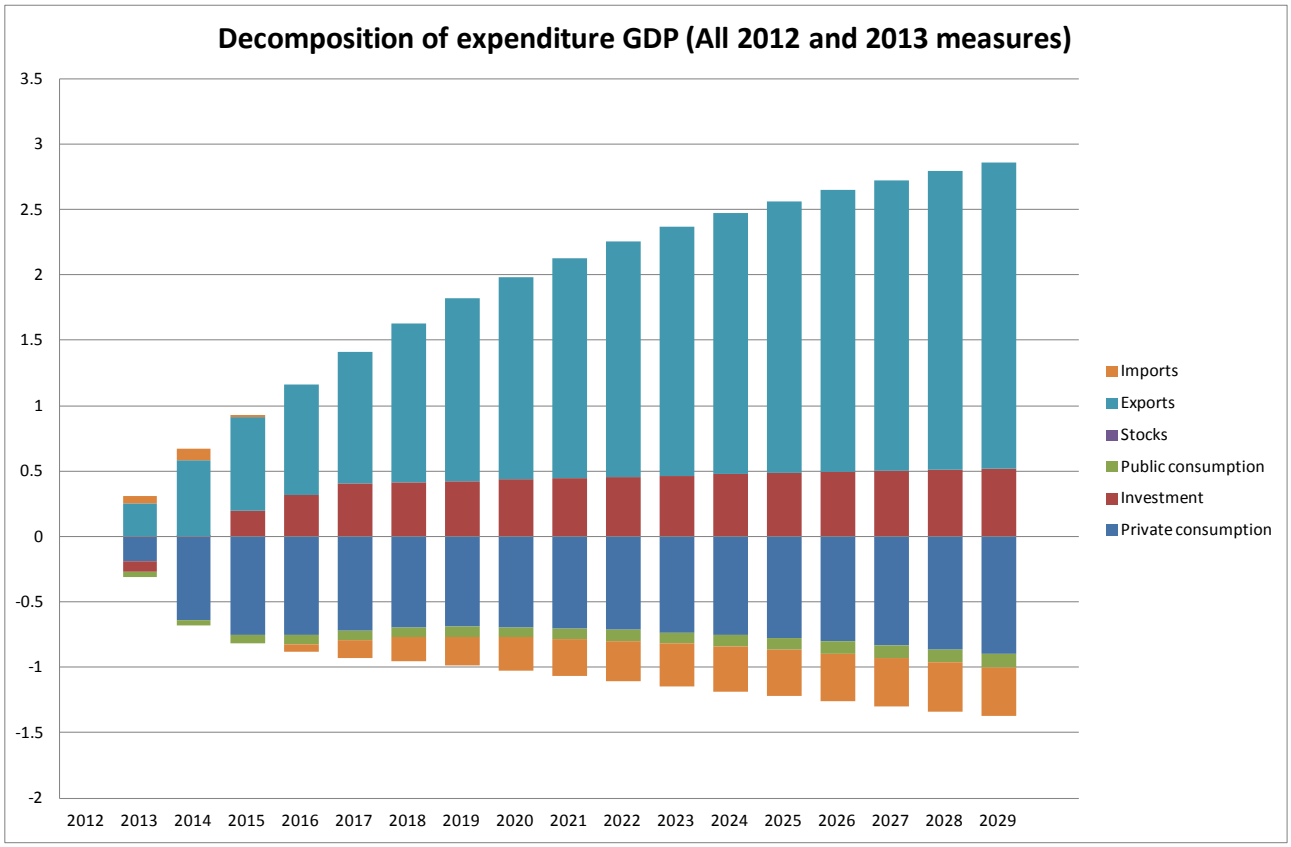


Figure 8. Contributions of expenditure aggregates (All 2012 and 2013 measures)



