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Abstract

This paper investigates the effect of shifting taxes from labor income to consumption on labor supply and the distribution of income in Germany. We simulate stepwise increases in the value-added tax (VAT) rate, which are compensated by revenue-neutral reductions in income-related taxes. We differentiate between the personal income tax (PIT) and social security contributions (SSC). Based on a dual data base and a microsimulation model of household labor supply behavior, we find a regressive impact of such a tax shift in the short run. When accounting for labor supply adjustments, the adverse distributional impact persists for PIT reductions, while the overall effects on inequality and progressivity become lower when payroll taxes are reduced. This is partly due to increases in aggregate labor supply, resulting from higher work incentives.

JEL Classification: C63, D31, H23
Keywords: income and payroll taxes, consumption taxes, microsimulation, inequality, Germany

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1 Introduction

The appropriate choice between direct and indirect tax instruments has been subject to an extensive debate on their respective merits and disadvantages. Although the question of the optimal mix is still open, there are reasons for a coexistence of both forms of taxation, as they address the economic policy objectives of efficiency and redistribution in different ways. Moreover, in the context of the need for fiscal consolidation, consumption constitutes an attractive and reliable source for government revenues as a stable tax base. In addition, shifting the tax burden from labor to consumption, referred to as *fiscal devaluation*, is currently considered as an alternative to nominal devaluation in order to restore competitiveness in some euro area countries (de Mooij and Keen, 2012; Koske, 2013).

The debate on possible consequences of a tax shift from income towards consumption centers around two issues. First, according to standard economic theory, such a tax shift might be favorable with respect to employment as a consequence of lower marginal tax rates on labor income, implying higher incentives to take up work. Second, higher consumption taxes are often associated with lower tax progressivity and higher levels of inequality. However, employment increases from a tax shift may outweigh adverse distributional impacts. The degree to which there exists a trade-off between equity and efficiency in this context is an empirical question. We provide an analysis for Germany to gauge the extent of this trade-off and investigate whether a shift from income to consumption taxation can be justified in light of positive labor supply effects. Germany represents a particular interesting case as the tax wedge on labor income is among the highest in industrialized countries (OECD, 2014).

Despite the theoretical virtues of indirect taxes, the direct to indirect tax ratio has been on the rise over the last decades, mostly due to increasing social security contributions (Martinez-Vazquez et al., 2010). Consequently, recent years have witnessed a growing discussion on a heavier reliance on consumption taxes, such as sales taxes and the Value Added Tax (VAT) (OECD, 2007, 2010). A concrete policy implementation of such a *tax cut cum base broadening* was the 2007 VAT increase in Germany, which was compensated by simultaneously cutting unemployment insurance contributions.[1] This policy was explicitly motivated by increasing work incentives and generating revenues at the same time. In the same spirit, in

[1] The standard VAT rate was raised from 16% to 19%, while the total rate of unemployment insurance contributions was lowered from 6.5% to 4.2%. This specific reform has been ex ante investigated by Bach et al. (2006).

2009, Hungary financed a five percentage point reduction in the employer Social Security Contributions rate through a higher VAT. These policies followed the argumentation that the tax burden on labor in most OECD countries is too high and implies disincentives for labor market participation. Moreover, payroll taxes constitute a significant share of labor costs for employers (OECD, 2014). A shift away from income and payroll taxes towards consumption taxes could therefore release unused productive capacities by increasing labor supply *and* demand. Moreover, labor constitutes the major tax base for generating revenues in most countries, which might be questioned in light of a proper application of the Ability to Pay Principle. Broadening the tax base addresses this issue by treating all sources of income equally. The distributional consequences of a tax shift are however unclear.

In this paper, we carry out microsimulations of several revenue-neutral policy scenarios. We simulate a step-wise increase of the standard VAT rate of currently 19% in Germany, accompanied by a reduction in personal income taxes (PIT) or social security contributions (SSC).[2] We add to the existing literature by simulating a range of revenue-neutral reforms on both PIT and SSC, accounting for labor supply responses at the same time. As the distributional analysis is differentiated along several socio-demographic dimensions, the results can help to design specifically targeted policies to compensate the potential losers from an increase in VAT rates. For example, if pensioners are found to be worse off, it might be worth considering to split the additional revenue from the higher VAT on lowering payroll taxes *and* raising old-age pensions. The analysis is carried out with the behavioral microsimulation model IZAΨMOD (Löffler et al., 2014a). Based on a representative sample of the German population from the Socio-Economic Panel Study (SOEP) and a detailed model of the German tax and transfer system, we are able to simulate changes in household budgets as well as adjustments in labor supply behavior. As the information on household consumption in SOEP is insufficient, we impute expenditures based on estimates from the German Sample Survey of Income and Expenditures (EVS). Our empirical approach is related to the studies of Decoster et al. (2009) and Bach et al. (2006), but differs in several aspects. While the former study depicts only the static changes in household budgets ignoring behavioral responses, the latter does not consider a revenue-neutral reform.

We find that both scenarios of reducing the direct tax burden, either lowering

[2] There are two VAT rates in Germany. Apart from the standard rate of 19%, there is a reduced rate of 7% applied on most food commodities, public transport, books, newspapers, journals, entrance to cultural facilities and works of art. Moreover, medical, educational and financial services as well as rents are fully exempted from the VAT.

PIT or SSC, imply distinct distributional impacts. Due to its strongly progressive design, a compensated reduction of personal income taxes leads to a higher level of inequality. Low-income earners, pensioners and unemployed are found to be the main losers from the policy. For payroll tax reductions, the adverse distributional effects are significantly less severe, because payroll taxes constitute a regressive tax themselves. Taking into account behavioral adjustments, we find that the distributional impacts of the tax shift are weakened. For lowering the PIT level however, a strongly regressive impact persists. Reducing payroll taxes seems particularly promising, given their potential to raise work incentives. In these scenarios, some households are able to compensate their losses through higher labor earnings. Beyond, our results suggest no systematic difference between augmenting both VAT rates or only the standard rate, which underlines the limited redistributional power that is often attributed to a differentiation of VAT rates.

The paper is structured as follows: Section 2 reviews the theory on labor versus consumption taxation and the empirical evidence on tax shifts. Then, we present related empirical findings on the macro and micro level. In Section 3, our microsimulation approach and the underlying data base is presented. Furthermore, our method to impute expenditures in an income data set is described in detail. In the results section 4, the simulated labor supply reactions are presented first. Second, a detailed distributional analysis identifies winners and losers from the reform. A comparison of several aggregated measures of inequality and progressivity completes the analysis. Section 5 concludes.

2 Background and Literature

2.1 Theory

Taxation affects economic incentives and may therefore induce behavioral adjustments for individuals, causing efficiency costs compared to a hypothetical situation without taxes. As any feasible tax causes distortions, the theoretical question is how to characterize the second-best setting that implies minimum efficiency losses, given a fixed government revenue. Economic theory provides intuition for why a shift from income to consumption taxation might be favorable in efficiency terms, i.e., promoting growth and employment. Within a static standard utility-maximization framework, it can be shown that both taxes distort the individual decision between consumption and leisure equivalently. An income tax reduces the net wage, while a

consumption tax reduces the real value of net earnings. Under non-negative wage and income elasticities of labor supply, both forms of taxation reduce work incentives (Bargain et al., 2014). While only a fraction of the population is subject to income taxation, virtually everyone pays consumption taxes. The consumption tax base is hence broader, as it includes expenditures of pensioners, benefit-recipients and capital-income earners. Hence, consumption taxes allow for obtaining the same revenue with a lower rate. If one recalls the classic insight that the excess burden of a tax rises approximately with the square of the tax rate (Auerbach, 1982), a shift towards a consumption tax induces lower aggregate efficiency costs. The intuition is that the positive effect on labor supply from the higher net wage exceeds the negative effect from a lower real income, resulting in higher aggregate labor supply.

A theoretical counter-argument is that throughout the life-cycle, income necessarily equals consumption and therefore implies an equal burden of both taxes (Caspersen and Metcalf, 1993; Metcalf, 1994). However, this argument only holds if both tax schedules are constant in the long run and if bequests are not considered. Although the only difference between (labor) income and consumption arises from consumption smoothing, this intuition is hardly relevant in the policy debate on what is understood as a regressive tax.[3] Another argument refers to the treatment of capital income. A tax levied on capital income distorts an individual's saving decision, as it implicitly taxes future consumption. If this is a normal good, an income tax discourages savings. In contrast, the savings decision is neutral to the level of consumption taxation, as the consumption tax does not alter the returns to savings. Reducing the capital income tax in favor of the consumption tax is therefore expected to increase savings and hence economic growth(Feldstein, 1978; Auerbach and Hines, 2002).

