



ISSN 1725-3187 (online)
ISSN 1016-8060 (print)

EUROPEAN ECONOMY

Economic Papers 542 | December 2014

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Economic and
Financial Affairs

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KC-AI-14-542-EN-N (online)
ISBN 978-92-79-35191-4 (online)
doi:10.2765/72096 (online)

KC-AI-14-542-EN-C (print)
ISBN 978-92-79-36143-2 (print)
doi:10.2765/80490 (print)

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Fiscal Devaluation: Efficiency and Equity

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Abstract

Whilst it is generally accepted that a shift of taxation from labour to consumption has positive effects on employment and is growth enhancing, such a policy reform is often not pursued due to equity considerations. In this paper we challenge these considerations by arguing that a fiscal devaluation is a means to shift taxes from labour to all sources of income including income from financial and non-financial wealth. Approaching income from a functional income distribution angle, we focus on the impact that a fiscal devaluation has on income from financial and non-financial wealth, from labour and from social transfers. We simulate tax shifts in the European Commission's QUEST3 model and show that a tax shift redistributes real consumption income from capital owners to wage earners. Concerning the ratio of net wage income to income from financial and non-financial assets specifically, we find that the tax shift is regressive in the short run, but progressive in the long run, if it is enacted by reducing employers' social security contributions, and is progressive already in the short run if it is enacted by reducing personal income taxes. Concerning the ratio between net wage income and social transfer income, the tax shift is regressive, especially in a situation in which transfer income recipients are not compensated for the increase in the VAT. This adverse effect on benefit recipients is partly alleviated by a positive employment effect which allows unemployed workers into employment.

JEL Classification: D31, H20, H23, D58.

Keywords: Income Distribution, Fiscal Devaluation, Tax shift, Redistributive Effects of Taxes, DSGE Modelling.

Acknowledgements

The authors acknowledge suggestions and comments by Anneleen Vandeplass, Jan in 't Veld and seminar participants at the internal seminar at DG ECFIN. The views expressed in this paper are those of the authors and should not be attributed to the European Commission.

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SUMMARY

The economic literature has highlighted the desirability of shifting taxation from distortionary levies like taxes on labour to less distortionary ones like value-added taxes in order to strengthen economic growth and foster employment. Such a tax shift is discussed as one policy option to engineer a (fiscal) devaluation in some EA member states with elevated domestic labour costs. Despite their favourable effects on growth, fiscal devaluations are very often opposed because of equity considerations. It is argued that shifting taxation from labour to consumption is regressive as it favours households with a comparably high savings rate over those with a low savings rate and that such a tax reform is associated with a redistribution of income from relatively poor to relatively rich households. This view has recently been challenged in the literature arguing that a consumption tax is an implicit tax on capital and in particular distributed profits plus interest income. In particular, it is argued that theoretical results backing the regressivity claim are based on models which are not able to capture realistic wealth distributions. The often used overlapping generation models cannot generate large wealth discrepancies as they do not allow for bequests. Dynamic Stochastic General Equilibrium models with infinitely lived agents implicitly would allow for bequests and are therefore more adequate to address this question.

The literature on fiscal devaluations distinguishes between micro-simulation studies and general equilibrium analysis. The advantage of micro simulation studies is their level of detail concerning the income distribution. However, those studies tend to ignore how the tax reform affects prices and quantities in the economy. General equilibrium analyses do not seek to map a realistic household income distribution, but instead focus on coherent modelling of different sources of income such as income from labour, assets, transfers, benefits etc. Moreover, general equilibrium analysis accounts for price and quantity adjustments e.g. in the goods and labour market in response to a reform. Micro-simulation studies find evidence that a tax shift is only beneficial to the upper deciles of the income distribution. This result can be explained by the large share of the non-working population in lower deciles of the income distribution. Not working, these households would not profit from a reduction in the tax burden on labour. Furthermore, micro-simulation studies often focus on disposable income instead of total consumption spending which might be a more adequate indicator for permanent income effects of the tax shift. Indeed, micro studies focussing on total consumption expenditures point to a more favourable distributive effect of a fiscal devaluation.

General equilibrium analysis often suffers from an unrealistic assumption on the distribution of wealth. The frequently used overlapping generation models cannot generate large wealth discrepancies as they do not allow for bequests. Dynamic Stochastic General Equilibrium models like the European Commission's QUEST3 model with infinitely lived agents implicitly would allow for bequests and are therefore more adequate to address this question. QUEST3 distinguishes between two types of households, namely liquidity constrained households who receive only income from labour and transfers and financially unconstrained households who

receive labour income, transfers and income from financial wealth (government bonds) and real capital. Although this does not allow for a detailed analysis of distributional effects across income and wealth deciles, it does show how the tax shift affects real (permanent) income of households that only rely on labour and transfer income and households that in addition receive income from financial wealth. Furthermore, the QUEST3 model allows for a separate analysis of how the tax shift affects the several categories of income: wage, benefit, transfer, profit and interest income.

This paper highlights some attractive properties of tax shifts from labour to consumption. First, we confirm the well-established positive effects on growth and on the external balance. Second, such a tax reform has progressive effects on the distribution of income between workers and capital owners in the long run, while the reform is regressive when we compare the effects of labour and transfer income. This is due to the fact that such a tax reform shifts taxation away from labour to all other sources of income. Concerning the ratio of net wage to income from financial and non-financial assets specifically, we find that the tax shift is regressive in the short run[‡] but progressive in the long run if it is enacted by reducing employers' social security contributions but is progressive already in the short run if it is enacted by reducing labour taxes. Concerning the ratio between net wage income and net transfer income the tax shift is regressive, especially in the case in which transfer income recipients are not compensated for the increase in the VAT. This effect is partly alleviated by a positive employment effect which allows unemployed workers into employment. Third, in contrast to monetary devaluations the employment and GDP effects of a fiscal devaluation can be permanent. Forth, fiscal devaluations can mimic the effects of a labour market reform by increasing the gap between net wages and net benefits. Fifth, the simulation results highlight the trade-off between higher efficiency gains and equity considerations with regards to transfer and benefit recipients: the growth and employment gains from a fiscal devaluation are smaller if transfer and benefit recipients are explicitly compensated for their purchasing power losses, owing to the increase in VAT.

[‡] With "short run", we are referring to an extended period of time, in which sticky prices and wages - owing to price rigidities - can adjust. Any time horizon beyond will be labelled "long run".

1 INTRODUCTION

The economic literature has highlighted the desirability of shifting taxation from distortionary taxes – e.g. taxes on labour – to less distortionary taxes – e.g. value-added taxes – in order to strengthen economic growth and foster employment. Such a tax shift is discussed as one policy option to engineer a (fiscal) devaluation in some euro area member states with elevated domestic labour costs. Since countries within the euro area differ systematically and significantly concerning the relative size of labour and consumption taxation, the question also arises how much of the cross country GDP and employment differences could be explained by the structure of taxation.

Whereas it is generally accepted that a shift of taxation from labour to consumption has positive effects on employment and is growth enhancing, such a policy reform is often discarded for equity considerations. In this paper we challenge these considerations by arguing that a fiscal devaluation is a means to shift taxes away from labour to all sources of income including income from financial and non-financial wealth. Approaching income from a functional income distribution perspective, we focus on the impact a fiscal devaluation has on income from financial and non-financial wealth, from labour and from social transfers. By reflecting certain aspects of the wealth-income distribution in our model, we can draw conclusions about the distributive effect of a fiscal devaluation.

The literature strongly supports the view that a fiscal devaluation is efficiency enhancing by boosting competitiveness. Koske (2013) surveys the effects of fiscal devaluations and discusses the mechanisms behind it. She stresses that the potential short term gains hinge upon aspects like the extent to which monetary policy accommodates the tax shift, the degree of openness (the more open an economy, the higher the gains in competitiveness), the sensitivity of exports and imports to price changes, or the rigidity of exchange rates. According to Koske permanent effects depend on how the burden of the tax shift is shared between the different groups of the population, namely workers, capital owners, pensioners etc. Furthermore, Koske argues that a fiscal devaluation should only be used within the context of a broader reform package and not be seen as a replacement for structural changes to the economy.

Langot et al. (2012) discuss optimal fiscal devaluation in a small-open economy model with labour market search frictions. Leaving aside the open-economy dimension and abstracting from labour market frictions, the authors show that a relatively larger consumption tax base is a sufficient condition for the tax shift to be welfare and employment enhancing. As soon as the model is extended to an open-economy setup and labour market frictions are introduced, the relative size of tax bases is not sufficient anymore for welfare implications of the tax shift. We challenge their view by analytically demonstrating that the tax shift is unequivocally positively affecting equilibrium employment levels in the long run independent of the relative size of the two tax bases.

With regards to the distributive effect of a fiscal devaluation the literature is more divided. Correia (2010) surveys an ongoing discussion in the US about the distributional effects of a tax shift. She describes evidence from both micro studies and general equilibrium analyses. The advantage of micro simulation studies is their level of detail concerning the income distribution. However, those studies tend to ignore how the tax reform affects prices and quantities in the economy. General equilibrium analyses do not seek to map a completely

realistic household income distribution, but instead focus on coherent modelling of different sources of income such as income from labour, assets, transfers, benefits etc. Moreover, general equilibrium analysis accounts for price and quantity adjustments e.g. in the goods and labour market in response to a reform. Concerning micro studies she reports two conflicting results. Feenberg et al. (1997) conclude that the tax burden on high income households is lower after the tax reform. This study uses data on individual characteristics for consumption, income and tax liabilities. In contrast, Gentry and Hubbard (1997) conclude that the tax reform can be progressive. They use data on the composition of household portfolios.

According to Correia, general equilibrium models often arrive at the conclusion that a tax shift is regressive (see Jorgenson and Wilcoxon, 1997, Ventura, 1999 and Altig, 2001). Correia argues that this is due to the use of OLG models. In these models, the main source of household heterogeneity is age and labor efficiency, because without voluntary bequest these models are unable to generate realistic degrees of wealth inequality (see Castañeda et al., 2003). In order to better capture the degree of wealth inequality in the US, Correia (2010) uses a DSGE model with infinitely lived households. This model is equivalent to an OLG set up with households who care about their offsprings and so on and therefore leave bequests. Correia also shows that this model can be calibrated to any wealth distribution and she comes to the conclusion that a system with an important role for VAT is more equitable in a world with wealth concentration.

The most recent European study on this issue we are aware of is from Decoster et al. (2010) using EUROMOD. Whether a VAT is regressive or progressive depends on whether one focuses on household income or expenditure. Decoster et al. (2010) find that the VAT is regressive (the tax rate is lower, the higher the households disposable income) based on the income concept, since higher income households tend to have a higher savings rate compared to low income households (who can even have a negative savings rate). For example in the case of Belgium, VAT as a share of disposable income amounts to 21.1% for the lowest income decile and to only 8.1% for the highest income decile.

However, there are also good reasons to distinguish households in terms of total consumption spending rather than disposable income. First, expenditure may better reflect permanent income. For example, disposable income of a temporarily unemployed person may be low, but consumption may nevertheless not fully adjust downward because the person expects to be re-employed. Similarly the pension income of a retiree does not reflect the possibility to dissave. Second, at low income levels there could also be measurement problems (e. g. income from the shadow economy). They also show that based on expenditure data, the VAT appears to be slightly progressive. For example in the case of Belgium, indirect tax payments as a % of non-durable expenditure is 11.3% for the lowest expenditure decile and 13.9% for the highest decile. Pestel and Sommer (2013) find similar effects in a micro-simulation study for Germany. Households at the low end of the income distribution – low-income earners, unemployed and pensioners – do not profit from the reduced tax burden on labour as much as households at the upper tail of the distribution. Furthermore, the authors estimate a relatively moderate increase in employment which is not enough to overcompensate the detrimental effects of the tax shift in the lower quantiles of the income distribution. However, there is one shortcoming of micro simulation results. Due to the nature of the micro simulation experiment, the effects calculated do not take into account changes in wages and prices (other than the change in VAT), changes in employment and adjustments in savings.

Summarising both the efficiency and distributional consequences of a tax shift from labour to consumption, two dimensions should be separated, namely, first, effects arising from

changing the ratio of net wages to transfers and second, effects arising from shifting taxation away from labour to income from capital to the extent that it is used for consumption. In previous tax shift exercises the first dimension has often been emphasised. In particular the tax shift was interpreted as a labour market reform measure which could increase incentives to take up work by increasing the wedge between net labour income and transfers/benefits. However, recently distributional issues related to fiscal measures have come more to the forefront (see for example IMF Fiscal Monitor, 2013) and distributional effects of fiscal measures, in particular how they affect taxation of top income earners and holders of financial wealth, have gained more prominence in policy discussions.