5. The welfare effects of the austerity packages

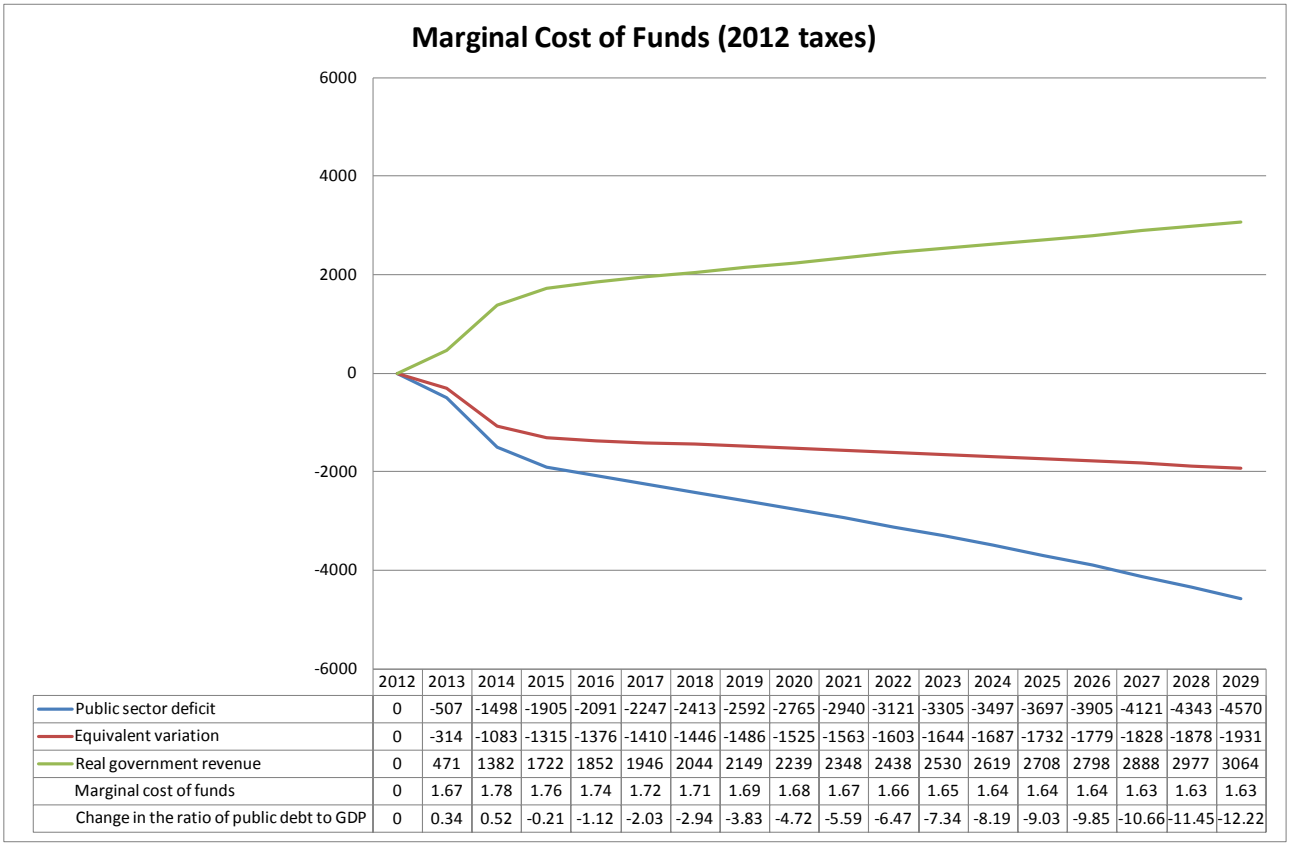
In this section, we summarise the effects of the reforms from the efficiency and welfare points of view. As the ultimate aim of the tax reforms and the spending cuts is to reduce the future debt burden, it is natural to report the effects on public sector debt. However, it is clear that the welfare implications depend on the excess burden of taxes as well. Finally, the reforms also have distributional effects. In microsimulation studies, changes in income distribution are often summarized with Gini-coefficient. However, their use in representative household models is less straightforward, and we use a societal welfare functions to cover the distributional effects in a compact manner instead.