The interdependencies between both forms of taxation have regularly been addressed by the optimal taxation literature. Atkinson and Stiglitz (1976) were the first to capture the equity-efficiency trade-off of both taxes within a formal framework. Under the assumption of separable preferences and individuals that are inequality-neutral, they neglect any role for indirect taxation. Since all commodities are equally substitutable for leisure, any attempt to offset the distortion between labor and leisure is bound to cause efficiency losses.[4] Later contributions refined this argument by imposing more realistic assumptions and found commodity taxation to

[3] For a treatment of lifetime inequality in a simulation context, see Creedy (1997). A recent empirical analysis of lifetime inequality among German employees can be found in Bönke et al. (2015).

[4] See also the argumentation by Sørensen (2007).

be a necessary component of any optimal tax structure. Among these assumptions are uncertainty about individual wages (Cremer and Gahvari, 1995), heterogeneity among agents not only in ability (Cremer et al., 2001; Saez, 2002), different underlying production technologies (Naito, 2007) or different evasion characteristics of both taxes (Boadway et al., 1994; Richter and Boadway, 2005). According to Mankiw et al. (2009), the advance of indirect taxes and VAT in particular can be attributed to findings of optimal taxation theory. Despite Atkinson and Stiglitz' wide-known result not to levy any indirect taxes, it seems worth to consider whether a shift to consumption taxation might adjust the direct to indirect tax mix towards the optimum (European Commission, 2008).

A proper application of the Ability to Pay Principle might provide further justification for a heavier reliance on consumption taxation. Such arguments favor consumption (the use of income) to income (the contribution to national production) as the better measure for individual ability (Gruber, 2011, chap. 25).[5]

2.2 Empirical Evidence

The efficiency impact of a shift from income to consumption taxation has been investigated by a number of empirical studies, most of them based on a macrosimulation framework. They largely reveal positive, but moderate effects from a compensated SSC reduction on GDP growth rate and employment for the German case.[6] All studies suggest positive, but moderate employment effects not higher than 1% of total employment. Similar results are obtained for other countries.[7] Unions' behavior in the aftermath of the reform is found crucial for the long-run effects of the tax shift. Studies that explicitly incorporate the mode of wage bargaining draw rather pessimistic conclusions. If unions' bargaining power is assumed to be sufficiently high, wage increases as a consequence of increased living costs become likely in the medium term. Another channel that might work against the effectiveness, though not captured in these studies, are announcement effects of VAT increases that cause domestic demand to boost before and to decline in the aftermath of the

[5] This idea dates as far back as to Thomas Hobbes: "It is fairer to tax people on what they extract from the economy, as roughly measured by their consumption, than to tax them on what they produce for the economy, as roughly measured by their income."(Gruber, 2011, p. 754)

[6] See Buscher et al. (2001), Steiner (1996), Meinhardt and Zwiener (2005), Feil and Zika (2005), Feil et al. (2006), Böhringer et al. (2005).

[7] See European Commission (2006, 2008) for a cut in income taxes in the EU as a whole, Altig et al. (2001) for a shift of the US federal income tax, and Dahlby (2003) for income tax shifting in Canada.

policy change.

Macro approaches exhibit drawbacks when it comes to distributional questions. Any conclusions derived from macro simulations do not account for heterogeneity among individuals. As a consequence, these kinds of questions have been addressed by a number of microsimulation studies which all focus on SSC reductions. Decoster et al. (2009) provide a comprehensive study incorporating four European countries. They simulate a 25% reduction in social security contributions, compensated by a VAT increase. Their results indicate negative welfare effects for households in low income deciles, as well as for households with low-educated and unemployed heads. This is in line with O'Donoghue et al. (2004), who find a general regressive impact in twelve OECD countries, Portugal being most regressive and Belgium being nearly proportional. Similar results are obtained by Bach et al. (2006), who simulate the effect of the three percentage points VAT increase implemented by the German government in 2007. This was complemented by a cut in unemployment insurance contributions by two percentage points. It should however be noted that this reform was not revenue-neutral. Thomas and Picos-Sanchez (2015) simulate a revenue-neutral shift of 5% of the SSC burden to VAT and find increasing work incentives particularly for low-income earners across several European countries. Meinhardt and Zwiener (2005) simulate a cut in SSC by two percentage points, combined with an increase in VAT by the same amount. Although the authors do not report fiscal effects, this reform is presumably not revenue-neutral as well. They identify civil servants, self-employed and unemployed as the main losers from the reform, while gains for employed persons are rather moderate. A related study is provided by Moscarola et al. (2015), who consider a shift of the tax base from labor to property, while accounting for labor market reactions.

The empirical results partly strengthen the cause for a tax shift for efficiency reasons, though the positive impact on employment and growth seems to be rather moderate. As the results for Germany indicate, the magnitude crucially depends on the institutional setting of the economy. The microsimulation studies presented here confirm a regressive impact. Low-income groups are typically worse off from a tax shift as well as unemployed and pensioners. This result is not surprising, as these groups typically face a low burden of income taxes and social security contributions.

3 Empirical Approach

Microsimulation models have become a standard tool in the ex-ante assessment of reforms of the tax-benefit system and therefore allow to trace changes in highly complex tax regulations. In particular, the specific institutional setting and the socio-economic structure in a given country need to be taken into account, which can hardly be accomplished by an analysis on an aggregate level.

The basic idea of microsimulation in the context of labor supply is to model the individual (or household) decision between leisure and consumption. Based on observed behavior of a representative population sample in a given institutional setting, preference parameters can be estimated. If net income (and thus consumption possibilities) changes as a consequence of a tax-benefit reform, these estimates are used to predict individual labor supply *after* the reform. The reform effect is then defined as the difference in aggregate behavior between the two institutional regimes. For this, a detailed representation of the tax-benefit system is necessary. We use the IZA Policy SImulation MODel (IZAΨMOD) of the Institute for the Study of Labor (Löffler et al., 2014a). Apart from replicating the German tax and transfer system, it comprises an econometrically estimated model of labor supply behavior. It assumes a discrete choice set of working hours, which facilitates the treatment of family labor supply. As our main database does not capture consumption expenditures, we have to extend our database. This is done by an Engel curve procedure, adopting the approach of Decoster et al. (2013).[8]

Reform Scenarios. We carry out simulations of two benchmark scenarios, in which the standard VAT rate of 19% is increased in steps of one percentage point each. For a given increase in the standard VAT rate $d\tau > 0$, we obtain the resulting additional VAT revenue from total simulated revenues. We rely on simulated, not official revenues for this, as our micro-data only capture consumption from private households living in Germany and therefore cannot depict VAT payments from public consumption, enterprises and foreigners.[9] On the basis of revenue statistics, we obtain the necessary proportional reduction on income-related taxes and apply this factor to the simulated tax liabilities.[10] This is done for personal income taxes and

[8] Details on the data base, the imputation procedure and the underlying labor supply model are provided in the Appendix.

[9] We however correct the simulated revenue by the under-coverage of total private consumption compared to national accounts, which amounts to 81% for the 2008 EVS.

[10] There are numerous ways for governments to reduce the burden of income-related taxes. Here, we refrain from discussing the various interdependent impacts of instruments, such as reducing

social security contributions separately. This procedure is repeated eleven times until in the last step, an increase in the standard VAT rate from 19% to 30% is combined with a corresponding reduction on labor-related taxes. At the same time, we provide more detailed results for a reference scenario with a standard rate of 25%. While this implies substantial tax shifts, secondary effects, such as demand for compensation by unions, are less likely to play a role than for even stronger tax shifts.

Although SSC and income tax payments flow into separate budgets, their impacts on the overall budget are highly interlinked. For many years, the German statutory pension system has been partly financed through the tax budget, since SSC revenues are not sufficient to cover public pension payments. In fact, these payments have become the largest share of federal expenses.[11] For this reason, reforms on either income taxes or SSC imply equivalent effects for the public budget as a whole. A VAT increase by six percentage points would result in additional VAT revenue of € 29 bn, the corresponding relief amounting to 16.9% for the personal income tax (total status quo revenues: € 174.6 bn) and 15.5% for social security contributions (total status quo revenues from employees: € 190.5 bn).

Income concept. For each reform step, the combined tax change alters household budget constraints which, in turn, induces adjustments in household labor supply if the expected utility of an alternative choice category is higher than the status quo. In order to account for the budget effect of an increased consumption tax, the commonly used concept of disposable income is not sufficient here, as it ignores consumption taxes. For the subsequent analysis, the quantity of interest will be *Post-VAT Income (PVI)*, which is defined as disposable income minus VAT expenses. PVI can be understood as the amount of money that *would* be left for consumption after paying the Value Added Tax. This income is of course virtual, as it is not disposable for consumption after VAT has been paid. PVI is not only the basis for the distributional analysis, but also enters the utility function and hence determines the labor supply decision. We thereby implicitly assume that households have an identical perception of their burden of direct and indirect taxes. This may be questioned in light of the experimental studies by Sausgruber and Tyran (2005) and Blumkin et al. (2012),

marginal tax rates or raising the exemption level. Instead of providing a blueprint for a tax reform, we rather aim at gaining a rough insight on the interaction between both forms of taxation with respect to distributional questions. Therefore, we opt for the most straightforward way to reduce taxes, namely by proportional reduction.