In our simulation study, we address distributional concerns from two angles. First, we focus on how several sources of income (from wages, benefits, transfers, profits and interest payments) are affected by the shift in taxation. This, and the relative development of these income categories, allows us to have a strongly disaggregated view on the evolution of households' disposable income. The income composition of any given household can be reflected. Second, to mimic consumption behaviour of two specific types of households, namely those that have access to financial markets and those that are financially constrained, we compare liquidity constrained and Ricardian households' consumption expenditures. As the two household types in QUEST are identical with respect to net wages and transfers per capita the relative change of consumption is only due to two factors, the initial wealth distribution and differences in savings behaviour. Liquidity constrained households do not save, while Ricardians have a positive savings rate and adjust savings optimally to new economic conditions. Monitoring consumption expenditure over time comes close to the concept of welfare gain/loss in Decoster et al. (2010). Notice in particular, that in contrast to standard micro-simulation studies we can look at the dynamic evolution of relative expenditure as prices (wages) and quantities (savings and employment) adjust to the tax reform. Third, by distinguishing between tax shifts in which benefit and transfer recipients are compensated to shifts in which they are not, we particularly address an issue which cannot be addressed sufficiently in micro simulation studies.

A study of the income and wealth distribution by Janti et al. (2008) based on the Luxemburg Wealth Study provides evidence that financial and non-financial wealth is more strongly concentrated than income. Having wealth strongly concentrated and income less so supports the adequacy of our functional approach to study the distributional impact of tax reforms in a more standard sense. If a fiscal devaluation shifts revenue from capital owners to wage earners than grosso modo income is redistributed from the top to the middle of the classical wealth-income distribution. Including transfer and benefit recipients into the analysis completes the classical view on the income distribution by adding the class which is typically seen to be both wealth and income poor.

Overall, the simulation results in the European Commission's QUEST model⁴ show that a fiscal devaluation is efficiency enhancing without condition. Also, a fiscal devaluation always redistributes income from capital owners to wage earners in the long run. Whereas the effect is progressive on the distribution of income between workers and capital owners, the reform is regressive when we compare the effects of labour and transfer income. This is due to the fact that such a tax reform shifts taxation away from labour to all other sources of income. An important observation is that whereas a VAT taxes income from capital and financial wealth, to the extent that these incomes are spent on consumption, it is not distorting investment

⁴ For details on the QUEST model, see references on http://ec.europa.eu/economy_finance/research/macroeconomic_models_en.htm

decisions. Furthermore, the simulation results exhibit a certain trade-off between efficiency gains and equity considerations with regards to transfer and benefit recipients: employment and growth effects are mitigated when transfer and benefit recipients are explicitly compensated for their purchasing power losses.

In more detail, the paper highlights the following aspects of fiscal devaluations: First, we confirm the well-established positive effects on growth and on the external balance. Second, with regards to the redistributive effect between the various sources of income, we show that a tax shift allows for a redistribution of real consumption income from capital owners to wage earners. Concerning the ratio of net wage to income from financial and non-financial assets specifically, we find that the tax shift is regressive in the short run⁵ but progressive in the long run if it is enacted by reducing employers' social security contributions but is progressive already in the short run if it is enacted by reducing labour taxes. Concerning the ratio between net wage income and net transfer income the tax shift is regressive, especially in the case in which transfer income recipients are not compensated for the increase in the VAT. This effect is partly alleviated by a positive employment effect which allows unemployed workers into employment. Third, in contrast to monetary devaluations the employment and GDP effects of a fiscal devaluation can be permanent. Forth, fiscal devaluations can mimic the effects of a labour market reform by increasing the gap between net wages and net benefits. The magnitude of this effect depends on the extent to which benefit recipients are compensated for consumption tax induced purchasing power losses. Fifth, the simulation results highlight the trade-off between higher efficiency gains and equity considerations with regards to transfer and benefit recipients: the growth and employment gains are smaller if transfer and benefit recipients are explicitly compensated for their purchasing power losses, owing to the increase in VAT.

The note is organised as follows: Section 2 provides an overview on how labour and consumption are taxed in the EU and evidence on how income and wealth are distributed. Section 3 discusses some theoretical aspects of a tax shift in the QUEST model. Section 4 presents simulations of tax shifts several scenarios in QUEST focusing on growth, competitiveness and distributional effects. Section 5 concludes.

2 SOME FACTS

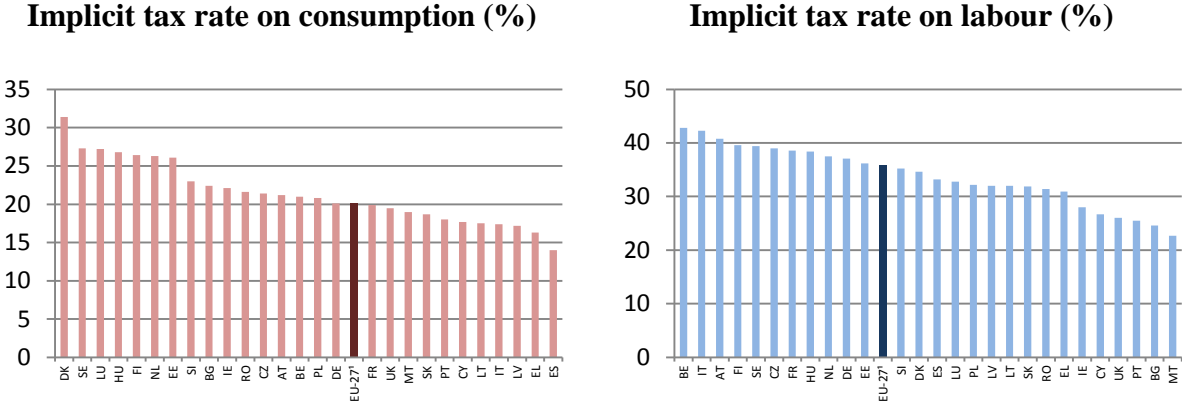
2.1 Taxation of labour and consumption in the EU

Even though the concept of a fiscal devaluation has been advocated in some EU countries as an adequate policy measure to restore competitiveness, not many countries have so far engaged in fiscal devaluations. As an exception serve Spain and France where fiscal devaluations have been enacted to a certain extent or are planned to be enacted (Puglisi, 2014, provides a comprehensive discussion of the current state of fiscal devaluation in the EU). A cross-country comparison of EU-27 countries reveals that especially the crisis-hit Mediterranean countries imposed relatively low taxes on consumption in 2011. Figure 1 displays implicit tax rates on consumption and labour for all EU-27 countries in 2011. Implicit tax rates on consumption range from 14.0% in Spain to 31.4% in Denmark. The GDP-weighted EU-27 average is at 20.1%. The Mediterranean countries exhibit implicit consumption tax rates below the EU average (Spain, 14%; Greece, 16.3%; Italy, 17.4%; Portugal, 18.0%). The implicit tax rate on labour ranges from 22.7% in Malta to 42.8% in

⁵ With "short run", we are referring to an extended period of time, in which sticky prices and wages - owing to price rigidities - can adjust. Any time horizon beyond will be labelled "long run".

Belgium with an EU average of 35.8%. With 42.3%, Italian levies on labour are among the highest in Europe. Spain, Greece and Portugal tax labour at 33.2%, 30.9% and 25.5%, respectively – all below EU-27 average.

Figure 1: Implicit tax rates on consumption and labour in 2011

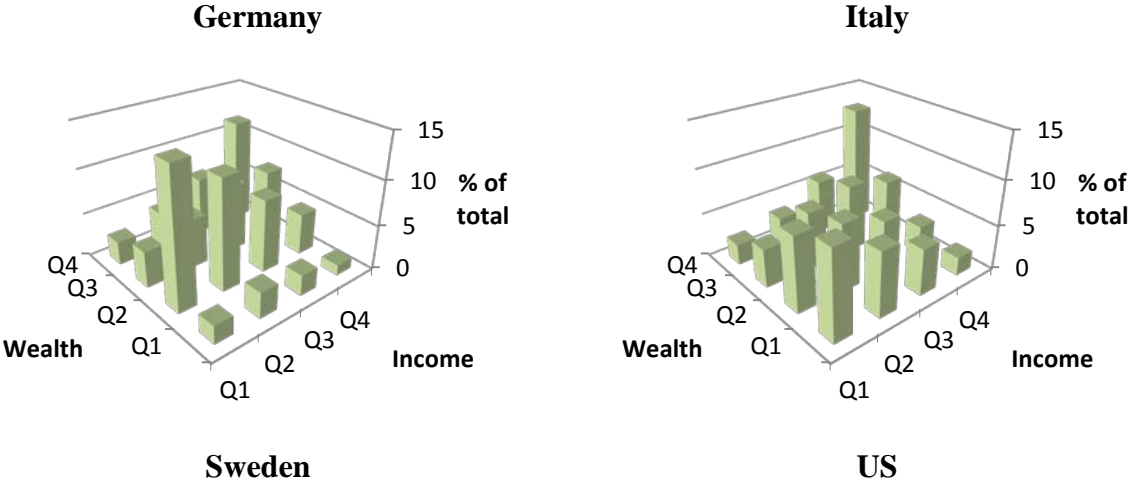


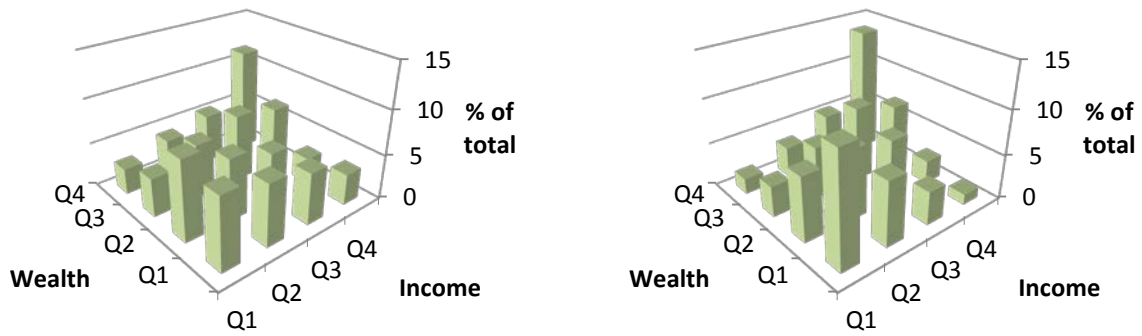
¹ GDP-weighted average
Source: Commission services

2.2 Joint distribution of income and wealth

Figure 2 shows the joint distribution of income and wealth holdings in Germany, Italy, Sweden and the US. The data is taken from Jantti et al. (2008) who base their work on the Luxemburg Wealth Study. The figures display quartile groups of income and wealth. The bars indicate percent of the total population in the corresponding group. Leaving Germany aside – the highest absolute shares of the population can be found at the lower and upper margins, i.e. low incomes tend to go along with low wealth and high incomes with high wealth. Across all countries, in the lowest wealth quartile, the share of total population decreases with increasing income, however in the highest wealth quartile the share of total population increases with increasing income. This suggests a positive correlation between income and wealth.

Figure 2: Income-wealth quartile groups



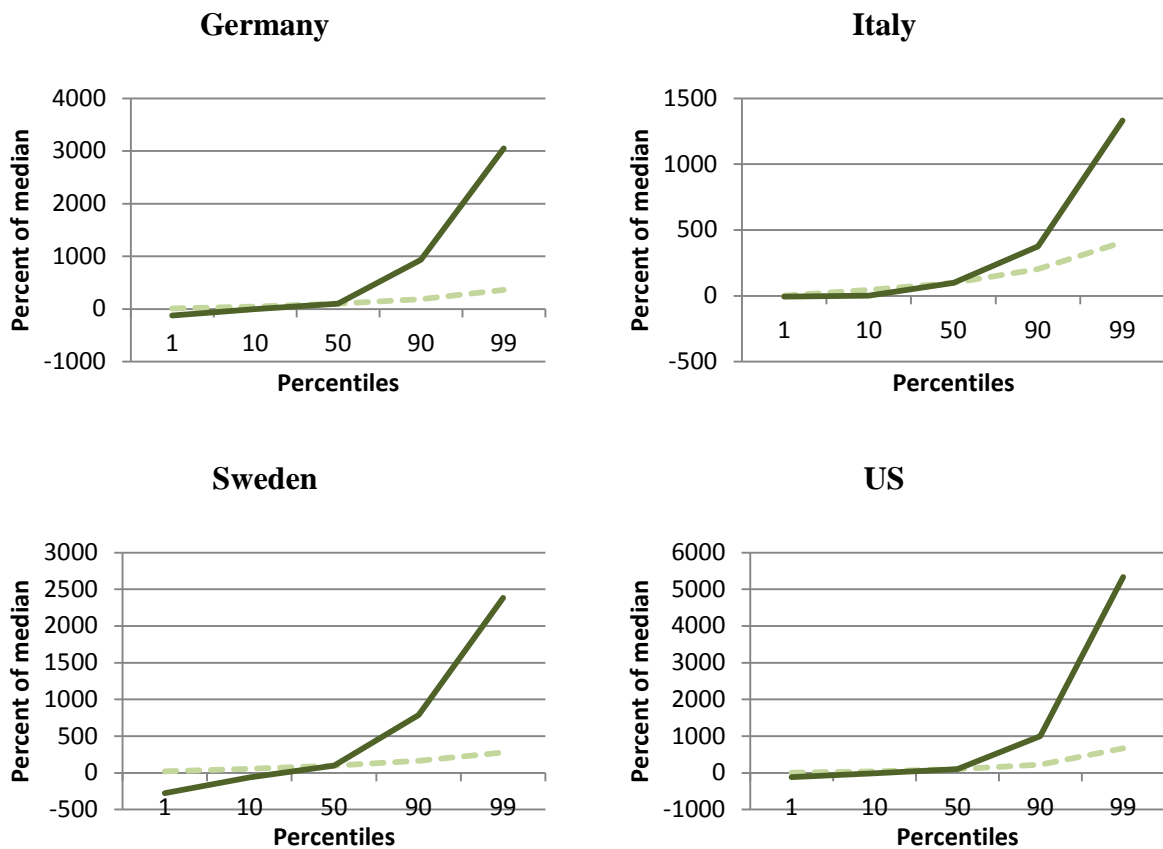


Source: Jantti et al. (2008), Luxemburg Wealth Study

Note: The figures display quartile groups of both income and wealth. The bars indicate percent of the total population in the corresponding group. All bars sum up to 100%.