Figure 9 shows the effects on government deficit and real government revenue of the 2012 tax reforms. In the long run, the government gains over €2 billion in real terms, and the nominal deficit is decreasing by about 4.5 billion by 2030. This reduces the cost of servicing the debts as well, and thus the debt to GDP ratio is 12 percentage points lower in 2030 than in our baseline. The MCF for the reform is fairly high, though, and remains above 1.6 through our simulation period. Clearly then, increasing income taxes to improve the fiscal stance does not come without cost.

Figure 10 shows the combined effects of the tax increases and spending cuts. Together, the 2012 thrift measures and tax increases reduce the deficit by about €4.8 billion by 2030. The contribution of the spending cuts is smaller than the initial nominal savings, though, which reflects the fact that many transfers to the households are indexed and will therefore adjust to the policy changes. It is noteworthy, though, that in terms of its efficiency the overall thrift package fares slightly better than the tax increases alone, in that MCF is lower for the overall 2012 thrift package than the tax package alone. The primary reason for this is, we suspect, that the many of the spending cuts consist of removing subsidies and cutting down on spending that does not have direct welfare effects.

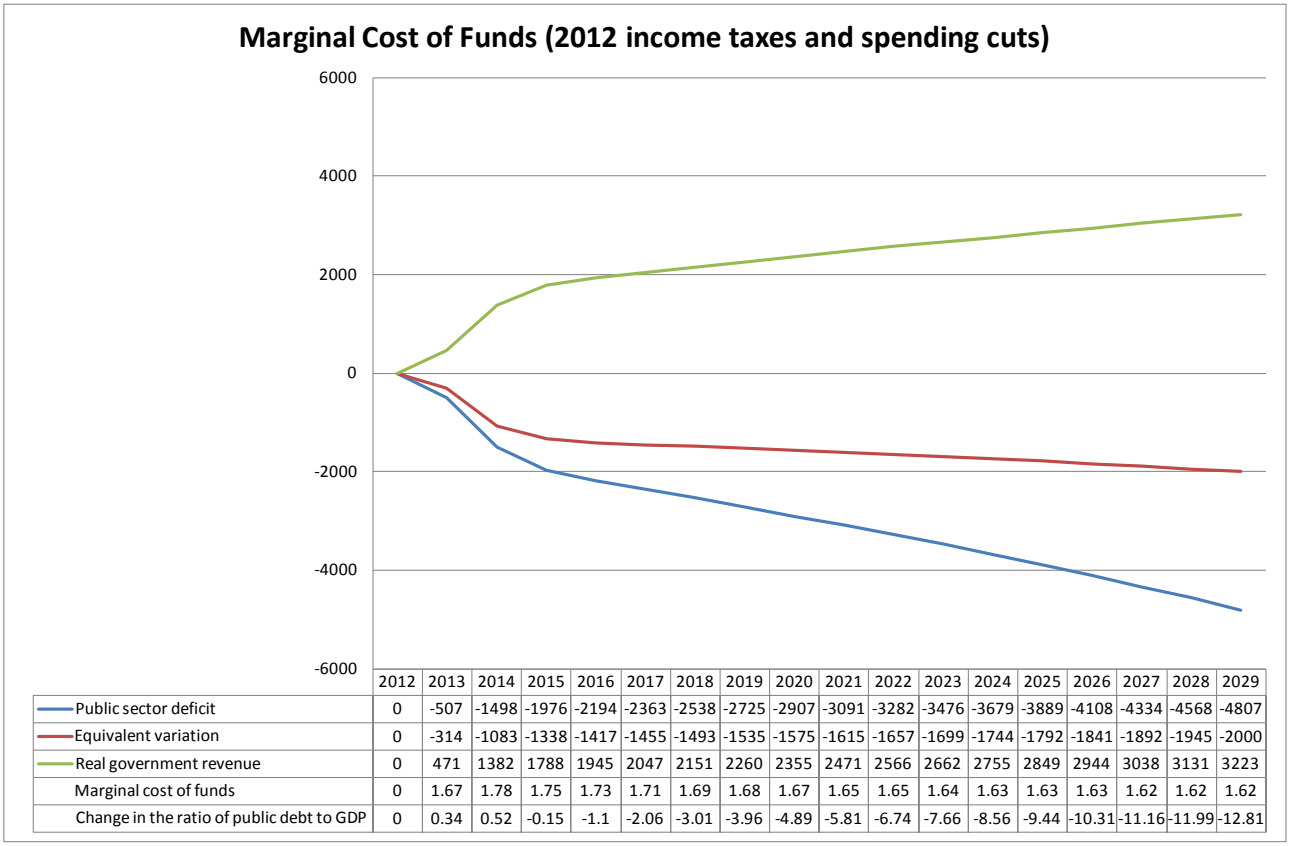
Figure 11 shows the effects of the combined 2012 and 2013 measures. A striking result is that the 2013 corporate tax reform manages to contribute more than two billion euros in revenue in the long run, pushing down the debt to deficit ratio by en extra five percentage points compared to the 2012 thrift measures, despite the fact that it is initially revenue neutral. Furthermore, it does this efficiently, since the MCF falls from the initial 1.67 to 1.25 by 2030. Again, the caveat that our estimate probably is an upper bound should be kept in mind. It is likely that not all sectors will be able to fully benefit from the reform, whence the overall stimulus to the economy is bound to remains smaller.