[11] In 2009, € 102 bn of tax revenues (roughly one third of total revenues) were spent on financing social security.

both pointing to a lower perception of consumption taxes. If this is true, households would ignore the VAT increase to some extent, implying a higher reaction from a reduced direct tax. With positive elasticities of labor supply, our estimated labor supply reaction should hence be understood as a lower bound.

Subtracting VAT expenses from disposable income is equivalent to full and instantaneous VAT shifting from firms to consumers.[12] We therefore abstract from the fact that it may take time until firms shift the higher VAT to consumers, which is in line with the logic of static models. Our expenditure imputation is also able to depict the effect on commodity demand through income and price changes.[13] This affects savings behavior as well as adjustments in the expenditure structure across commodity groups. As the level of basic social assistance in Germany is linked to inflation rates, we address the importance of this particular channel on our results.[14]

Incidence and VAT differentiation. Subtracting the revenue-neutral deduction from household income implicitly assumes that workers bear the full burden of income taxes and social security contributions. Doubts are however justified, particularly for the case of payroll taxes, as their payment is split between employers and employees.[15] We address this issue by assuming alternative divisions of the tax incidence in a robustness check. If the incidence is low, employees benefit less from a tax reduction. We evaluate the extent to which this influences the overall distributional impact of the reform.

In a further robustness check, we alter the benchmark scenarios by increasing both VAT rates simultaneously, thereby addressing the issue of VAT rate differentiation. As in most OECD countries, expenditures for necessities are taxed with a reduced rate in Germany. The common justification for this policy are equity concerns. If the reduced rate is fulfilling its redistributional objective, a simultaneous increase of both VAT

[12] Full incidence of the German VAT in the medium run has been found by the Bundesbank (2008).

[13] See Appendix for details.

[14] In practice, the level of the means-tested unemployment benefit (*Arbeitslosengeld II*) is annually adjusted by the change of an index consisting of the price change in basic goods and services (70%) and the average change in employees' net wages (30%). As 54.3% of all expenditures are subject to the standard VAT rate (see Table A.1), each percentage point of higher standard VAT rate mechanically raises the price level and hence the unemployment benefit by 0.46 percentage points.

[15] The findings of Saez et al. (2012), exploiting a natural experiment in Greece, suggest that for a payroll tax increase, the long-term burden of workers is limited to the *employee* share. It is however unclear whether their findings are applicable for a different institutional setting and a payroll tax *reduction*.

rates should imply more regressive effects than the benchmark scenarios.

4 Results

4.1 Labor Supply Effects

Our microsimulation approach sheds light on whether the expectations of positive effects on work incentives can be confirmed. The labor supply effects simulated here have to be interpreted as medium-term outcomes, i. e., after households have adjusted their labor supply behavior to the new institutional environment. If one assumes a negative wage elasticity of labor demand, firms will react to higher labor supply by lowering offered wages, leading to an equilibrium outcome below the initial labor supply shift (Peichl and Siegloch, 2012).

[Table 1 here]

The simulated labor supply responses, for an increase of the standard VAT rate from 19% to 25%, are displayed in Table 1. It shows the aggregate change in hours worked, measured in full-time equivalents (FTE) of 40 hours per week. The total effect is found to be positive in the order of 200,000 to 250,000 FTE for both the PIT and the SSC reduction. This corresponds to an increase in labor supply by around 0.5% of total employment. This is well in line with results obtained from CGE studies (Buscher et al., 2001, p. 466; Böhringer et al., 2005, pp. 95ff). Looking at the extensive margin of labor supply, i.e., the number of individuals entering the labor market from inactivity, we simulate an increase by 86,000 (PIT reduction) and 124,000 (SSC reduction) workers respectively, indicating substantially higher activating potential of lower social security contributions compared to lower PIT. This is not surprising, as many workers with comparably low earnings are subject to these contributions, while still exempted from the income tax. If the increase in labor supply can be mostly realized, i.e., facing limited constraints on the demand side, our simulation results confirm the theoretical expectations concerning a moderate growth in total employment.[16] In the results presented so far, unemployment benefits are indexed by the inflation rate. The additional two columns in Table 1

[16]Microsimulation approaches with demand side restrictions are provided by Creedy and Duncan (2005) and Peichl and Siegloch (2012). In both studies, at least half of the supply effect is maintained.

reveal that ignoring this channel would significantly overestimate potential labor supply effects. This holds particularly for the extensive margin (up to 1.5 times higher labor supply effect), as higher unemployment benefits reduce the price for leisure and hence lower work incentives.

Aggregate labor supply effects for different reform scenarios (i.e. different VAT increases) are depicted in Figure 1. This sheds light on the interaction between both taxes if the shift is smaller. Overall, the total hours effect increases about linearly for both scenarios, reaching 400,000 (PIT) and 330,000 (SSC) full-time equivalents respectively. For the participation margin, effects are substantial only after the fourth reform step. Moreover, the labor supply effect of the SSC reduction is stronger than the PIT reduction across the whole range of reforms for the participation margin. The inverse holds for the change in aggregate hours.

[Figure 1 here]

The total change in labor supply for the reference scenario is decomposed by income deciles in Figure 2. It can be seen that the increase in hours worked in the PIT scenario (dark gray bars) is mainly driven by higher income groups. The participation effect is even slightly negative up to the third decile, while most workers entering the labor market are in the top deciles. These are mostly secondary earners who have been previously inactive and now face a lower individual marginal tax rate. Shifting from SSC affects household budgets already at a lower income level and exceeds the hours effect from the PIT reduction in the bottom half of the distribution, as indicated by the light gray bars. If policy-makers seek to reduce entry barriers into the labor market by reducing the tax wedge, the SSC scenario appears to be better targeted.

[Figure 2 here]

4.2 Distributional Impact

Employment Type. The average budget effects with respect to the employment type are illustrated in Figure 3.[17] Employees experience modest income gains vis-à-vis the status quo (+4% in the short run, +5% when accounting for labor supply changes). For other employment groups, the differences between the scenarios with and without behavioral adjustment are negligible. Pensioners lose most from the

[17] Throughout the distributional analysis, incomes are adjusted by equivalence weights using the modified OECD scale.

reform, as they hardly benefit from reductions on the income side. Moreover, they are not able to cushion the adverse budget effect trough increased labor supply. For self-employed and civil servants, the picture is mixed. On the one hand, these groups significantly benefit from income tax reductions. However, they are not subject to social security payments. For this reason, civil servants turn out to be slightly worse off from the SSC reform.[18]

[Figure 3 here]

With the exception of pensioners and civil servants, all employment groups are able to compensate a large share of their losses through increased realized labor supply. The main losers from the SSC reform are pensioners, who lose around 2% on average. In relative terms, employees and unemployed workers are the main beneficiaries. The average budget effect for unemployed (+2% and +4% respectively for the SSC reduction) is due to substantial increases for *some* unemployed. For those remaining unemployed the total change in PVI will be about zero, as the increase in VAT expenses is expected to correspond roughly to the increase in unemployment benefits due to indexation. In general, these results are in line with expectations as well. Those who are not affected by the tax that is reduced are, in tendency, worse off from the reform.

Income deciles. The distributional impact along the reform path, differentiated by (status quo) deciles of Post-VAT-Income, is illustrated in the upper part of Figure 4. It displays the relative income change due to the reform by income deciles. For a clearer exposition, we restrict the presentation to five selected deciles.

[Figure 4 here]

The upper panel of Figure 4 demonstrates the increasingly regressive impact of a shift from personal income tax to VAT. Minor VAT increases hardly affect budgets of medium-income earners, but rather let the high-income earners better off. After the final reform step (standard VAT rate of 30%), the lowest decile suffers from an income loss of around 4%, while the top decile gains more than 8%. This is in principle not surprising as one would typically expect those households to lose from a shift towards consumption taxation who bear a low burden of PIT prior to the reform. The higher saving ratio of high-income earners exacerbates this effect.

[18] The slightly positive budget effect for self-employed is purely due to changes in spouses' income, which cause equivalence-weighted household income to change.

The core interest of our investigation is to analyze to what extent the regressive impact is weakened if behavioral responses are accounted for. As the right panel shows, the distributional picture however hardly changes for the PIT scenario, if we consider the budget changes after the labor supply response. The improvement to the first-round effect is one percentage point at most across income deciles, leaving the poorest decile 4% worse off compared to the baseline.