In Figure 3 we turn our focus to the marginal distributions of income and net wealth. Net financial wealth and income are only deviating comparably little from their respective medians in the lower percentiles (1st and 10th percentile). However in the upper deciles (90th and 99th percentile) the discrepancy between relative income and relative net wealth is striking. Whereas the average income in the 99th percentile is only between 3 and 7 its median level, the average wealth is between 13 and 53 times its median level in our sample of countries. These figures point to a comparably small concentration of income in the light of a high concentration of wealth.

Figure 3: Values of income and net wealth for different percentiles



Source: Jantti et al. (2008), table 4; Luxemburg Wealth Study

Note: Figures display net wealth (solid lines) and income (dashed lines) expressed in percent of their respective medians. Based on a wealth definition that includes business equity.

3 THEORETICAL CONSIDERATIONS OF THE TAX SHIFT

We use a three-region version of the QUEST 3 model. The three regions are one small open economy member of a large monetary union, the rest of this monetary union and the rest of the world. In each of the regions in the model there are households, firms and a government. Goods are produced in a tradable and a non-tradable sector. Households can be financially-constrained or unconstrained. Financially unconstrained (Ricardian) households have access to borrowing and lending in order to smooth their consumption and are allowed to accumulate net foreign assets or liabilities. Besides income from labour and capital, they receive income from non-retained earnings of the firms, which they own. Financially constrained households do not have access to financial markets and instantaneously consume their disposable income (zero savings rate). The government uses revenue from labour, capital and consumption taxes to finance expenditures in government consumption, transfers and unemployment benefits, where the latter two are disbursed to households.

Goods and services are traded internationally, whereas foreign and domestic goods and services are considered to be imperfect substitutes. The degree of substitutability is measured by the price elasticity of imports. Capital is – apart from a small risk premium associated with net foreign debt – nearly perfectly mobile internationally. Goods markets are monopolistically competitive and producers face nominal price rigidities in the form of price adjustment costs. Workers have monopolistic power when setting wages. As prices, wages are subject to adjustment costs.

3.1 Household

Households derive utility from consumption and disutility from labour. Utility is maximised subject to a budget constraint. Financially unconstrained households receive (net) labour income, unemployment benefits and transfers, rental income from capital and interest income from holding government bonds. All variables are expressed in efficiency units, i. e. they are divided by a deterministic growth term $(1 + \nu)$. The objective function is as follows:

$$Max \sum_{t=0}^{\infty} \beta^t \left[\log(C_t) - \frac{\omega}{1 + \kappa} N_t^{1+\kappa} \right] \quad (1)$$

with κ being the inverse of the Frisch elasticity, ω the relative weight of employment N_t in the utility function and β the discount factor. The budget constraint is given by

$$B_t = \frac{(1 + r_{t-1})}{(1 + \nu)} B_{t-1} + (1 - tl)w_t N_t + r_{t-1}^K K_{t-1} - \left(K_t - \frac{(1 - \delta)}{(1 + \nu)} K_{t-1} \right) - (1 + tv)C_t + TR_t(1 + tv)^y + (1 - N_t)ben_t(1 + tv)^y \quad (2)$$

B_t is a one-period government bond, r_t is the risk-free real interest rate, tl is the labour tax rate, w_t is the real wage, r_t^K is the rental rate of capital, K_t is capital, δ its depreciation rate, tv is the consumption tax rate, TR_t is transfers and ben_t is benefits (both can be indexed to

consumption taxes). Let λ_t be the Lagrange multiplier of the budget constraint in the household optimisation problem. First-order conditions are:

$$\frac{\partial L}{\partial C_t} = \frac{1}{C_t} - \lambda_t(1 + tv) = 0 \quad (3)$$

$$\frac{\partial L}{\partial B_t} = -\lambda_t + \beta\lambda_{t+1} \frac{(1 + r_t)}{(1 + v)} = 0 \quad (4)$$

$$\frac{\partial L}{\partial K_t} = -\lambda_t + \beta\lambda_{t+1} \frac{(1 - \delta + r_t^K)}{(1 + v)} = 0 \quad (5)$$

$$\frac{\partial L}{\partial N_t} = \omega N_t^\varphi - \lambda_t((1 - tl)w_t - ben_t) = 0 \quad (6)$$

Combining equations (3) and (6) yields the labour supply equation:

$$N_t^\varphi = \frac{1}{\omega} \frac{1}{C_t(1 + tv)} ((1 - tl)w_t - ben_t) \quad (7)$$

The rental rate of capital is equal to the sum of real interest rate and depreciation rate

$$r_t^K = r_t + \delta \quad (8)$$

Capital evolves according to:

$$K_t = I_t + \frac{1 - \delta}{1 + v} K_{t-1} \quad (9)$$

Consumption levels of a financially constrained household are determined by its instantaneous budget constraint:

$$(1 + tv)C_t = (1 - N_t)ben_t + TR_t + (1 - tl)w_tN_t$$

3.2 Firm:

The monopolistically competitive firm maximises profits Pr_t

$$Pr_t = P(Y)Y - (1 + sc)W_tN_t - r_t^K K_t \quad (10)$$

$$\frac{\partial Pr_t}{\partial K_t} = (1 - \mu) \frac{Y_t}{K_t} - r_t^K = 0 \quad (11)$$

$$\frac{\partial Pr_t}{\partial N_t} = (1 - \mu) \frac{Y_t}{N_t} - w_t(1 + sc) = 0 \quad (12)$$

where μ is the mark up (inverse of price elasticity of demand) and the production technology is given by a Cobb Douglas production function

$$Y_t = K_t^{1-\alpha} N_t^\alpha \quad (13)$$

3.3 Government:

The budget constraint of the government is given by

$$B_t = \frac{(1 + r_{t-1}^w)}{(1 + v)} B_{t-1} + G_t + (1 + tv)^\gamma TR_t - tvC_t - (tl + sc)w_t N_t + (1 - N_t)ben_t(1 + tv)^\gamma \quad (14)$$

G_t is government purchases of goods and services. Transfer payments and benefits are either indexed ($\gamma = 1$) or not indexed ($\gamma = 0$) to value added taxes.

3.4 Net foreign assets and trade

The net foreign assets (NFA) evolve according to the following equation:

$$E_t B_t^w = \frac{(1 + r_{t-1}^w)}{(1 + v)} E_t B_{t-1}^w + p_t^x X_t - p_t^m M_t \quad (15)$$

where E_t is the real exchange rate. Demand for imports and exports is given by a standard import and export equation:

$$X = sim^w \left(\frac{P^w}{PM^w} \right)^\theta (C^w + I^w + G^w) \quad (16)$$

$$M = sim^d \left(\frac{P^d}{PM^d} \right)^\theta (C^d + I^d + G^d) \quad (17)$$

where sim^w denotes the share of domestic exports in world demand and sim^d denotes the share of imports in domestic demand. P^w, PM^w, P^d, PM^d denote the world price level, domestic export prices, the domestic price level and the domestic import price, respectively. $C^{w/d}, I^{w/d}, G^{w/d}$ denote world/domestic demand for consumption, investment and government consumption, respectively.

The interest parity condition is subject to a risk premium which depends negatively on the deviation of NFA positions from a target set by foreign investors:

$$r_t^d = r_t^w + E \left(\frac{\Delta RER_{t+1}}{RER_t} \right) - \rho \left(\frac{B_t^w}{Y_t} - T \right) \quad (18)$$

where $r_t^{d/w}$ is the domestic/world interest rate, RER_t is the real effective exchange rate and T is the target NFA rate. This equation captures in a simple way risk and portfolio balance considerations of financial market participants. It also pins down the long run (steady state) net foreign asset position of the economy. For example in the case of a (fiscal) devaluation leading to a positive trade balance and an accumulation of NFAs, this induces a decline in the risk premium and reduces the interest rate for domestic households and firms. This in turn increases domestic demand and imports until the economy reaches a new equilibrium with a net foreign asset position which is equal to the baseline value. Notice, however, there exist other ways of modelling international portfolio allocations without forcing the NFA to return to the baseline value. In particular models with overlapping generations have the property that financial wealth affects the rate of time preference (see for example Blanchard, 1985). These models are in principle able to generate permanent changes in NFAs associated with tax measures. However, these models would typically not predict a permanent improvement of the NFA for a country which starts from net foreign debt and where households have a high rate of time preference.

3.5 The long run effect of a tax shift on employment

The tax shift from labour to consumption is generally regarded as efficiency enhancing. Recent theoretical research in the context of discussions in the United States about

"fundamental tax reform" (see Correia, 2010, and Coleman, 2000) has shown that a VAT can be seen as a combination of a tax on labour and a tax on existing assets, insofar as these assets yield returns which are partially used for consumption. Nevertheless, it is sometimes argued that a consumption tax is about as distortive as a direct tax on labour and possible efficiency gains could only result from differences in relative tax bases (e.g. Langot et al., 2012). In this section we show for a simplified closed economy version of the QUEST model that a tax shift from labour to consumption yields positive long run employment and output effects, irrespective of the relative tax base⁶.

To analytically solve the model it is advisable to make further assumptions. Households only receive transfers, but no benefits. Further, assume that the government keeps government spending (transfers and consumption) as well as government debt as a constant fraction of GDP:

$$TR_t = trY_t \quad (19)$$

$$G_t = gY_t \quad (20)$$

$$B_t = bY_t \quad (21)$$

Assuming that exogenous changes in the personal income tax rate are financed through endogenous adjustment in consumption taxes such that the debt to GDP ratio remains constant, we can solve for N_t as a function of exogenous variables (tl , sc) and parameters⁷:

$$N = \left[\frac{1}{\omega} \frac{\frac{(1-tl)(1-\mu)\alpha}{(1+sc)}}{\left[1 - \frac{(g+\delta)(1-\mu)(1-\alpha)}{(1+g)((1+g)\rho+g+\delta)} + \rho b - \frac{(tl+sc)(1-\mu)\alpha}{1+sc} + tr \right]} \right]^{\frac{1}{1+\kappa}} \quad (22)$$

To understand the qualitative effect of an exogenous change in tl on N , it is enough to check the parameter space for which (for details, see Appendix A)

$$\frac{\partial(N^{1+\kappa})}{\partial tl} < 0 \quad (23)$$

$$\Leftrightarrow \alpha < \frac{1+tr - \frac{(g+\delta)(1-\mu)}{(1+g)((1+g)\rho+g+\delta)} + \rho b}{(1-\mu) \frac{(1+g)((1+g)\rho+g+\delta)}{(1+g)((1+g)\rho+g+\delta)} + g(\delta-1)} \equiv \alpha^{upperbound} \quad (24)$$

Rearranging equation (23), shows that an increase in the labour tax compensated by a reduction in VAT reduces employment as long as the output elasticity of labour is below a certain upper bound. Since for a constant returns to scale production technology, plausible values for α are in the region between zero and one, it is easy to check whether condition (24) can be satisfied for values within this range.

⁶ The results obtained in this section also hold qualitatively for the small open economy case. However, in the small open economy case the effects are quantitatively smaller, because any output expansion yields a real depreciation in the long run (because of increased supply of domestic goods) which depends inversely on the elasticity of substitution between domestic and foreign goods. The real depreciation has adverse effects on labour supply and investment.

⁷ For a full derivation, see Appendix A.