Figure 9. Changes in revenue and welfare (2012 taxes)



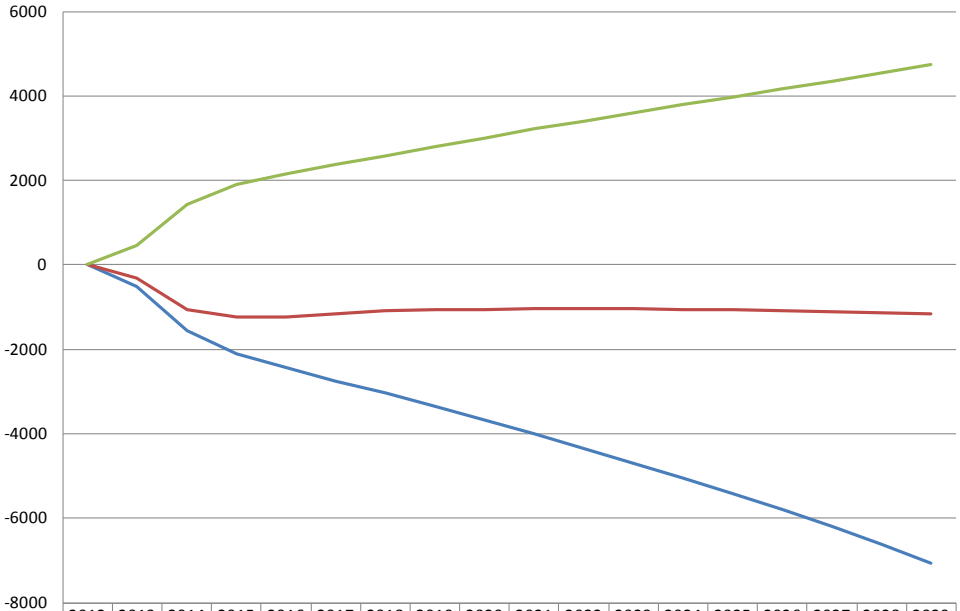
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Public sector deficit	0	-507	-1498	-1905	-2091	-2247	-2413	-2592	-2765	-2940	-3121	-3305	-3497	-3697	-3905	-4121	-4343	-4570
Equivalent variation	0	-314	-1083	-1315	-1376	-1410	-1446	-1486	-1525	-1563	-1603	-1644	-1687	-1732	-1779	-1828	-1878	-1931
Real government revenue	0	471	1382	1722	1852	1946	2044	2149	2239	2348	2438	2530	2619	2708	2798	2888	2977	3064
Marginal cost of funds	0	1.67	1.78	1.76	1.74	1.72	1.71	1.69	1.68	1.67	1.66	1.65	1.64	1.64	1.64	1.63	1.63	1.63
Change in the ratio of public debt to GDP	0	0.34	0.52	-0.21	-1.12	-2.03	-2.94	-3.83	-4.72	-5.59	-6.47	-7.34	-8.19	-9.03	-9.85	-10.66	-11.45	-12.22