The equivalent analysis is presented in the lower panel of Figure 4 for the SSC reduction. While still implying a regressive impact in the short run, income gains are not larger than 1.5%. The bottom decile loses around 2% on average. Besides, the 7^{th} decile experiences larger gains than the 10^{th} income decile. This can be explained by a low marginal payroll tax burden for top-earners due to the assessment threshold and a decreasing income share of labor earnings for this group. The labor supply response causes the picture to change to some extent by raising the income effects for all deciles. Middle income groups gain relatively more than the highest income decile. The SSC reductions shift taxes from one regressive form of taxation to the other, which clearly has lower adverse distributional effects than the income tax reduction. As the burden of SSC is more dispersed over the income distribution, the budget changes from the reform are less pronounced for the second scenario.

Summing up, a shift from labor to consumption taxation indeed exhibits a regressive impact on household budgets. Lower income groups loose while receivers of high incomes benefit, in tendency, from the reform. This can be easily explained by the fact that the bottom 50% of the income distribution account only for 5% of total income tax revenues and thus hardly benefit from a reduction. The regressive impact is substantially less severe for a shift from social security contributions to VAT. Hence, reforming the personal income tax as suggested here is likely to be confronted with strong political opposition and is therefore not a realistic policy proposal. As a consequence, the in-depth analysis in Section 4.3 concentrates on the SSC reductions as the more attractive option for policy-makers.

Tax Progressivity and Inequality. To complete the picture on the distributional impact of the reform, Table 2 shows results for the degree of tax progressivity for different components of the tax-benefit system. We analyze two measures of tax progressivity. The Suits index π_{Suits} builds on the Lorenz curve for tax payments. Let $L_X(p)$ and $L_T(p)$ denote the Lorenz curves for pre-tax incomes and tax liabilities

respectively. Then the *Suits* index π_{Suits} is obtained by

$$\pi_{Suits} = 2\int_0^1 [L_X(p) - L_T(p)]L'_X(p)dp \tag{1}$$

If π_{Suits} is calculated for some parts of the tax-benefit system (as in Table 2), the index for the overall progressivity is a weighted average of the partial indices, with average tax rate as weights (Suits, 1977). The index takes values in the [-1;1] interval and is an indicator for the progressivity of the tax schedule. A value of 1 would imply an extremely progressive system where only one individual would be subject to the tax. Opposed to this, the *Reynold-Smolensky* index π_{RS} captures the redistributional impact of a particular tax by the difference in pre- and post-tax income concentration.

$$\pi_{RS} = 2\int_0^1 [L_{X-T}(p) - L_X(p)]dp = \text{Gini}_{\text{PreTax}} - \text{Gini}_{\text{PostTax}} \tag{2}$$

The difference of both indices can be illustrated by the following example. A strongly progressive tax schedule (as measured by π_{Suits}) only exerts a redistributive impact if high marginal tax rates are paid by a significant number of taxpayers (captured by π_{RS}). Similarly to π_{Suits}, π_{RS} can be decomposed into the relative contributions of certain elements of the tax system (Lambert, 2001). For both concepts, a progressive (regressive) tax is associated with a negative (positive) value.

[Table 2 here]

In the status quo, π_{Suits} for VAT amounts to -0.194, while it is 0.346 for the personal income tax. Hence, the Value-Added Tax is about half as regressive as the income tax schedule is progressive.[19] At the same time, the distributional impact of VAT as measured by π_{RS} is regressive (-0.012), but only a quarter compared to the PIT progressivity (0.049). The PIT reduction does not affect the progressivity of the tax tariff, but reduces redistribution via the income tax. It is also apparent that both reforms make the VAT schedule more regressive in distributive terms. The Reynold-Smolenksy measure for VAT is only slightly higher than for SSC. This explains why the SSC reform is close to neutral in terms of total progressivity ($\Delta\pi_{Suits} = -2.7\%$) and redistribution ($\Delta\pi_{RS} = -2.6\%$).

[Figure 5 here]

[19] See Decoster et al. (2010) for other countries.

The baseline Gini for our income concepts amounts to 0.303. For the reference scenario, it increases by 0.013 for the PIT reform after Labor Supply. For the SSC reform, the Gini index increases by only 0.001, leaving inequality nearly unchanged. The percentage changes for four basic inequality and progressivity measures are depicted in Figure 5 for each intermediate reform step. The Gini index rises by about 8% for the full PIT reform and around 1% for the SSC reform. The $P90/P10$ ratio (upper right panel) however shows a significant increase also for the SSC reform, suggesting higher income polarization.

4.3 Sensitivity Analysis

Alternative payroll tax incidence. We deviate from the benchmark SSC reduction scenario by altering the assumption of full incidence of the payroll tax. This implies that the total payroll tax reduction falls on employees. Instead, we present changes in aggregate distributional measures in Figure 6 for payroll tax incidence values of 100%, 75%, 50%, 25% and 0% respectively. As labor demand is typically estimated to be more elastic than labor supply (Lichter et al., 2014), an incidence share of more than 50% for employees seems most realistic. Incidence below 100% causes employees to gain less from a payroll tax reduction and hence weakens the positive effect on work incentives. For the extreme case of no incidence, we simply raise only the Value Added Tax.

[Figure 6 here]

As expected, the labor supply response is weaker if the net wage is less affected by the payroll tax change (left panel of Figure 6). For an incidence of 25% or less, aggregate labor supply even decreases for all scenarios. The right panel depicts the corresponding changes of various measures of inequality and tax progressivity, the left bar representing the benchmark scenario of 100%. While the Gini index is higher for lower incidence, income polarization, measured by the $P90/P10$ share, decreases. The intuition is that earners of higher incomes are losing disproportionately if tax incidence is lower. Tax regressivity is increasing steadily as assumed incidence decreases; the overall redistribution of the tax system does not vary much for different incidence values. For the most realistic range of 50% and above, our main conclusions with regard to the overall inequality impact however remain unaffected.

The Suits index indicates a steadily increasing overall regressivity. Interestingly, the $P90/P10$ measure slightly decreases for lower tax incidence, suggesting slightly lower income polarization.

Increasing both VAT rates. So far, our reform scenarios left the reduced VAT rate of 7% unchanged. Levying reduced VAT rates on necessities is justified, among others, by equity considerations. As a consequence, all EU countries with the exception of Denmark impose differentiated VAT rates. Nonetheless, VAT differentiation is often criticized for not achieving its social purpose (OECD/Korea Institute of Public Finance, 2014) and to distort consumers' choices. In the following, we address the question whether shifting the tax burden also on commodities that are taxed at a lower rate is particularly to the detriment of low-income earners. We alter the SSC reduction scenario such that in each reform step, we increase both rates simultaneously in steps of one percentage point. A VAT structure with rates of 23% and 11% (Status Quo: 19% and 7%) is comparable with the reference scenario with regard to the revenue effect. It is important to note that the zero-rate commodities remain exempted.

[Figure 7 here]

The distributional outcome of this reform is depicted in Figure 7, contrasted with the reference scenario for the SSC reform. As there is virtually no difference in the income changes both in the short and medium run, it is fair to conclude that raising both VAT rates instead of the standard rate does not imply a distinct distributional impact. This suggests that the reduced VAT rate in Germany hardly achieves its redistributional purpose. The intuition is given in Figure 8. Reduced-rate commodities account for about the same expenditure share across income groups. A further policy proposal often discussed is the introduction of a uniform VAT rate. If the VAT-exempted commodities are left untouched, one would expect (qualitatively) very similar distributional effects of this reform as in Figure 7.

[Figure 8 here]

5 Conclusions

This paper examines a partial shift of taxation from labor income to consumption in Germany. Our empirical approach combines a detailed analysis of changes in household budgets with a microsimulation of behavioral reactions on the labor market. Based on a dual data base, we carry out a microsimulation of several reform scenarios shifting a substantial share of personal income taxes or social security contributions onto the Value Added Tax. The policies are designed revenue-neutral.

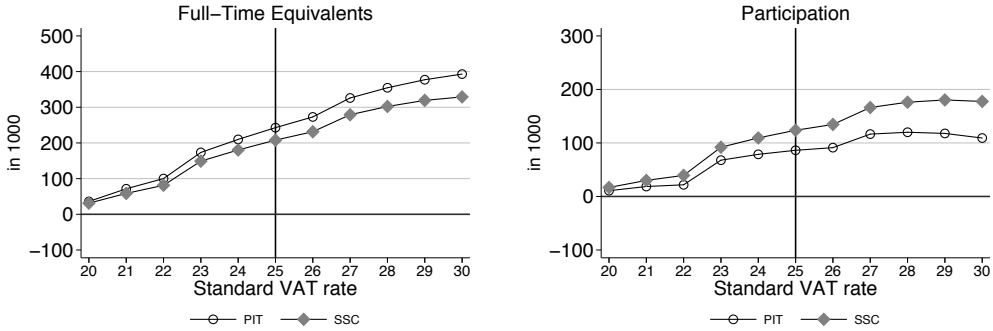
The expectations of positive effects on household work incentives are confirmed by the simulation. The total increase in labor supply for the reference scenario (Standard VAT rate of 25%) is expected to be rather moderate below 1% of total employment for the benchmark scenarios. This suggests a limited capacity of this policy instrument for targeting workers at the margin to enter employment.