Table 1: Upper bound on α for certain parameter values for $g = 0$

$\alpha^{upperbound}$	$\mu = 0.2, \quad b = 2.4$	$\mu = 0, \quad b = 0$
$\delta = 0.015, \rho = 0.02, tr = 0.00$	1.54	1
$\delta = 0.015, \rho = 0.02, tr = 0.16$	1.89	1.28
$\delta = 0.015, \rho = 0.02, tr = 0.32$	2.24	1.56

Table 2: Upper bound on α for certain parameter values for $g = 0.02$

$\alpha^{upperbound}$	$\mu = 0.2, \quad b = 2.4$	$\mu = 0, \quad b = 0$
$\delta = 0.015, \rho = 0.02, tr = 0.00$	1.81	1
$\delta = 0.015, \rho = 0.02, tr = 0.16$	2.34	1.42
$\delta = 0.015, \rho = 0.02, tr = 0.32$	2.87	1.84

Rearranging equation (23), shows that an increase in the labour tax compensated by a reduction in VAT reduces employment as long as the output elasticity of labour is below a certain upper bound. Since for a constant returns to scale production technology, plausible values for α are in the region between zero and one, it is easy to check whether condition (24) can be satisfied for values within this range.

Table 1 and Table 2 display values for $\alpha^{upperbound}$. For all realistic parameter combinations, the condition seems easily satisfied and a tax shift from labour (reducing tl) to consumption increases employment. Notice, however, in the special case of zero monopoly rents ($\mu = 0$), zero interest income ($b = 0$) and zero transfer income ($tr = 0$), there exists a situation for which a tax shift from labour to consumption does not yield a positive employment effect, namely when the output elasticity of capital is equal to zero ($\alpha = 1$). This special case characterises an economy where capital is unproductive and the only source of income is labour income (no asset and no transfer income). This result shows that the real effect of a tax shift from labour to consumption results from the fact that such a tax reform shifts taxation from labour to income from capital, financial assets and transfers. In an economy without capital or without positive return from capital the labour and consumption tax are equivalent.

Related to this, Table 3 compares income tax multipliers for employment (for a given value of the output elasticity of capital/labour). Table 3 compares the employment multiplier of a tax shift for economies with a small and a large profit and interest income share. Differences in profit and interest income shares are generated by assuming that in the former economy there are no monopoly rents and zero government debt, while in the latter economy a mark up of 20% and debt to GDP ratio of 60% is assumed. As can be seen from Table 3 the multiplier is larger in an economy which has a larger share of income from capital and financial wealth. This again suggests that lowering labour taxes and increasing VAT shifts taxation from labour to income from capital and financial assets, i. e. with a higher capital income share the VAT needs to be increased less in order to finance a given reduction in labour taxes. Table 3 also shows the sensitivity of the tax shift multiplier w. r. t. the size of transfer income. The multiplier increases with the share of transfers paid to households. This is due to the fact that

in this experiment transfer recipients are not directly compensated for the increase in the VAT, which implies that increasing VAT shifts the tax burden from labour to transfer recipients. Thus a tax shift from labour to VAT reduces the tax burden of labour at the expense of transfer and capital income recipients. How strongly transfer recipients should be charged obviously depends on policy measures adopted by governments, namely on the extent in which transfer income is indexed to changes in VAT. The fact that the tax burden is shifted to capital income recipients raises the question to what extent this distorts investment decisions, this issue will be dealt with in the next subsection.

Table 3: $\frac{\partial N}{\partial tl}$ for certain parameter values for $g = 0.02$

$\frac{\partial N}{\partial tl}$	$\mu = 0.2, \quad b = 2.4$	$\mu = 0, \quad b = 0$
$\delta = 0.015, \rho = 0.02, tr = 0.00$	-0.55	-0.24
$\delta = 0.015, \rho = 0.02, tr = 0.16$	-0.75	-0.49
$\delta = 0.015, \rho = 0.02, tr = 0.32$	-0.92	-0.70

$\kappa = 2, \omega = 0.011, tl = 0.25, sc = 0.15, \alpha = 0.65$

3.6 The long run effect of a tax shift on capital

As can be seen from the first order condition on capital of the firm, equation (11), the capital-output ratio depends on capital cost required by savers, which is equal to the real interest rate and the depreciation rate (see equation (8))⁸. The household savings decision (equations (3) and (4)) determines the steady state level of the real interest rate as the sum of the exogenous growth rate of technology and population and the rate of time preference. Neither labour nor value added taxes enter this expression. It is interesting to note that the value added tax does not distort the capital accumulation decision despite the fact that it is a tax on distributed profits. In contrast to a capital tax, which taxes the return from capital irrespective of whether it is used for consumption or re-invested, a value added tax discriminates between the two uses of capital returns and only taxes the return insofar as it is used for consumption. Taking into account that capital productivity can also be expressed as a ratio between labour (augmented by labour efficiency) and capital, we get that

$$\frac{Y_t}{K_t} = \left(\frac{N_t U_t}{K_t} \right)^\alpha.$$

From this it follows directly that a tax shift from labour to consumption keeps the capital-labour ratio constant in the long run, i.e. capital increases at the same rate as labour in the steady state. With constant returns to scale this implies that output also grows at the same rate in the steady state. A further consequence of a constant capital-labour ratio associated with the tax shift is that gross real wages remain constant and the growth of net real consumption wages is equal to the difference between the change in labour taxes and value added taxes.

⁸ Note in a more comprehensive model the rate of return would also depend on an expected capital gain/loss depending on expected inflation differentials between investment and GDP and capital taxation. We also neglect risk premia associated with capital investment, which results in equal return between capital and bonds.

Notice, however, these long run relationships only hold in a closed economy. In an open economy the real consumption wage will grow less because of an adverse terms of trade effect which results from the fact that domestic and foreign goods are imperfect substitutes. This in turn implies that an increase in domestic supply can only be sold at a lower price, i.e. it goes along with a fall of the terms of trade. These effects will be fully taken into account in the simulation exercises reported below. The terms of trade effect also affects capital formation negatively, since investment goods are partly imported. The same holds for intermediate products. Notice, however, the trade effects will only reduce the effects but not change the sign, since these are effects which only arise as a consequence of an increase in domestic output. Also, the theoretical discussion is confined to long term effects of a tax shift, the short term effects will differ because of price and wage rigidities and the time it takes for the capital stock and employment to adjust to their optimal levels. Section 4 of this paper provides the full dynamic adjustment path to the tax shift.

3.7 Calibration

Table 4 displays values for crucial parameters in the calibration. The main national accounts aggregates and tax bases are calibrated to match a median EU-27 country. Precisely, private consumption expenditures – the tax base for VAT – are calibrated to 65% of GDP and the wage bill – the labour tax base – is calibrated to 55% of GDP. Mark-ups in the non-tradable sector are slightly higher than in the tradable sector pointing to less relative competition in the non-tradable sector. The degree of openness is assumed to be 81% of GDP. In the baseline, the implicit tax rates on consumption and labour (including SSC) are at 17% and 41%, respectively. In the text, we use implicit tax rate on consumption and VAT rate interchangeably being aware of the subtle differences between the two concepts. The debt-to-GDP ratio is set to 60%.

Table 4: Calibration (overview)

VAT tax base (% of GDP)	65%
Labour tax base (% of GDP)	55%
Frisch elasticity of labour supply	0.5
Substitution elasticity between domestic and foreign goods	1.1
Mark-up in tradable sector	10%
Mark-up in non-tradable sector	20%
Degree of openness (EX+IM, % of GDP)	81%
Elasticity of intertemporal substitution	1 (log utility)
Implicit tax rate on consumption	17%
Implicit tax rate on labour (including SSC)	41%
Debt-to-GDP ratio (target)	60%

4 SIMULATION RESULTS

4.1 The tax shift scenario

We focus on the effects of an ex-ante budgetary neutral shift from taxation of labour – via a reduction of employers' social security contributions⁹ - to taxation of consumption. In order to achieve an ex-ante budgetary neutral tax shift of 1% of GDP, the consumption tax rate has to be increased by 1.54 p.p. (up from 17 %) and the social security contribution rate has to be lowered by 1.96 p.p. (down from 15 %). In the benchmark scenario, benefits as well as transfers are indexed to the consumer price index before VAT (scenario without compensation). We are however also interested in tax shifts where benefit and transfer recipients are compensated for changes in the VAT rate (scenario with compensation)¹⁰. Ex-post budgetary effects are neutralized by adjusting the labour tax rate accordingly to hold the debt-to-GDP ratio at its target level. We avoid strong effects of the tax shift on the debt level by adjusting the personal income tax rate instantaneously to counteract strong ex-post budgetary effects of the reform. The shift is supposed to be permanent and entirely enacted within the first quarter.

4.2 Efficiency in the benchmark scenario

Figure 4: GDP and the labour market - Without compensation

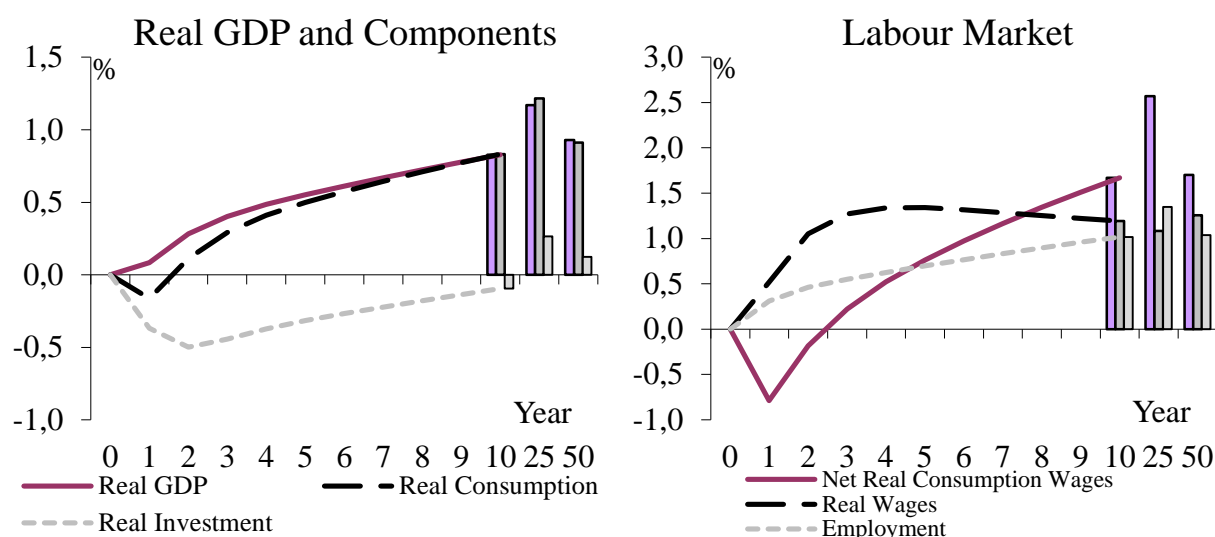


Figure 4 displays the responses of GDP, its components and labour market variables. Short run increases in GDP are driven by an improvement of the external position (see next paragraph for an intuition). Consumption already recovers from an instantaneous drop in the second year and drives GDP in the long-run. On the labour market developments, the reduction in social security contributions reduces unit labour costs and increases demand for

⁹ Whereas in the short-run adjustment effects of taxes levied on the employer's and employee's side may differ due to nominal and real frictions, the long-run budgetary neutrality ensures equivalence between both types of measures. In section 4.6 and Appendix C we elaborate further on the equivalence between employer and employee side labour taxation in the short and long run.

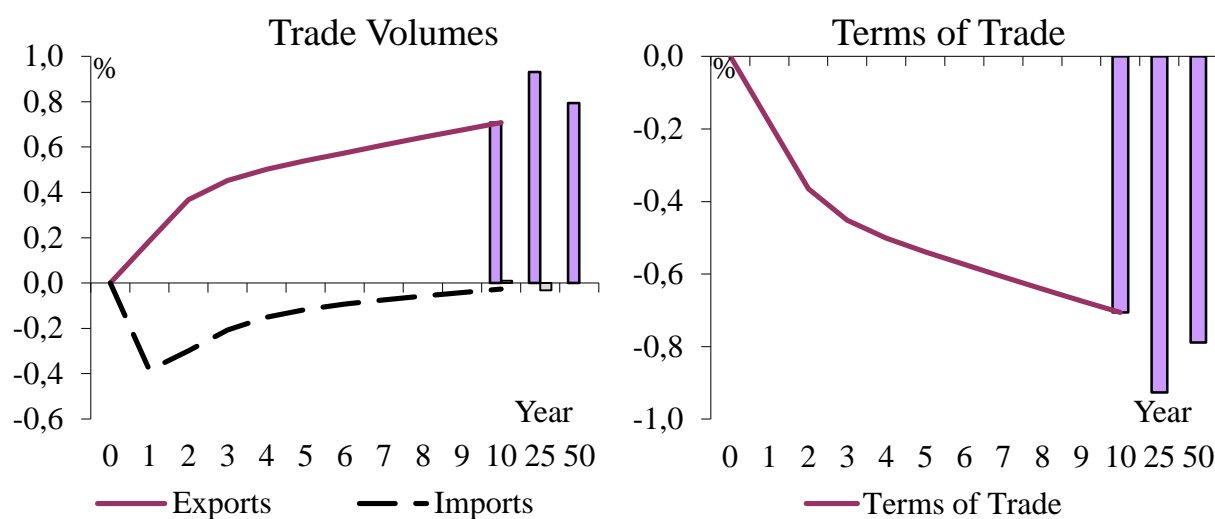
¹⁰ For better comparability of the scenarios with and without compensation, the ex-ante budgetary neutrality of the former disregards the budgetary effect on transfer and benefit expenditures. Appendix D reports simulation results for a scenario under full ex-ante neutrality.

labour, which leads to higher wages and employment in the short and long run. Net real consumption wages drop on impact due to increases in the VAT, after three years they return to positive territory as real after tax wages increase significantly.