Figure 10. Changes in revenue and welfare (2012 taxes and spending cuts)



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Public sector deficit	0	-507	-1498	-1976	-2194	-2363	-2538	-2725	-2907	-3091	-3282	-3476	-3679	-3889	-4108	-4334	-4568	-4807
Equivalent variation	0	-314	-1083	-1338	-1417	-1455	-1493	-1535	-1575	-1615	-1657	-1699	-1744	-1792	-1841	-1892	-1945	-2000
Real government revenue	0	471	1382	1788	1945	2047	2151	2260	2355	2471	2566	2662	2755	2849	2944	3038	3131	3223
Marginal cost of funds	0	1.67	1.78	1.75	1.73	1.71	1.69	1.68	1.67	1.65	1.65	1.64	1.63	1.63	1.63	1.62	1.62	1.62
Change in the ratio of public debt to GDP	0	0.34	0.52	-0.15	-1.1	-2.06	-3.01	-3.96	-4.89	-5.81	-6.74	-7.66	-8.56	-9.44	-10.31	-11.16	-11.99	-12.81

Figure 11. Changes in revenue and welfare (All 2012 and 2013 measures)



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Public sector deficit	0	-507	-1551	-2109	-2440	-2755	-3037	-3364	-3686	-4012	-4346	-4687	-5042	-5412	-5801	-6205	-6628	-7067
Equivalent variation	0	-314	-1054	-1240	-1233	-1167	-1096	-1070	-1053	-1043	-1040	-1042	-1050	-1064	-1083	-1108	-1137	-1171
Real government revenue	0	471	1431	1906	2164	2390	2578	2796	2994	3213	3405	3598	3786	3975	4166	4358	4551	4744
Marginal cost of funds	0	1.67	1.74	1.65	1.57	1.49	1.43	1.38	1.35	1.32	1.31	1.29	1.28	1.27	1.26	1.25	1.25	1.25
Change in the ratio of public debt to GDP	0	0.34	0.46	-0.29	-1.35	-2.46	-3.58	-4.71	-5.88	-7.08	-8.31	-9.57	-10.83	-12.1	-13.37	-14.64	-15.91	-17.19

An interesting aspect of the Finnish debate on thrift measures has been the determination to combine austerity with social justness. Since it is rather difficult to measure justness in an objective way, we opt to report the effects on welfare in a form that allows for different interpretations. Specifically, we use a societal welfare index defined by

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

where the index is defined over income deciles, and where U measures welfare with real, disposable income in each income decile. By changing the value of the parameter in the aggregator, the welfare function can be given different interperetations:

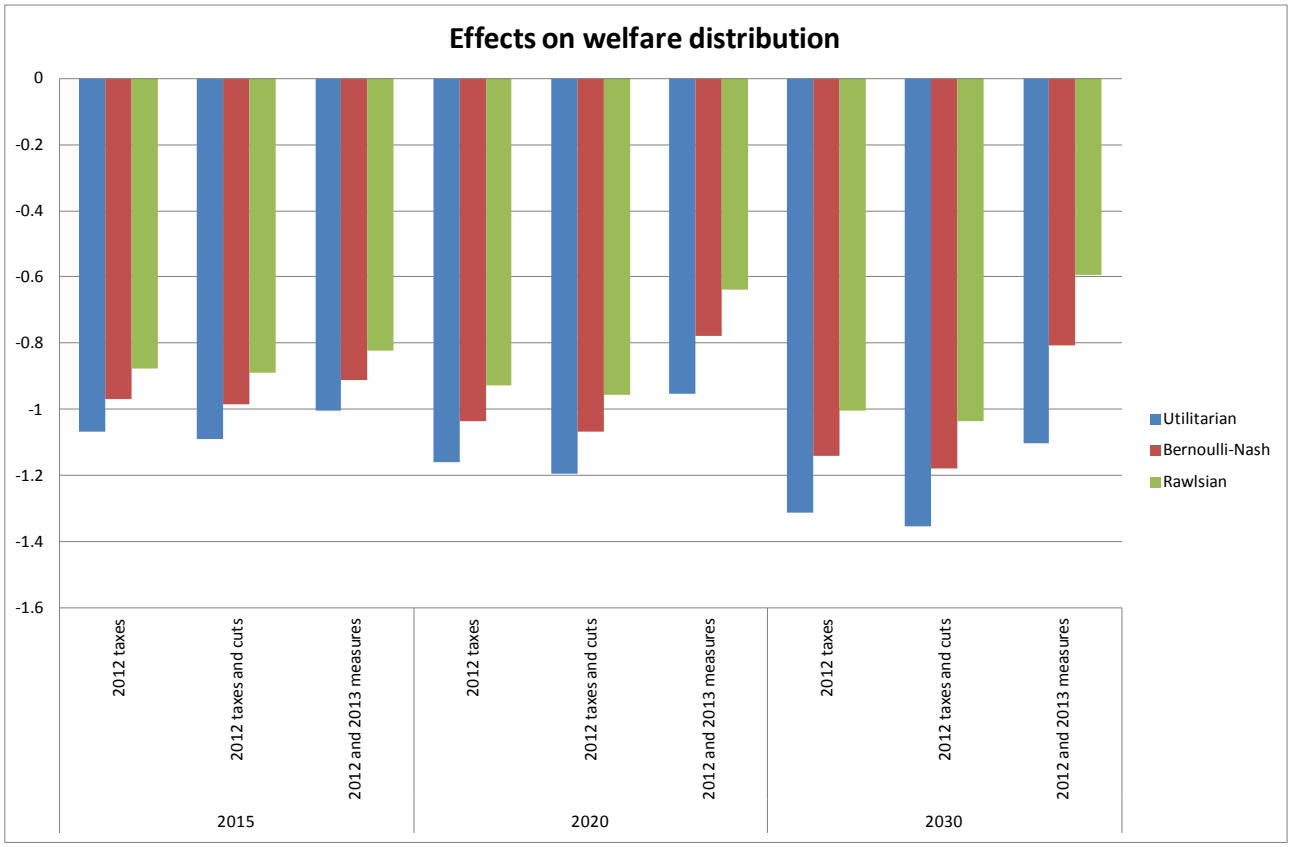
with *a* -> 0, W corresponds to a utilitarian view which only concerns over the aggregated welfare of the deciles, not changes in the distribution of welfare;

with *a* -> ∞ W corresponds to a Rawlsian view, where the concern is on the welfare of those in the worst position; and

with *a* -> *1 (*Bernoulli-Nash), W lies between the two extremes.

Figure 12 shows W for chosen years in our simulation. It is easy to see that there are no large differences between the 2012 tax reforms and the combined 2012 thrift package, and both the utilitarian and Rawlsian measures change for the worse over time. Remarkably, the 2013 package seems to show a clear improvement not only with respect to the 2012 package but also between utilitarian and Rawlsian measures.

Figure 12. Changes in welfare indices



6. Conclusions

We have studied the effects of the Finnish fiscal thrift measures with the aim of comparing the efficiency of different measures in improving the fiscal stance of the public sector. As a methodological point, we find that with the extended model our simulations cover elements of tax reforms not typically included in AGE analyses.

The main findings of our study are that the cost of raising taxes on labour are significant in terms of welfare, but under the assumption of endogenous labour supply, not necessarily on the GDP; spending cuts, if directed towards removing subsidies and government spencing that does not directly affect welfare, appear slightly more efficient than tax cuts; reforms in corporate taxes appear very efficient according to our simulations. However, there are significant caveats to the last conclusion: first, since the effects depend on the initial double taxation of corporate earnings, which is well known to possess problems; second, since the reforms benefits might not accrue to all of the economy's sectors; and third, since there is already an element of tax competition within the EU in corporate taxation.

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