The distributional evidence suggests that a shift from personal income tax to VAT has a regressive impact on household budgets. Negative effects are expected for low-income households, unemployed and pensioners in particular. This budget loss amounts to up to 4% of equivalized income, whereas the policy clearly favors high-income earners. The change in aggregate distributional measures supports this view by indicating higher inequality and a lower degree of the overall tax progressivity. Typically, most losers have a low burden of direct taxes and thus hardly benefit from a reduction on the income side.

Taking into consideration labor supply effects, the overall picture slightly improves for the SSC reduction, as income effects turn positive for the majority of people. This is for two reasons. First, SSC are a regressive form of taxation themselves. Replacing them with another regressive form of taxation hardly alters its distributional impact. Second, SSC reductions affect household budgets at a rather low income level, which bears activating potential. Reducing social security contributions overall entails lower inequality increases than a shift from personal income taxes. Besides, we demonstrate the negligible redistributive impact of the reduced VAT rate. It is worth noting that our static approach does not allow conclusions beyond the medium run. It is possible that positive employment effects vanish in the long run if unions are able to assert higher wages.

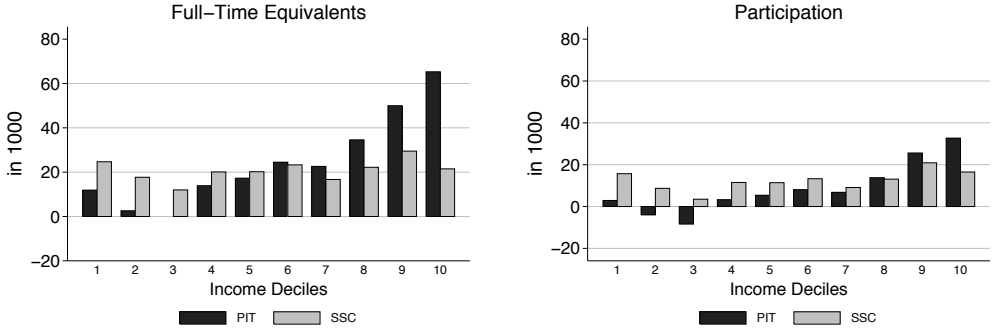
Our empirical results may serve as a point of departure for further research in several areas. First, it is worth considering possible extensions of the policy proposal in order to increase both political feasibility and effectiveness with regard to increasing work incentives for low-income groups (Thomas and Picos-Sanchez, 2015). One could think of a reform that is both *revenue*- and *inequality*-neutral. As Decoster et al. (2010) suggest, increasing the progressivity of the remaining income tax schedule is one option. Another way would be to compensate the main losers by raising old-age pensions. Our results suggest that designing such a reform is very well possible. In order to get a broader picture of the overall distribution of the consumption tax burden, incorporating excise taxes seems promising. A shift towards taxes on fuel or electricity is regularly discussed in the context of environmental tax reforms that aim at internalizing external effects.

Figure 1: Labor Supply Effects for different VAT rate increases



Own calculations with IZAΨMOD v.3.0.4. Full-Time Equivalent = 40 hours per week. The vertical line indicates the reference scenario that displayed in Table 1.

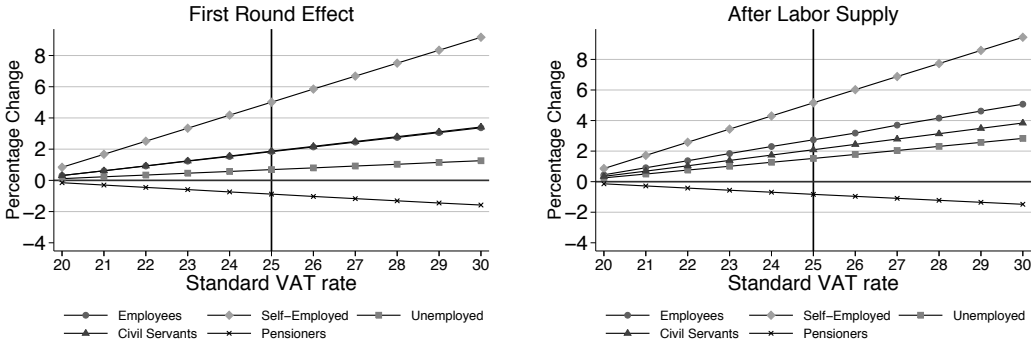
Figure 2: Labor Supply Effects by Income Deciles (VAT rate of 25%)



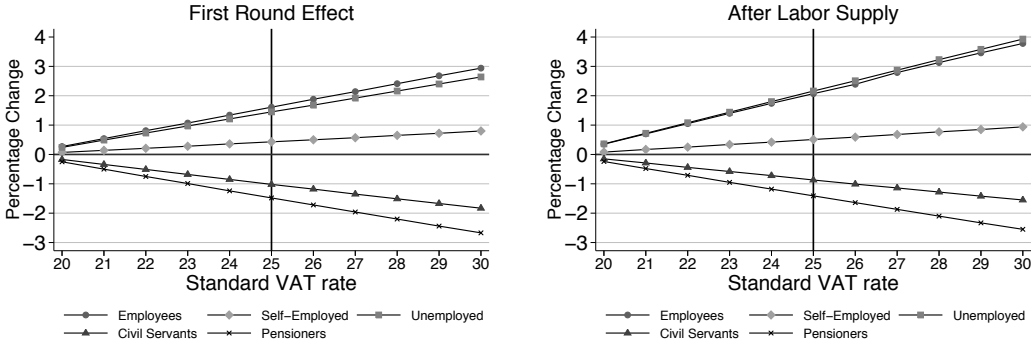
Own calculations with IZAΨMOD v.3.0.4. Income deciles are based on equivalized Post-VAT income. Full-Time Equivalent = 40 hours per week.

Figure 3: Income change by employment type

PIT Reduction



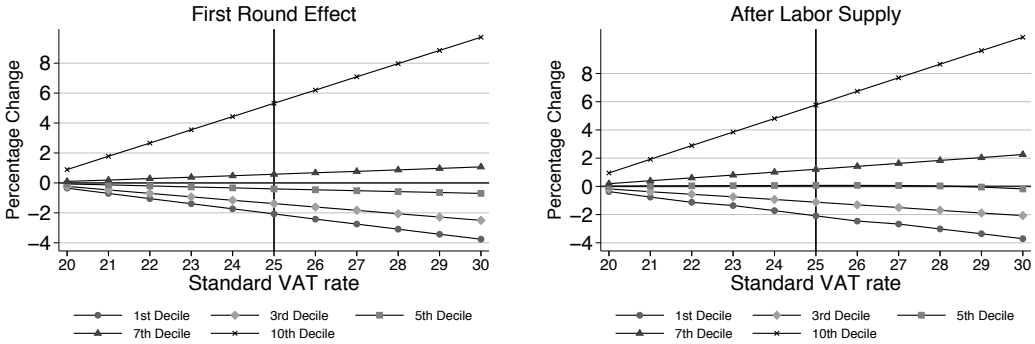
SSC Reduction



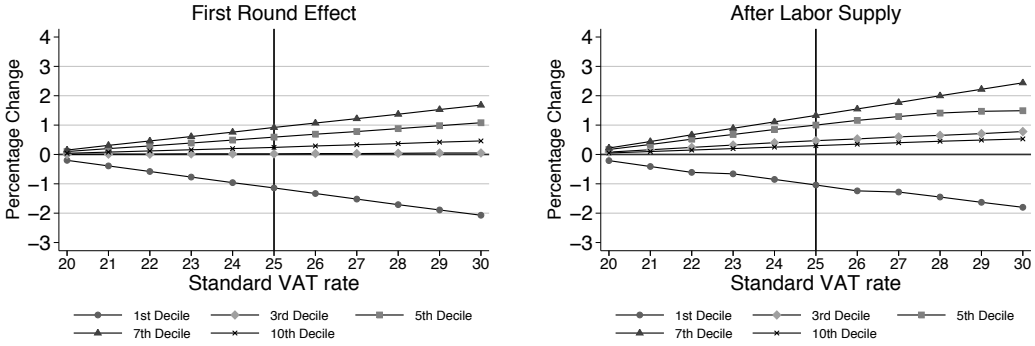
Own calculations with IZAΨMOD v.3.0.4. Income changes refer to equivalized Post-VAT income. First-Round Effects refer to the situation without labor supply reactions. The vertical line indicates the reference scenario.