Turning to the external effects of the tax reform in Figure 5, exports are increasing – in the short run and permanently. On impact, imports decline because of a fall in the terms of trade and an initial decline of domestic demand. Starting from the second year the increase of domestic demand leads to a turnaround of imports. While the short term effect of the tax shift on the trade balance is unambiguously positive, in the long run the trade balance returns to its initial position. This follows from a sustainability requirement, i. e. there are adjustments of prices and interest rates which ensure that the net foreign asset position is not permanently altered. Sustainability is eventually achieved by financial markets. The adjustment to a long run external equilibrium position works as follows. Since the tax shift reduces the terms of trade permanently via a reduction in wage costs for firms, real exports are permanently up. The effect on real imports (measured in domestic currency) is ambiguous since imports are affected positively by a rise in domestic income and negatively by a fall in the terms of trade. Since exports and imports cannot deviate permanently from each other, there must be another equilibrating mechanism which affects imports and the terms of trade. This is accomplished by financial markets via an adjustment in the real interest rate. Suppose the tax shift is such that a trade surplus emerges, i. e. increasing domestic income is not raising imports sufficiently. This leads to an accumulation of net foreign assets and thus a decline in risk premia, associated with an increased willingness of foreign investors to buy domestic assets. Thus domestic interest rates decline and stimulate private consumption and investment. This provides an additional stimulus for domestic imports. This process of interest rate adjustment continues until the trade balance is equilibrated.

It is important to notice that the fact that the trade balance eventually returns to its pre tax reform equilibrium position does not imply that the positive real effects on GDP and employment cannot persist. Trade is balanced in the long run with higher exports, higher imports but lower terms of trade. The lower level of terms of trade has some feedback on GDP and employment since it partly offsets the positive labour supply effect as workers base their labour supply on consumption real wage, which is declining with the fall in the terms of trade. Thus in a closed economy the positive real effect would generally be larger. However the terms of trade effect only mitigates but does not reverse the employment effect.

Figure 5: Competitiveness - Without compensation



4.3 Sensitivity analysis

Some authors argue (see e. g. Langot et al. (2013)) that the real effect of such a tax shift depends on the relative tax base. The argument is supported by the fact that labour and value added tax rates affect labour supply decisions in a similar manner, therefore the relative size of the tax rate changes should matter (see equation (7)). This relative size of a budgetary neutral tax shift is governed by the relative size of tax bases. However, as shown analytically in section 3, the qualitative effect of a tax shift from labour to consumption on employment is independent of the relative size of labour and consumption tax base. The basic intuition for this result is that VAT taxes all sources of income and therefore the proposed tax reform is shifting taxation away from workers onto income from transfers, profits and interest income. This result is based on several assumptions (closed economy, indexation of government expenditures to GDP, no benefits). To check whether the statement holds true in the more general setup of the QUEST model, we conduct three simulation exercises with differently sized consumption tax bases¹¹.

Figure 6 compares GDP and employment responses in the three ex-ante budgetary neutral tax shift scenarios where VAT changes due to differently sized consumption tax bases are 1.54 p.p., 1.96 p.p. and 2.69 p.p. from left to right. All three tax shifts yield similar short and long run effects for both real GDP and employment.

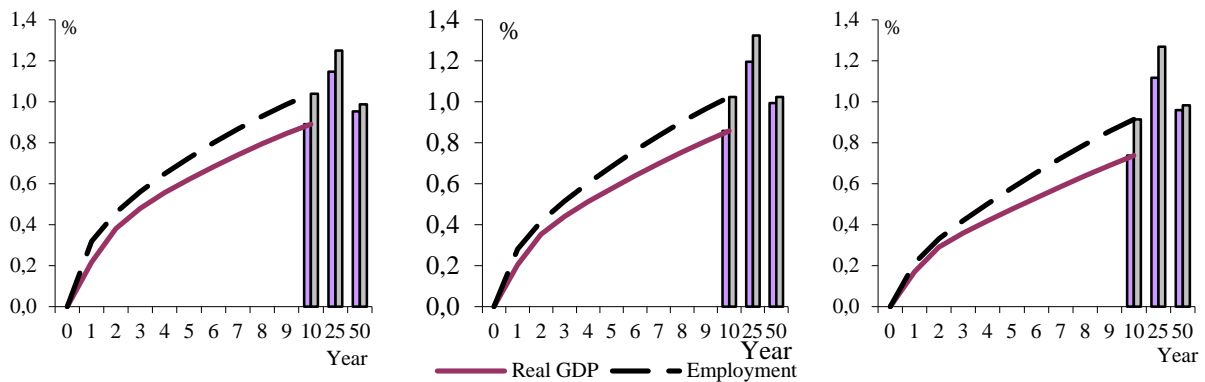
¹¹ For a detailed description of the scenarios, please refer to Appendix B.

Figure 6: Tax Base Neutrality of Consumption Tax

Large consumption tax base
(Baseline)

Equally sized tax bases

Large labour income tax base



4.4 Distributional Effects of a Tax Shift

Figure 7 displays the evolution of the different income components. After tax real wage income significantly benefits from the reform and increases permanently by more than 3%. The mild increase in real benefit and transfer income is due to real growth effects (because of indexation of transfers to GDP). Also transfer and benefit recipients do not lose from the terms of trade effect since benefits and transfers disbursed to households are indexed to consumer prices (excl. VAT). Despite the temporary substitution of labour for capital, capital owners still benefit overall from the reform by the reduction in firms' payroll costs induced by lower social security contributions. Higher demand for goods increases further profits in the short and long run.

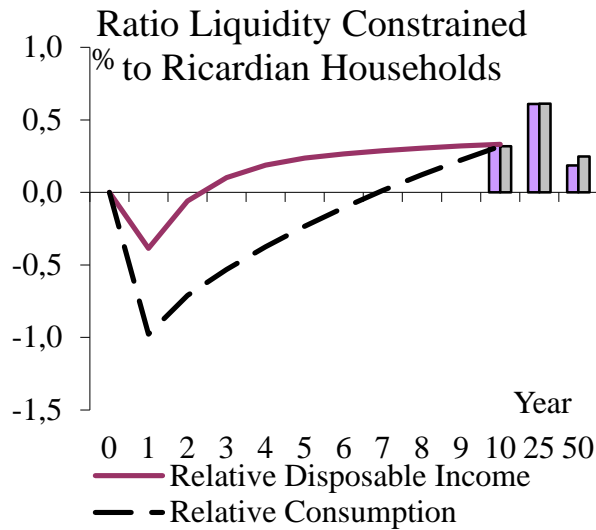
In relative terms, wage earners are best off with the reform. Apart from small relative losses in the first period compared to capital owners, wage earners significantly gain from the reform, particularly in the long run. Without compensating them, benefit and transfer earners are relatively worse off than capital owners. Bond holders mainly profit from increasing domestic real interest rates caused by a decline of domestic inflation with a (nearly) constant nominal interest rate in a monetary union.

Figure 7: Distribution I – Without compensation



In terms of relative disposable income and relative consumption of liquidity constrained and Ricardian households, the tax shift is regressive in the short run but progressive in the long run. Figure 8 compares the two types of average households in the model economy. Both relative disposable income and relative consumption decline on impact – favouring Ricardians over liquidity constrained households. Relative disposable income favours liquidity constrained already after three years, whereas relative consumption only after 8 years. In the long run, liquidity constrained households are better off both in terms of disposable income and consumption relative to Ricardians. Whereas relative disposable income is already in favour of liquidity constrained households after 3 years, relative consumption only is after 8 years. As profits increase more strongly than wage income in the short-run, disposable income of Ricardians rises more strongly than income of liquidity constrained households. Already after 3 years this is reverted. With regards to relative consumption, Ricardians can still benefit in the long run from relatively higher consumption increases as they can already in the short run borrow against elevated future income to smooth their consumption. Liquidity constrained households are cut off from financial markets by assumption.

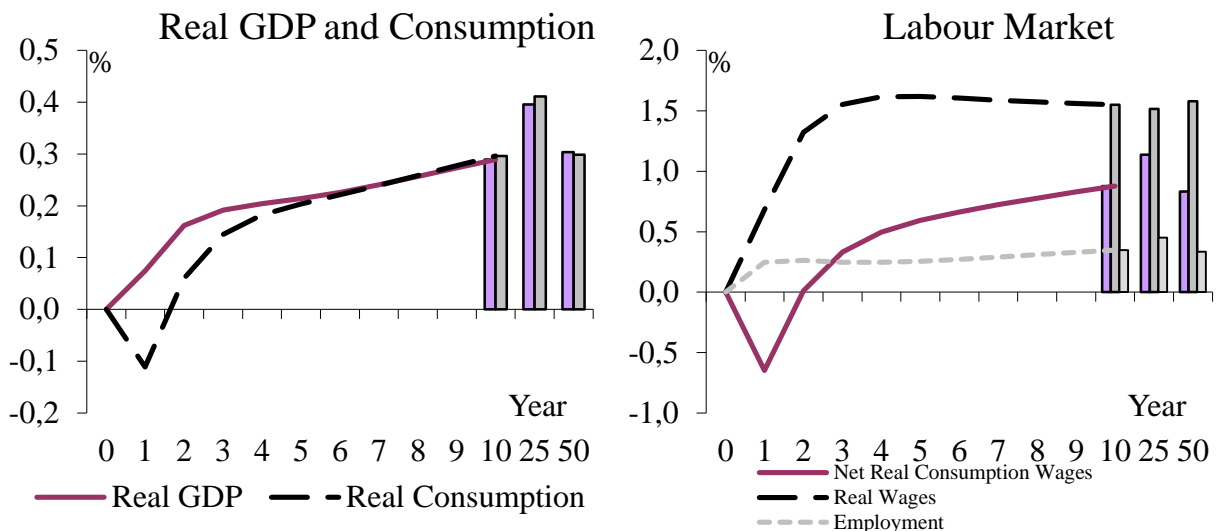
Figure 8: Distribution II – Without compensation



4.5 Compensation of transfer and benefit recipients

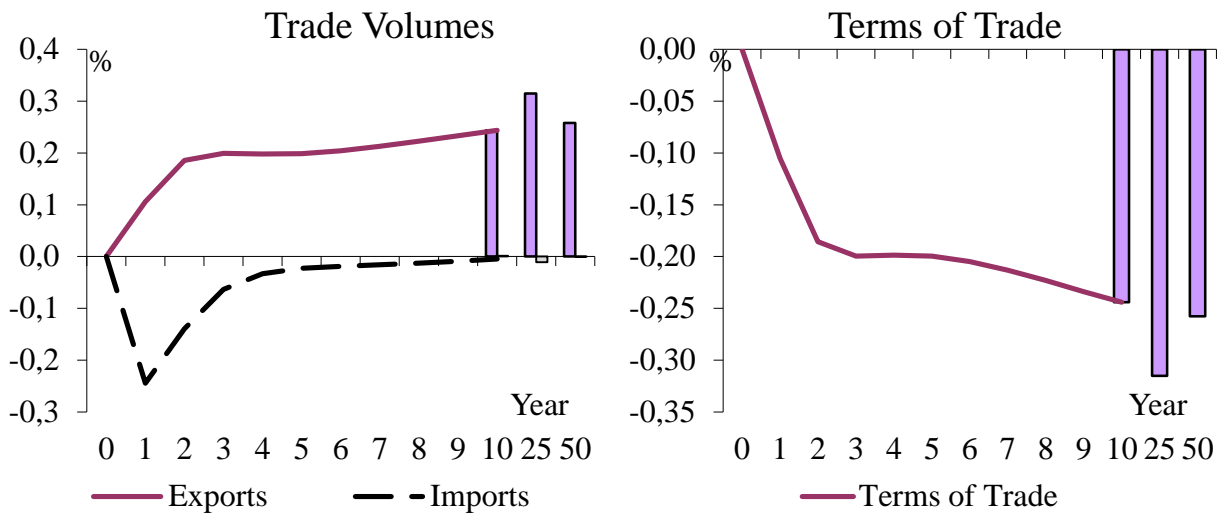
Allowing for a compensation of transfer and benefit recipients does not alter the dynamics of aggregate variables, but mutes the effect of a tax shift compared to the previous scenario. Even though disposable income of households originating from transfers and benefits should be higher (as these are now compensated for the elevated effective cost of consumption), employment effects of the tax shift are lower as the reservation wage increases thereby dampening work incentives. The elevated reservation wage dominates and therefore GDP increases are now only at 0.3% and employment at 0.3% (see Figure 9) compared to 0.9 % and 1.0 % in the compensated scenario.