Figure 4: Income change by income deciles

PIT reduction

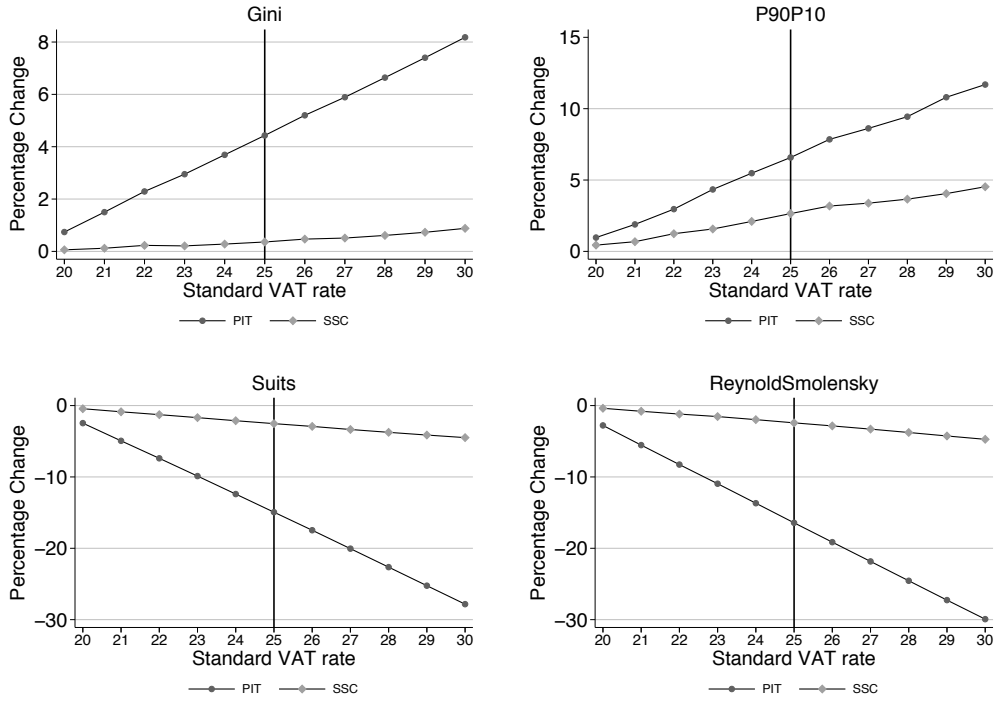


SSC reduction



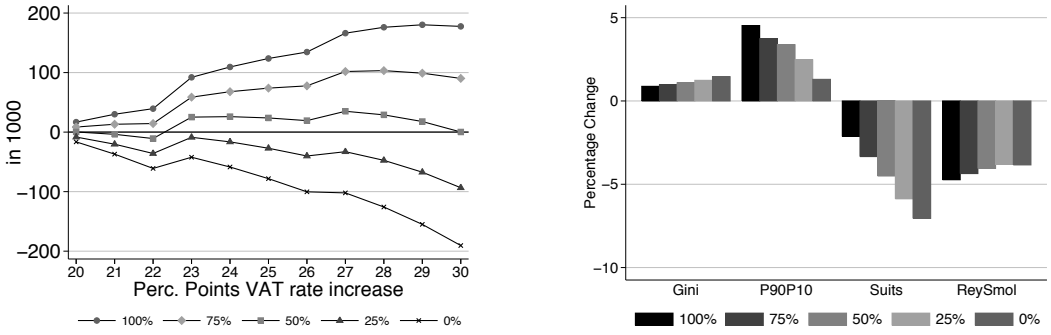
Own calculations with IZAΨMOD v.3.0.4. Income changes refer to equivalized Post-VAT income. First-Round Effects refer to the situation without labor supply reactions. The vertical line indicates the reference scenario.

Figure 5: Changes in Inequality and Tax progressivity



Own calculations with IZAΨMOD v.3.0.4. The graphs show the difference in distributional indices from reducing SSC after labor supply response. Graphs without behavioral response are available upon request. The vertical line indicates the reference scenario.

Figure 6: Alternative Incidence Assumptions

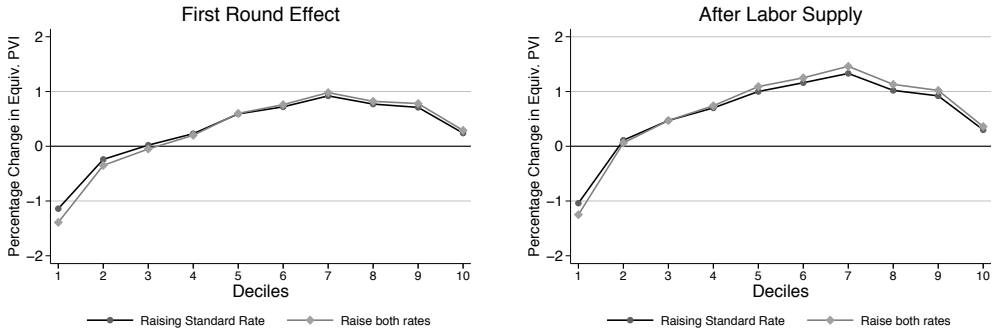


(a) Labor Supply Effects, Participation

(b) Inequality Effects, after LS

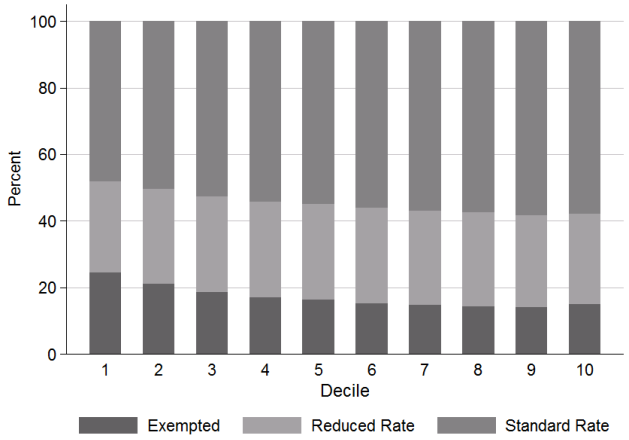
Own calculations with IZAΨMOD v.3.0.4.

Figure 7: Distributional impact of raising both VAT rates for the reference scenario



Own calculations with IZAΨMOD v.3.0.4. The standard rate scenario corresponds to the baseline SSC reduction with a standard VAT rate of 25%, the second scenario applies a standard rate of 23% and a reduced rate of 11%, while reducing SSC. Income changes refer to equivalized Post-VAT income. First-Round Effects refer to the situation without labor supply reactions.

Figure 8: VAT Tax Rates over Income Deciles



Source: EVS 2008. Income deciles for equivalized disposable income. Each bar shows mean values of expenditures shares by the respective VAT rate applied.

Table 1: Labor Supply Effects (Standard VAT rate of 25%)

Reform Scenario	**Base**	**PIT Reduction**		**SSC Reduction**	
		with UB indexation	no UB indexation	with UB indexation	no UB indexation
			in thousands		
Full-Time Equivalents	38,039	242.9	286.3	207.9	249.9
Participation	40,344	86.3	125.3	123.7	161.6

Own calculations with IZAΨMOD v.3.0.4. Full-Time Equivalent = 40 hours per week.

Table 2: Progressivity of Different Taxes

Reference Scenario	**Total**	**PIT**	**SSC**	**VAT**
		Base		
π_{Suits}	0.218	0.346	-0.060	-0.194
π_{RS}	0.076	0.049	-0.007	-0.012
		Reform 1: PIT Reduction		
π_{Suits}	0.185	0.345	-0.058	-0.188
π_{RS}	0.063	0.040	-0.007	-0.014
		Reform 2: SSC Reduction		
π_{Suits}	0.212	0.345	-0.059	-0.192
π_{RS}	0.074	0.049	-0.005	-0.015

Own calculations with IZAΨMOD v.3.0.4. Reform effects after Labor Supply adjustment for VAT standard rate of 25%. All reforms with indexation of basic unemployment benefit.

References

Altig, D., Auerbach, A. J., Kotlikoff, L. J., Smetters, K. A. and Walliser, J. (2001). Simulating Fundamental Tax Reform in the United States, *American Economic Review* **91**(3): 574 – 595.

Atkinson, A. and Stiglitz, J. (1976). The design of tax structure: Direct versus indirect taxation, *Journal of Public Economics* **6**(1-2): 55 – 75.

Auerbach, A. J. (1982). The Theory of Excess Burden and Optimal Taxation. NBER Working Paper No. 1025.

Auerbach, A. J. and Hines, J. R. (2002). Taxation and Economic Ebfficiency, *Handbook of public economics* **3**: 1347–1421.

Bach, S. (2005). Mehrwertsteuerbelastung der privaten Haushalte. Deutsches Institut für Wirtschaftsforschung (DIW), Data Documentation 10.

Bach, S., Haan, P., Hofmeister, O. and Steiner, V. (2006). Increasing the Value-Added Tax to Re-Finance a Reduction of Social Security Contributions? A Behavioral Microsimulation Analysis for Germany, DIW Berlin.

Banks, J., Blundell, R. and Lewbel, A. (1997). Quadratic Engel Curves and Consumer Demand, *The Review of Economics and Statistics* **79**(4): 527 – 539.

Bargain, O., Orsini, K. and Peichl, A. (2014). Comparing Labor Supply Elasticities in Europe and the US: New Results, *Journal of Human Resources* **49**(3): 723 – 838.

Becker, I., Frick, J. R., Grabka, M. M., Hauser, R., Krause, P. and Wagner, G. G. (2003). A Comparison of the Main Household Income Surveys for Germany: EVS and SOEP, *in* R. Hauser and I. Becker (eds), *Reporting on Income Distribution and Poverty*, Springer, Heidelberg, pp. 55–90.

Beznoska, M. and Ochmann, R. (2013). The interest elasticity of household savings: a structural approach with German micro data, *Empirical Economics* **45**: 371 – 399.

Blumkin, T., Ruffle, B. J. and Ganun, Y. (2012). Are income and consumption taxes ever really equivalent? Evidence from a real-effort experiment with real goods, *European Economic Review* **56**(6): 1200 – 1219.

Boadway, R., Marchand, M. and Pestieau, P. (1994). Towards a theory of the direct-indirect tax mix, *Journal of Public Economics* **55**(1): 71 – 88.

Böhringer, C., Boeters, S. and Feil, M. (2005). Taxation and unemployment: an applied general equilibrium approach, *Economic Modelling* **22**(1): 81 – 108.

Bönke, T., Corneo, G. and Lüthen, H. (2015). Lifetime Earnings Inequality in Germany, *Journal of Labor Economics* **33**(1): 171 – 208.

Bundesbank (2008). Preis- und Mengenwirkungen der Mehrwertsteueranhebung zum 1. Januar 2007. Monatsbericht April.

Buscher, H. S., Buslei, H., Göggelmann, K., Koschel, H., Schmidt, T. F., Steiner, V. and Winker, P. (2001). Empirical macro models under test. A comparative simulation study of the employment effects of a revenue neutral cut in social security contributions, *Economic Modelling* **18**(3): 455 – 474.

Caspersen, E. and Metcalf, G. (1993). Is a Value Added Tax Progressive? Annual versus Lifetime Incidence Measures. NBER Working Paper No. 4387.

Creedy, J. (1997). Lifetime Inequality and Tax Progressivity With Alternative Income Concepts, *Review of Income and Wealth* **43**(3): 283–295.

Creedy, J. and Duncan, A. (2005). Aggregating labour supply and feedback effects in microsimulation, *Australian Journal of Labour Economics* **8**(3): 277–290.

Cremer, H. and Gahvari, F. (1995). Uncertainty, Optimal Taxation and the Direct versus Indirect Tax Controversy, *The Economic Journal* **105**(432): 1165 – 1179.

Cremer, H., Pestieau, P. and Rochet, J.-C. (2001). Direct versus Indirect Taxation: The Design of the Tax Structure Revisited, *International Economic Review* **42**(3): 781– 799.

Dahlby, B. (2003). Restructuring the Canadian tax system by changing the mix of direct and indirect taxes, *in* H. Grubel (ed.), *Tax Reform in Canada: Our Path to Greater Prosperity*, The Fraser Institute, pp. 77 – 108.

de Mooij, R. and Keen, M. (2012). Fiscal Devaluation and Fiscal Consolidation: The VAT in troubled times. NBER Working Paper No. 17913.

Decoster, A., De Swerdt, K., Loughrey, J., O'Donoghue, C. and Verwerft, D. (2009). Comparative analysis of the distributional impact of combined changes in direct and indirect taxes and benefits for five European countries. EUROMOD AIM-AP Deliverable 3.6, University of Leuven.

Decoster, A., Loughrey, J., O'Donoghue, C. and Verwerft, D. (2010). How regressive are indirect taxes? A microsimulation analysis for five European Countries, *Journal of Policy Analysis and Management* **29**(2): 326 – 350.

Decoster, A., Ochmann, R. and Spiritus, K. (2013). Integrating Indirect Taxation into EUROMOD - Documentation and Results for Germany. EUROMOD Working Paper No. EM 20/13.

Destatis (2013). Einkommens- und Verbrauchsstichprobe – Aufgabe, Methode und Durchführung der EVS, Fachserie 15 Heft 7.

European Commission (2006). Macroeconomic Effects of a Shift from Direct to Indirect Taxation: A simulation for 15 EU Member States, *72nd meeting of the OECD Working Party No. 2 on Tax Policy Analysis and Tax Statistics*.

European Commission (2008). The Efficiency of Tax Systems: shifting taxation from labour to consumption. Note for the EPC Working Group on Quality and Public Finances.

Feil, M., Klinger, S. and Zika, G. (2006). Sozialabgaben und Beschäftigung. Simulation mit drei makroökonomischen Modellen. IAB Discussion Paper No. 22/2006.

Feil, M. and Zika, G. (2005). Less contribution, more employment? What will cutting social-security contributions accomplish?, *in* C. Dreger, H. P. Galler and U. Walwei (eds), *Determinants of employment. The macroeconomic view*, Schriften des Instituts für Wirtschaftsforschung Halle No. 22, Nomos, pp. 123 – 156.

Feldstein, M. (1978). The Welfare Cost of Capital Income Taxation, *Journal of Political Economy* **86**(2): S29 – S51.

Fritzsche, B., Kambeck, R. and von Loeffelholz, H. D. (2003). Empirische Analyse der effektiven Inzidenz des deutschen Steuersystems. Untersuchungen des Rheinisch-Westfälischen Instituts für Wirtschaftsforschung, Heft 42.

Gruber, J. (2011). *Public Finance and Public Policy*, 3 edn, Worth Publishers.

Hoynes, H. W. (1996). Welfare Transfers in Two-Parent Families: Labor Supply and Welfare Participation Under AFDC-UP, *Econometrica* **64**(2): 295 – 332.

Kohn, K. and Missong, M. (2003). Estimation of Quadratic Expenditure Systems Using German Household Budget Data, *Jahrbücher für Nationalökonomie und Statistik* **223**(4): 422 – 448.

Koske, I. (2013). Fiscal Devaluation - Can it help to boos competetiveness? OECD Economics Department Working Paper No. 1089.

Lambert, P. J. (2001). *The Distribution and Redistribution of Income*, 3 edn, Manchester University Press.

Lichter, A., Peichl, A. and Siegloch, S. (2014). The Own-Wage Elasticity of Labor Demand: A Meta-Regression Analysis. IZA Discussion Paper No. 7958.

Löffler, M., Peichl, A., Pestel, N., Siegloch, S. and Sommer, E. (2014a). Documentation IZAΨMOD v3.0: The IZA Policy Simulation Model. IZA Discussion Paper No. 8553.

Löffler, M., Peichl, A. and Siegloch, S. (2014b). Discrete Choice Labor Supply Models and Wage Exogeneity. IZA Discussion Paper No. 8281.

Mankiw, N. G., Weinzierl, M. and Yagan, D. (2009). Optimal Taxation in Theory and Practice, *Journal of Economic Perspectives* **23**(4): 147 – 174.

Marcus, J., Siegers, R. and Grabka, M. M. (2013). Preparation of Data from the New SOEP Consumption Module. DIW Data Documentation No. 70.

Martinez-Vazquez, J., Vulovic, V. and Liu, Y. (2010). Direct versus Indirect Taxation: Trends, Theory and Economic Significance, *International Studies Program Working Paper Series at AYSPS No. 1014*, International Studies Program, Andrew Young School of Policy Studies, Georgia State University.

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior, *in* P. Z. (ed.) (ed.), *Frontiers in Econometrics*, Academic Press, New York, pp. 105–142.

Meinhardt, V. and Zwiener, R. (2005). Gesamtwirtschaftliche Wirkungen einer Steuerfinanzierung versicherungsfremder Leistungen in der Sozialversicherung. DIW Politikberatung Kompakt 7.

Metcalf, G. E. (1994). Life Cycle versus Annual Perspectives on the Incidence of a Value Added Tax, *in* J. M. Poterba (ed.), *Tax Policy and The Economy*, Vol. 8, MIT Press, pp. 45 – 64.

Moscarola, F. C., Colombino, U., Figari, F. and Locatelli, M. (2015). Shifting Taxes from Labour to Property: A Simulation und Labour Market Equilibrium. IZA Discussion Paper No. 8832.

Naito, H. (2007). Atkinson-Stiglitz Theorem with Endogenous Human Capital Accumulation, *The B.E. Journal of Economic Analysis & Policy* **7**(1): 46.

O'Donoghue, C., Baldani, M. and Mantovani, D. (2004). Modelling the Redistributive Impact of Indirect Taxes in Europe: An Application of Euromod. EUROMOD Working Papers No. EM7/01.

OECD (2007). Consumption Taxes: the Way to the Future? OECD Policy Brief October 2007.