Figure 9: Growth Effects - With compensation



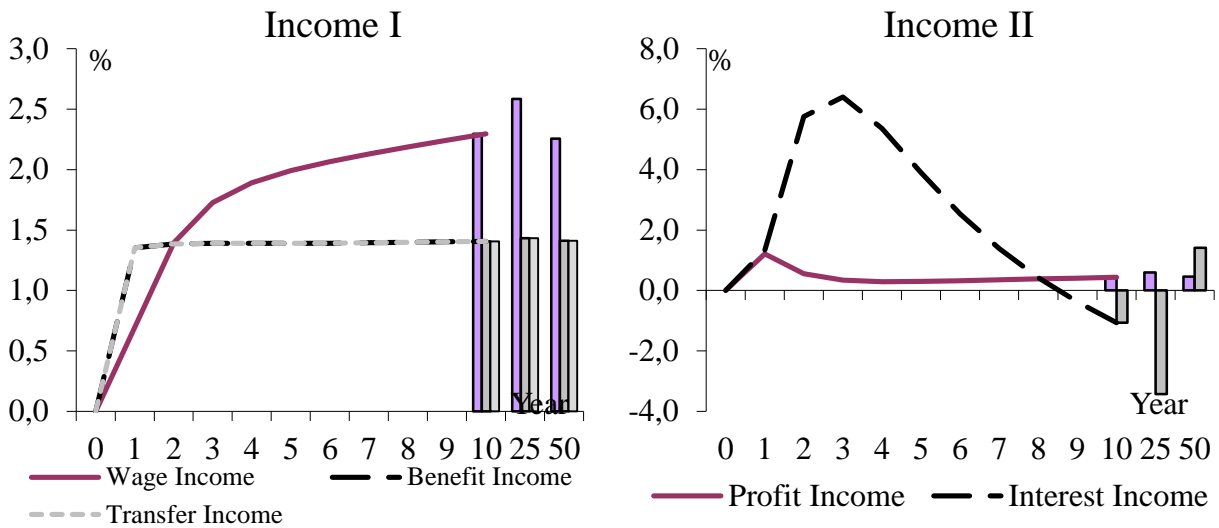
As a consequence of muted employment responses, competitiveness effects due to unit labour cost moderation are significantly lower in the compensated scenario, down from 0.8 % to 0.3 % for exports and up from -0.8 % to -0.3 % for the terms of trade (Figure 10).

Figure 10: Competitiveness - With compensation



The distributional effects of the compensated tax shift are displayed in Figure 11 and Figure 12. After tax wage income only increases by 2.3 % (down from 3 % in the non-compensated scenario) in the long run. Incomes from benefits and transfers are now better off. Profit incomes suffer from the reduced demand effects in the compensated scenario described above. However, the wage-profit ratio is now lower. Also reduced is the relative superiority of how wage income earners relative to benefit and transfer recipients benefit from the tax shift.

Figure 11: Distribution I – With compensation



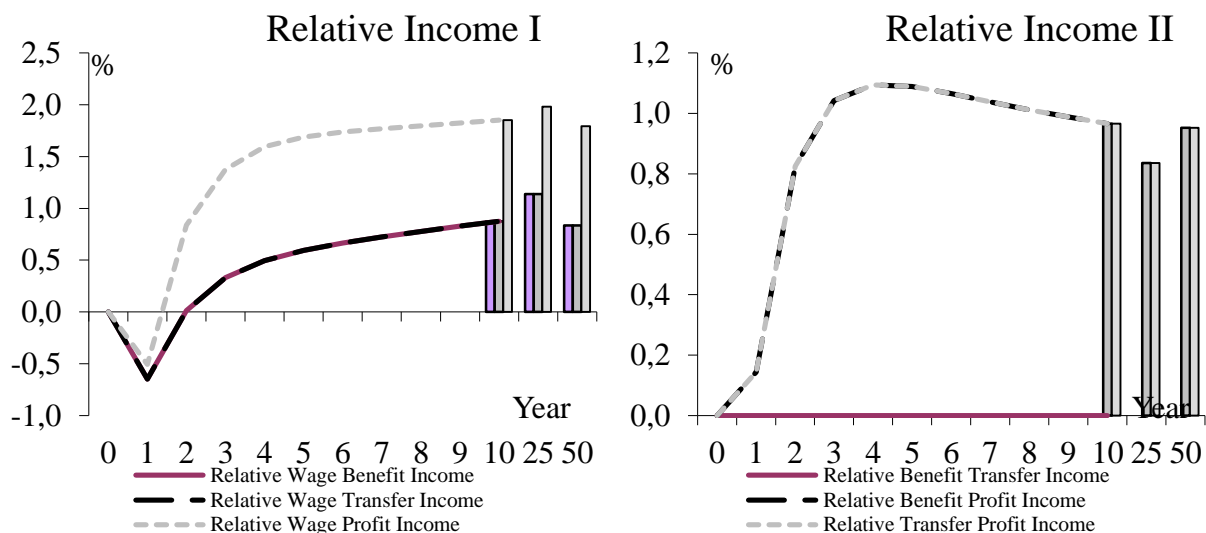
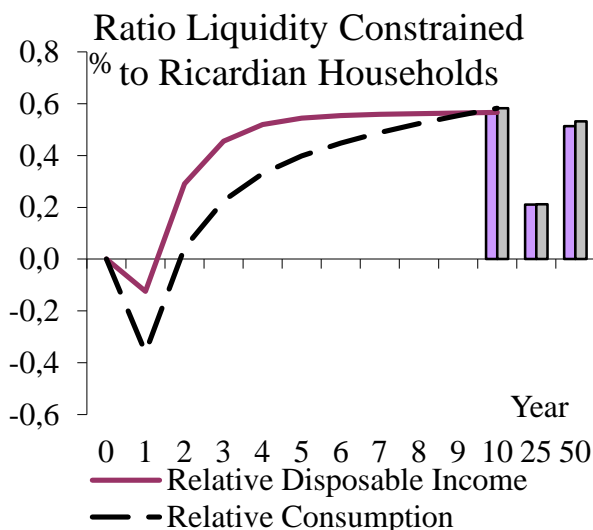


Figure 12: Distribution II – With compensation



Compensating transfer and benefit recipients leads to stronger relative gains of liquidity constrained households over Ricardian households both in terms of disposable income and consumption, which underlines the importance of benefits and transfers as income source for liquidity constrained households.

For better comparability of the scenarios with and without compensation, the ex-ante budgetary neutrality of the former disregards the budgetary effect of the VAT increase on transfer and benefit expenditures ex ante. Guaranteeing full ex-ante neutrality – i.e. accounting for the direct budgetary effect of a VAT induced transfer and benefit increase – requires a stronger VAT rate increase than in the standard scenario with compensation for a given 1% of GDP revenue reduction in labour taxes. Appendix D reports simulation results of such a scenario. Qualitatively, no difference can be observed between the full neutrality scenario and the scenario with compensation. Quantitatively, the effects are muted in the short run (owing to a more adverse effect on consumption) and stronger in the long run (owing to more fiscal space translating into a lower labour tax rate).

4.6 Short-run effects of employer versus employee side levies

In the previous simulations ex-ante neutrality of the tax shift was guaranteed by a reduction in social security contributions – on the employer's side. In this subsection, we will focus on an employee side income tax relief instead. Whereas in the long run both scenarios lead to identical effects, in the short run an employer side reduction of the labour tax burden leads to a slower adjustment due to sluggish wage adjustment¹².

Figure 13 through Figure 16 display the usual graphs for growth, competitiveness and distributive effects when employees' taxes are reduced. The sharp increase already in the first year of the net real consumption wages translates into a direct and persistent increase in private consumption. Negative short term effects from the tax shift observed in the previous scenarios when employers' tax burden was reduced can now be avoided. Relative disposable income of liquidity constrained over Ricardian households is now rising on impact.

Figure 13: Growth effects – Personal income tax reduction – Without compensation

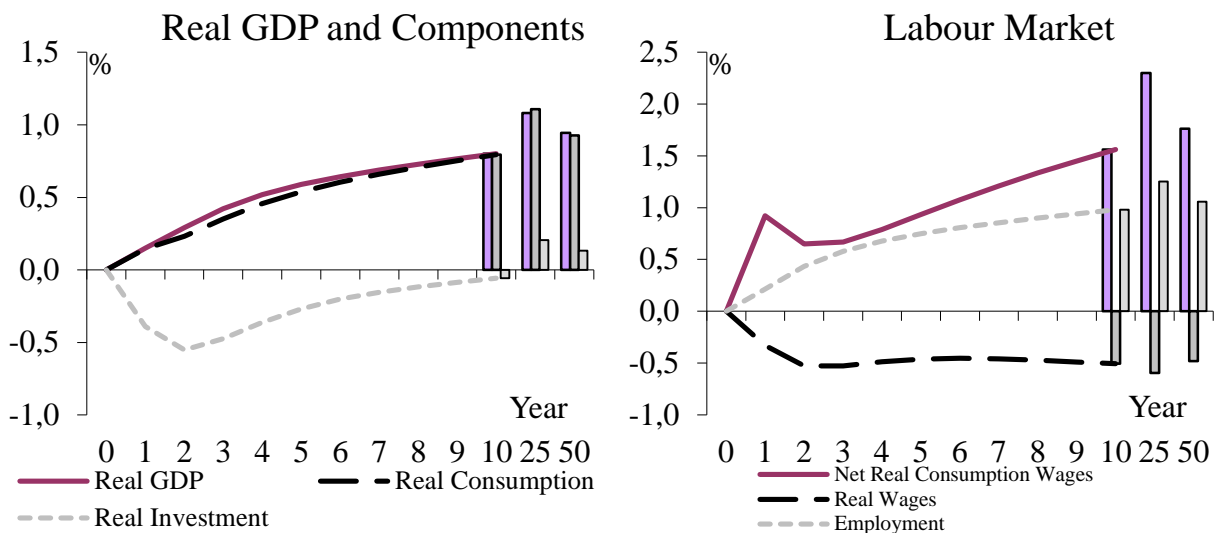
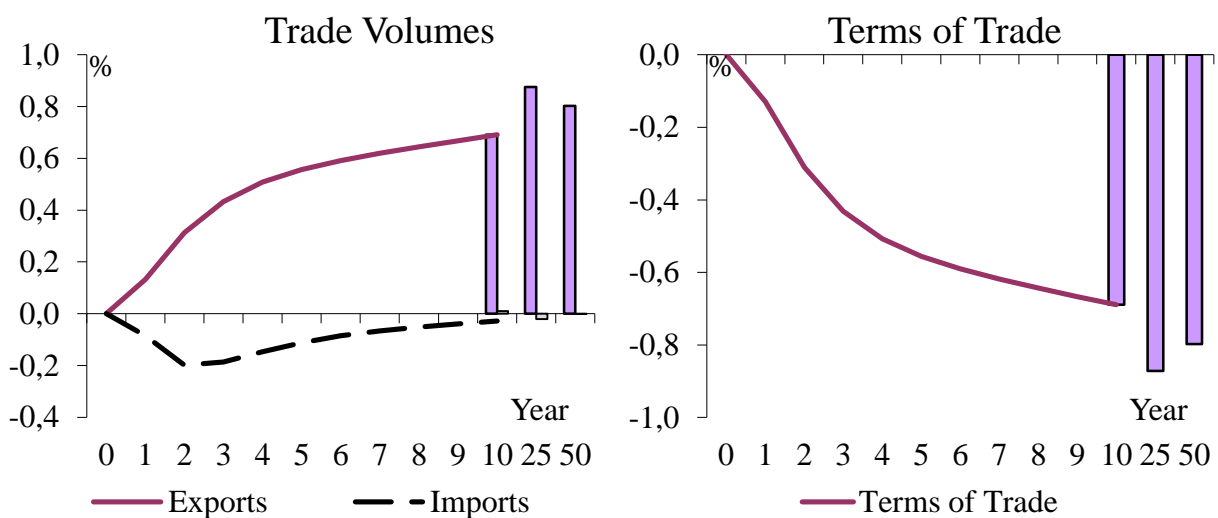


Figure 14: Competitiveness - Personal income tax reduction – Without compensation



¹² For a formal derivation of the equivalence between social security contributions on employers and personal income taxes, refer to Appendix C.

Figure 15: Distribution I – Personal income tax reduction – Without compensation

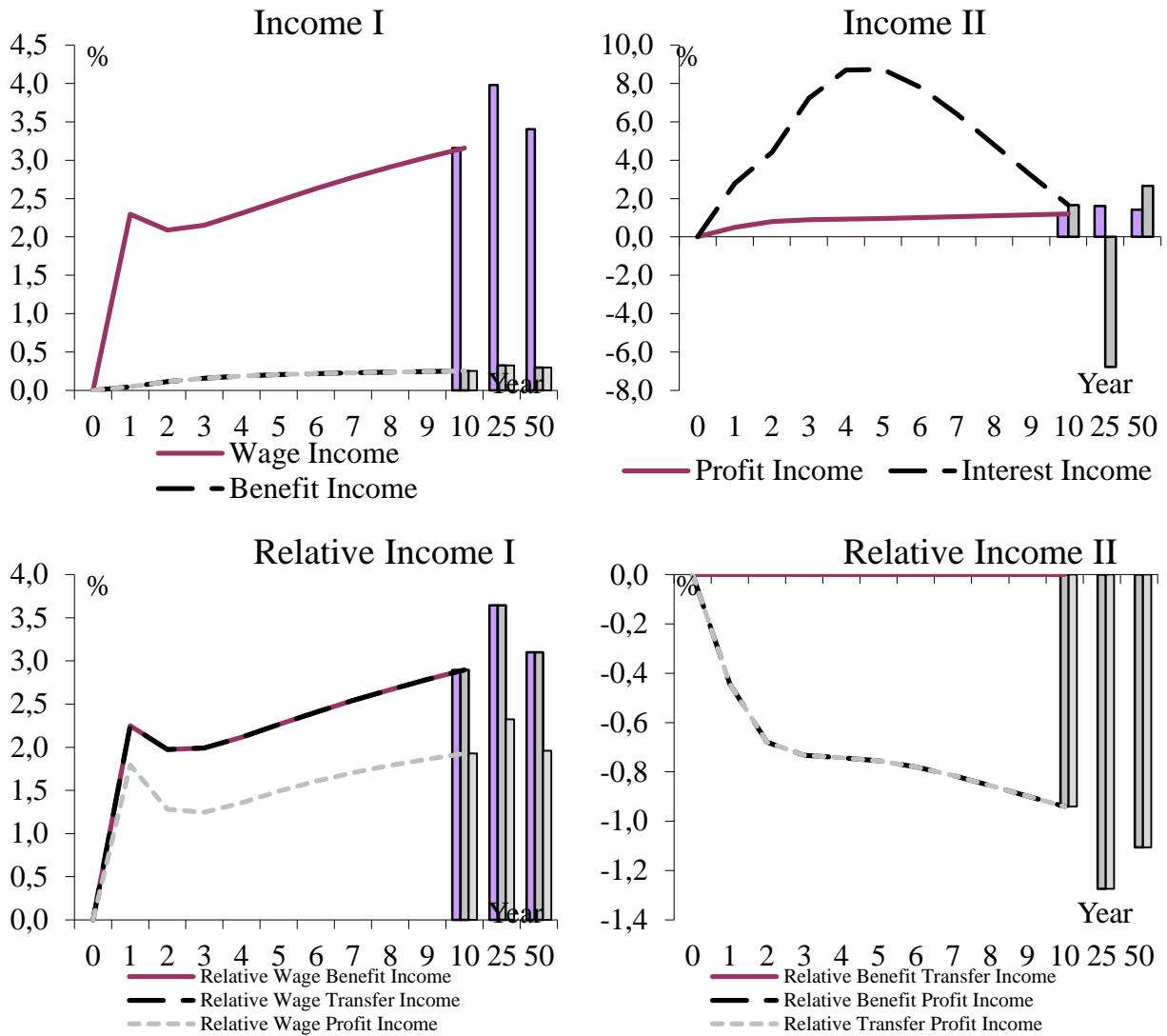
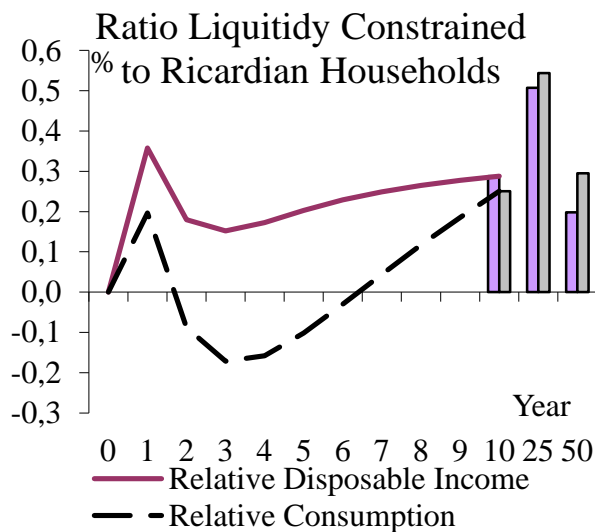


Figure 16: Distribution II – Personal income tax reduction – Without compensation



5 CONCLUSION

This paper highlights some attractive properties of tax shifts from labour to consumption. Such a tax reform has positive effects on growth and on the external balance. The extent to which a fiscal devaluation is growth enhancing importantly depends on the extent to which benefit and transfer recipients are compensated for their purchasing power losses owing to the consumption tax increase. Without compensation the household's reservation wage is less affected by the reform translating into a strong employment increase following the reform. However, by compensating transfer and benefit recipients the household's disposable income and therefore consumption is temporarily elevated. While growth effects are unequivocally higher in the former scenario, the effect on consumption is in the long run. We approach the distributional implications of a fiscal devaluation by looking at functional categories of income, namely income from labour, benefits, transfers, and from financial and non-financial wealth.

Simulations in the QUEST3 model show that a fiscal devaluation has progressive effects on the distribution of income between workers and capital owners in the long run, while the reform is regressive when we compare the effects of labour and transfer income. This is due to the fact that such a tax reform shifts taxation away from labour to all other sources of income. Concerning the ratio of net wage to income from financial and non-financial assets specifically, we find that the tax shift is regressive in the short run but progressive in the long run if it is enacted by reducing employers' social security contributions and is progressive already in the short run if it is enacted by reducing labour taxes. With regards to the ratio between net wage income and net transfer income the tax shift is regressive, especially in the situation in which transfer income recipients are not compensated for the increase in the VAT. This effect is partly alleviated by a positive employment effect which allows unemployed workers into employment. In particular, the favourable distributional effect a fiscal devaluation has on wage income with regards to income from capital is explained by the reason that such a tax reform shifts taxation away from labour to all other sources of income. It is important to note that even though a VAT taxes income from capital and financial wealth, it is not distorting investment decisions.

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Appendix

A EMPLOYMENT IN THE STEADY STATE

In this section we show that the steady state employment effects are positive for all economically plausible parameter values. The model outlined in section 3 in the steady state is as follows.

The resource constraint reads (assume for simplicity that trade is balanced):

$$Y = C + I + G \quad (25)$$

Output can be expressed as (Euler's theorem) the sum of factor income and monopoly rents:

$$Y = (1 + sc)wN + (r + \delta)K + \mu Y \quad (26)$$

Firm's labour demand reads:

$$(1 - \mu)\alpha \frac{Y}{N} = w(1 + sc) \quad (27)$$

Firm's demand for capital is:

$$(1 - \mu)(1 - \alpha) \frac{Y}{K} = r + \delta \quad (28)$$

The investment to capital ratio in steady state becomes:

$$I = \frac{g + \delta}{1 + g} K \quad (29)$$

The Euler equation in steady state pins down the relationship between rate of time preference ρ and the interest rate:

$$\rho = \frac{r - g}{1 + g} \quad (30)$$

Households supply labour according to:

$$N^\kappa = \frac{1}{\omega} \frac{1 - tl}{C(1 + tv)} w \quad (31)$$

The government budget constraint (assuming transfers not being indexed to the VAT):

$$G = \frac{g - r}{1 + g} B + tvC + (tl + sc)wN - TR \quad (32)$$

It is further assumed that government spending, government debt and transfers in the steady state are indexed to output:

$$G = gsY \quad (33)$$

$$B = bY \quad (34)$$

$$TR = trY \quad (35)$$

(32) is transformed into

$$\frac{G}{Y} = \frac{g-r}{1+g} \frac{B}{Y} + tv \frac{C}{Y} + (tl+sc) \frac{wN}{Y} - \frac{TR}{Y} \quad (36)$$

Plugging this expression into the resource constraint (25) and using (27), (29), (30), (33) and (34) yields:

$$\frac{C}{Y} = 1 - \frac{g+\delta K}{1+g} \frac{1}{Y} - \frac{g-r}{1+g} b - tv \frac{C}{Y} - \frac{(tl+sc)(1-\mu)\alpha}{1+sc} + tr \quad (37)$$

$$\Leftrightarrow (1+tv) \frac{C}{Y} = 1 - \frac{(g+\delta)(1-\mu)(1-\alpha)}{(1+g)((1+g)\rho+g+\delta)} + \rho b - \frac{(tl+sc)(1-\mu)\alpha}{1+sc} + tr \quad (38)$$

Using (27), the labour supply equation (31) can be transformed:

$$N^{\kappa+1} = \frac{1}{\omega} \frac{1-tl}{C} \frac{wN}{Y} \quad (39)$$

$$\Leftrightarrow N^{\kappa+1} = \frac{1}{\omega} \frac{(1-tl)(1-\mu)\alpha}{C(1+tv)(1+sc)} \quad (40)$$

Use (38) in the above equation to get employment expressed as a function of parameters and exogenous variables:

$$N = \left[\frac{1}{\omega} \frac{\frac{(1-tl)(1-\mu)\alpha}{(1+sc)}}{\left[1 - \frac{(g+\delta)(1-\mu)(1-\alpha)}{(1+g)((1+g)\rho+g+\delta)} + \rho b - \frac{(tl+sc)(1-\mu)\alpha}{1+sc} + tr \right]} \right]^{\frac{1}{1+\kappa}} \quad (41)$$

As $\kappa > -1$, to determine the direction of impact a change in the personal income tax rate has on employment it is enough to derive

$$\frac{\partial(N^{1+\kappa})}{\partial tl} = \frac{\alpha(1-\mu)}{\omega(1+sc)} \frac{-1 + \frac{(g+\delta)(1-\mu)(1-\alpha)}{(1+g)((1+g)\rho+g+\delta)} - \rho b + (1-\mu)\alpha - tr}{\left[1 - \frac{(g+\delta)(1-\mu)(1-\alpha)}{(1+g)((1+g)\rho+g+\delta)} + \rho b - \frac{(tl+sc)(1-\mu)\alpha}{1+sc} + tr \right]^2} \quad (42)$$

$$\frac{\partial(N^{1+\kappa})}{\partial tl} < 0 \quad (43)$$

$$\Leftrightarrow \alpha < \frac{1+tr - \frac{(g+\delta)(1-\mu)}{(1+g)((1+g)\rho+g+\delta)} + \rho b}{(1-\mu) \frac{(1+g)((1+g)\rho+g) + g(\delta-1)}{(1+g)((1+g)\rho+g+\delta)}} \quad (44)$$

This condition holds true for all combinations of reasonable parameter values. The same condition applies analogously to changes in the social security contribution rate.

For $g = 0$ the condition collapses to

$$\alpha < \frac{1 + tr - \frac{\delta(1 - \mu)}{(\rho + \delta)} + \rho b}{(1 - \mu) \frac{\rho}{\rho + \delta}} \equiv \alpha^{upperbound} \quad (45)$$

Values for $\alpha^{upperbound}$ for certain parameter values are shown in Table 1 and Table 2.

B THE TAX BASE INDEPENDENCE SCENARIO

To demonstrate independence of the effects of a tax shift from the relative size of tax bases, we have to recalibrate the QUEST3 model and design a special scenario which addresses the following issues:

- 1.) the ex-ante budgetary neutrality has to be preserved over the different scenarios to avoid feedback effects from debt stabilizing mechanisms as changes in labour taxes do affect employment significantly
- 2.) VAT changes have to differ in the different scenarios.

A possible way to account for both issues is a recalibration of the size of the consumption tax base. As a consequence, budgetary neutrality will be guaranteed whereas VAT rate changes differ. Further, to close the channel through which movements in the terms of trade can affect labour supply, we assure that the substitution elasticity between domestic and imported goods is high, so that terms of trade remain unaffected by the tax shift.

C EQUIVALENCE BETWEEN EMPLOYER AND EMPLOYEE SIDE LEVIES

C.1 Neutrality

We establish equivalence between employer and employee side levies by showing (employment) neutrality of an exogenous employer levy adjustment entirely financed by an employee levy adjustment. To show neutrality theoretically, we solve a simple linearized model consisting of equations (12), (7) and a government budget constraint¹³:

$$(1 - \mu)F_{NN0}\Delta N_t = (1 + sc_0)\Delta w_t + w_0\Delta sc_t \quad (46)$$

$$\begin{aligned} \frac{1}{1 - \eta} \left(\omega \kappa N_0^{\kappa-1} - \frac{(1 - tl_0)(1 - \mu)}{1 + sc_0} F_{NN0} \right) \Delta N_t \\ = -\frac{F_{N0}}{1 + sc_0} \Delta tl_t - \frac{F_{N0}(1 - tl_0)}{(1 + sc_0)^2} \Delta sc_t \end{aligned} \quad (47)$$

$$-(sc_0 + tl_0) \left[\frac{1}{N_0} \Delta N_t + \frac{1}{w_0} \Delta w_t \right] = \Delta sc_t + \Delta tl_t \quad (48)$$

For simplicity, it is assumed that government expenditures are financed by either SSC-ER or by PIT. We set changes in government expenditures equal to zero. Assuming that any exogenous change in the PIT is financed by an endogenous adjustment in SSC-ER, equations (46)-(48) can be solved for ΔN_t , Δw_t and Δsc_t expressed as functions of Δtl_t .

¹³ For simplicity, we abstract from benefits.

$$\Delta sc_t = -\frac{1 + sc_0}{1 - tl_0} \Delta tl_t \quad (49)$$

$$\Delta N_t = 0 \quad (50)$$

$$\Delta w_t = -\frac{w_0}{1 - tl_0} \Delta tl_t \quad (51)$$

Clearly, PIT changes which are financed by changes in SSC-ER do not affect employment. It is a straight forward exercise to show that neutrality also holds when SSC-ER are exogenous and PIT adjust accordingly.

C.2 Relative magnitude of employer and employee side levies

From equation (47) it becomes clear that an identical change in sc and tl does not have the same effect on employment as the factors multiplying the rate changes differ. The relative size (SSC relative to PIT) is given by $\frac{1-tl_0}{1+sc_0}$. Intuitively, this difference can be explained by a distinct evolution of the wage sum when SSC or PIT is changed. The equivalence of both measures referred to in C.1 calls for an equilibrium allocation for employment which assumes the same value irrespective if PIT or SSC is changed. This equilibrium can only be established if after tax wages $((1 - tl)w_t)$ and wage costs $((1 + sc)w_t)$ are identical not matter if PIT or SSC is changed. Such an identical equilibrium can therefore only be established if real wages w_t adjust accordingly in both scenarios. If SSC is lowered real wages, can at best not decline (in order not to have a negative effect on after tax wages), if PIT is lowered, real wages can at best not increase (in order to attain a similar effect on wage costs as when SSC is lowered). This distinct evolution in real wages leads to a distinct effect on the wage sum, which in case of an SSC change is not declining and in case of a PIT change is not increasing. To attain the same ex-post budgetary effect in both labour tax instruments, the absolute change in the labour tax instruments therefore has to differ. The relative importance of this change is governed by $\frac{1-tl_0}{1+sc_0}$.

D TAX SHIFT WITH COMPENSATION AND FULL EX-ANTE BUDGETARY NEUTRALITY

Figure 17: Growth effects – Personal income tax reduction – With compensation and full neutrality

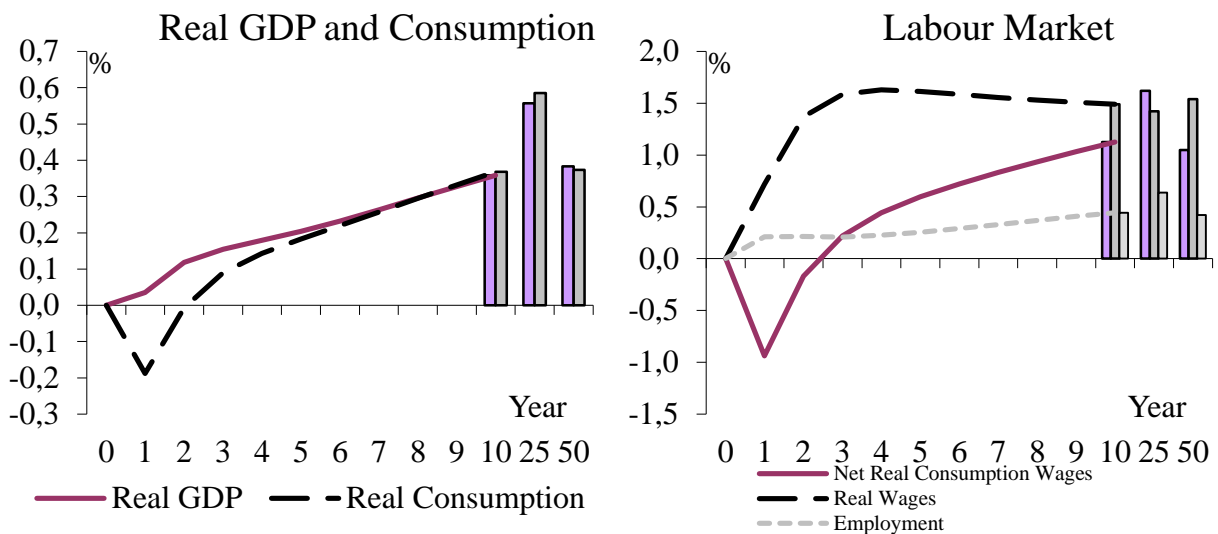


Figure 18: Competitiveness - Personal income tax reduction – With compensation and full neutrality

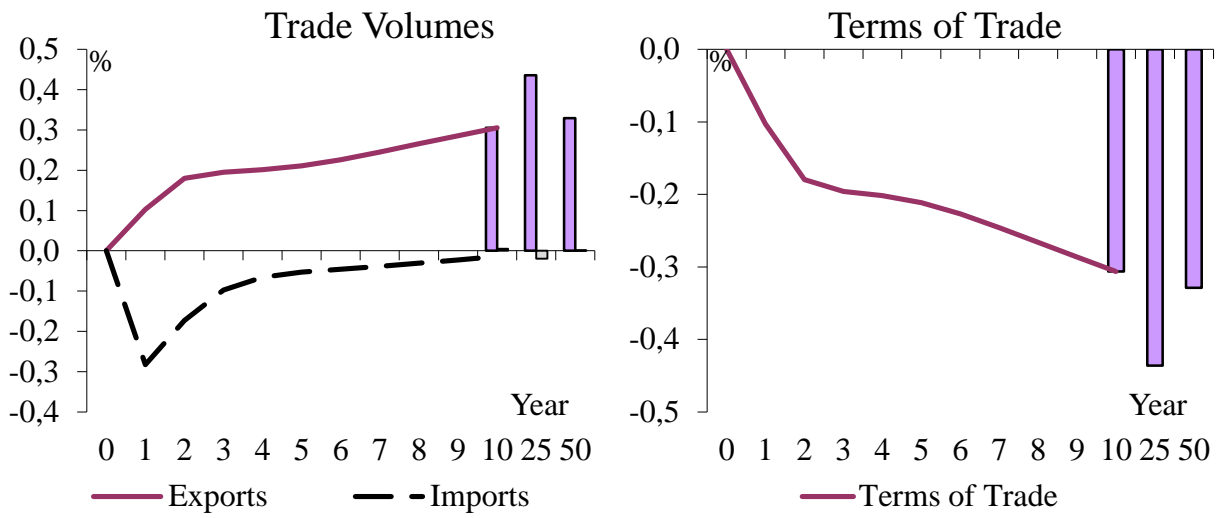


Figure 19: Distribution I – Personal income tax reduction – With compensation and full neutrality

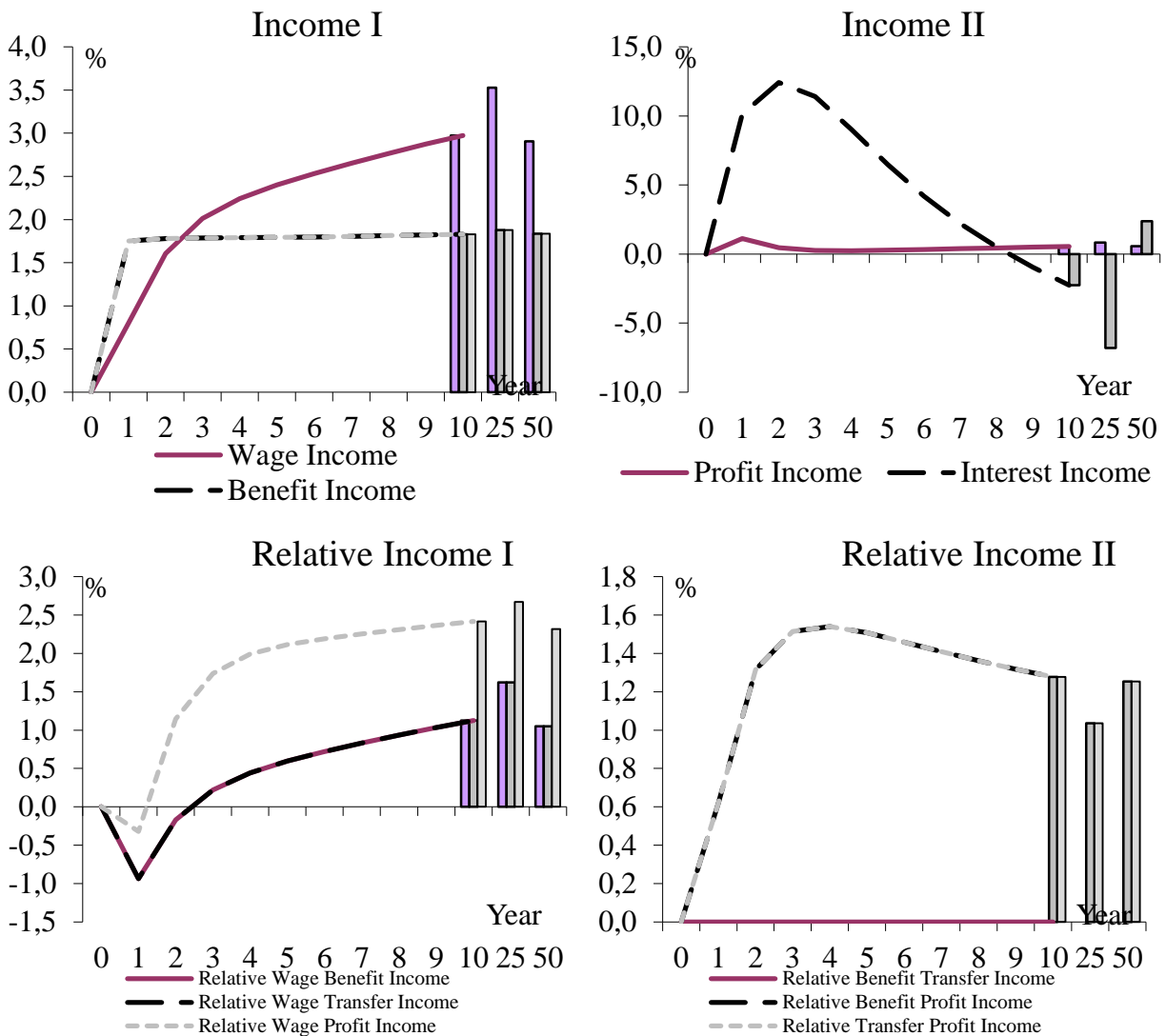
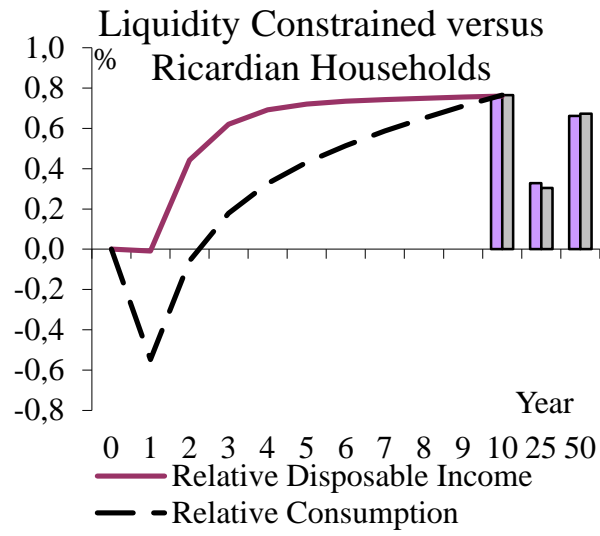


Figure 20: Distribution II – Personal income tax reduction – With compensation and full neutrality



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