OECD (2010). Choosing a Broad Base - Low Rate Approach to Taxation. OECD Tax Policy Studies No. 19.

OECD (2014). Taxing Wages 2014. OECD Publishing.

OECD/Korea Institute of Public Finance (2014). The Distributional Effects of Consumption Taxes in OECD Countries. OECD Tax Policy Studies No. 22, OECD Publishing.

Peichl, A. and Siegloch, S. (2012). Accounting for Labor Demand Effects in Structural Labor Supply Models, *Labour Economics* **19**(1): 129–138.

Richter, W. F. and Boadway, R. W. (2005). Trading Off Tax Distortion and Tax Evasion, *Journal of Public Economic Theory* **7**(3): 361 – 381.

RWI and FiFo (2007). Der Zusammenhang zwischen Steuerlast- und Einkommensverteilung, Forschungsprojekt für das Bundesministerium für Arbeit und Soziales; Rheinisch-Westfälisches Institut für Wirtschaftsforschung and Finanzwissenschaftliches Forschungsinstitut. RWI Projektberichte.

Saez, E. (2002). The desirability of commodity taxation under non-linear income taxation and heterogeneous tastes, *Journal of Public Economics* **83**(2): 217 – 230.

Saez, E., Matsaganis, M. and Takloglou, P. (2012). Earnings Determination and Taxes: Evidence from a cohort-based payroll tax reform in Greece, *The Quarterly of Journal of Economics* **127**: 493 – 533.

Sausgruber, R. and Tyran, J.-R. (2005). Testing the Mill hypothesis of fiscal illusion, *Public Choice* **122**: 39 – 68.

Savage, M. and Callan, T. (2015). Modelling the Impact of Direct and Indirect Taxes Using Complementary Datasets. IZA Discussion Paper No. 8897.

Sørensen, P. B. (2007). The theory of optimal taxation: what is the policy relevance?, *International Tax and Public Finance* **14**(4): 383 – 406.

Steiner, V. (1996). Employment and Wage Effects of Social Security Financing. ZEW Discussion Paper No. 96-14.

Suits, D. (1977). Measurement of Tax Progressivity, *American Economic Review* **67**(4): 747–752.

Thomas, A. and Picos-Sanchez, F. (2015). Shifting from Social Security Contributions to Consumption Taxes: Analysis of the Distributional Impact for 12 EU-OECD Countries, *forthcoming in: FinanzArchiv / Public Finance Analysis* .

UN (2012). COICOP - Classification of Individual Consumption According to Purpose, `http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=5&Lg=1`.

Wagner, G. G., Frick, J. R. and Schupp, J. (2007). The German Socio-Economic Panel Study (SOEP) - Scope, Evolution and Enhancements, DIW SOEPpapers, No. 1.

A Appendix

A.1 Dual Database

The main database for IZAΨMOD is the German Socio-Economic Panel Study (SOEP), which is an annual panel study of households and individuals that was launched in 1984 as a representative cross-section of the population living in private households in Germany (Wagner et al., 2007).[20] Since then, the scope and size of the panel has been steadily extended. Special attention is given to the representativeness of the German population by explicitly oversampling foreigners and high-income households. As of now, it covers around 22,000 persons living in more than 12,000 households. Among others, IZAΨMOD exploits information on gross wages, household composition, working time, age and educational background of household members, as well as employment status and housing costs. These data serve as input for the tax and benefit module and for the labor supply estimation.

The 2010 SOEP wave is delivered with information on household consumption. The survey design implies non-response and heaping of values, which are dealt with by correction methods described in Marcus et al. (2013). However, the consumption categories do not cover all aspects of household expenditure, which justifies the additional effort of imputing information from an auxiliary source, namely the German Sample Survey of Income and Expenditure (*Einkommens- und Verbrauchsstichprobe*, EVS).[21] It is a cross-sectional survey conducted by the Federal Statistical Office that started in 1962/1963 and is repeated every five years. The most recent available wave was conducted in 2008.[22] It covers about 55,000 households, of which a 80% subsample is provided for scientific analyses (44,088 observations). The EVS data contain detailed information on every household member's employment, income from different sources and assets. Its main focus rests on expenditures for all types of commodities and services. All participants constantly keep record of their expenditures throughout a three-month period.

Although EVS and SOEP apply similar concepts of household and household income, both data sets are not fully comparable due to methodological differences.[23]

[20] In particular, we use version 29 of the Socio-Economic Panel data for years 1984–2012, `doi:10.5684/soep.v29`. We rely on data from the 2009 wave only.

[21] Non-covered items include vehicle purchases, home appliances and telephone costs.

[22] See Destatis (2013) for a detailed description of the methodology. EVS has been part of the European Household Budget Survey until 1998. It was then replaced by the another survey (*Laufende Wirtschaftsrechnungen, LWR*) which is carried out annually, but with a much smaller sample.

[23] See Becker et al. (2003) for further information on the comparability of EVS and SOEP.

Income is reported in more detail in the EVS. On the other hand, it shows weaknesses with respect to representing foreigners and high-income earners accurately. EVS does not sample households above a monthly gross income threshold of € 18,000. In addition, middle-income groups are slightly over-represented. The measurement error is probably larger in SOEP than in EVS, due to the retrospective methodology of the SOEP.

A.2 Imputation of Expenditures

Major tax shifts, as analyzed in this paper, are expected not only to affect household budgets, but also to assert substantial price changes. To capture the effect on household consumption, the first-best approach would be to fully characterize household consumer behavior by estimating a demand system (Banks et al., 1997). This is unfortunately not possible based on one cross-section due to lack of price variation. We hence follow a middle-path by estimating Engel curve relationships in a first step, with the aim to reproduce the expenditure patterns observed in EVS in the SOEP data. In a second step, we incorporate externally estimated price elasticities.

For the imputation of expenditures, we adopt the approach by Decoster et al. (2013), who carry out a parametric estimation of Engel curves. This approach is briefly outlined in the following.[24] A similar approach has recently been applied by Savage and Callan (2015).

As the EVS is based on quarterly, rather than annual data, significant singular purchases may bias the picture by yielding inappropriately high expenditure values. For this reason, we clear the EVS from households with negative disposable income. Furthermore, we drop observations where either the statistical difference between income and expenditures or the amount of durable expenditures exceeds twice the disposable income. In total, less than 1% of observations are excluded, leaving us with a sample of 43,632 households.

We classify expenditures into 16 categories; 15 non-durables and one category for durable consumption goods.[25] Durable expenditures require special treatment,

[24]The main difference to Decoster et al. (2013) is that they impute expenditures into the German EU-SILC data, which is distinct from SOEP. We do not have any reason to believe that the imputation quality should be much different when applied to SOEP, as both data sets are a comprehensive samples of the same population. Apart from that, we employ further household covariates, such as the flat size. We also do not estimate a probit model for durable commodities first, as for our choice of cells, we are left with a negligible number of zero durable expenditures. Finally, we use a tobit specification for the four expenditure groups with many zero observations.

[25] The 15 nondurable commodity classes are mostly in line with the COICOP classifications (UN, 2012). Deviations occur for household services, which encompasses items from housing (COICOP 4) and household maintenance (COICOP 5). They are defined as follows: Food and non-alcoholic

as their purchase may not be observed in the three-month window, while the actual consumption stream persists from previous periods. For this reason, we distribute total durable expenditures equally among households with identical cells, defined by seven income groups, seven age cohorts and four household types.[26] Afterwards, two Engel curves for the total of durable and non-durable consumption are estimated.[27]

$$\ln c_{ji} = \alpha_j + \beta_j \ln y_i + \gamma_j \ln(y_i^2) + \delta_j X_i + \varepsilon_{ji} \tag{A.1}$$

where j is durable or nondurable total expenditure and y_i denotes households disposable income, X_i is a vector of households characteristics contained in both data sets, such as flat size, community size, number of children in several age groups, number of working household members and geographical region. Further covariates reflect characteristics of the household head, namely age, age squared, sex, education and employment status. We further include an interaction term between y_i and household size. Note that this framework explicitly allows negative savings, as the sum for durable and nondurable expenditures may exceed y_i. Based on these estimates, the total amount of durable and nondurable expenditure can be predicted for SOEP households. As the dependent variable in Equation (A.1) is in logs, the prediction bias needs to be corrected.

In a second step, we regress 15 nondurable expenditure *shares* on the log and log squared of total nondurable consumption. This functional form is regularly used for estimating commodity demand systems. Four nondurable categories (tobacco, rents, public transport and education) exhibit a substantial share of zero expenditures, which needs to be accounted for. We therefore fit a tobit model for these $k = (1, \ldots, 4)$ categories.

$$\omega_{ki}^* = \alpha_k + \beta_k \ln c_i^{\text{nd}} + \gamma_k \ln(c_i^{\text{nd}})^2 + \delta_k X_i + \varepsilon_{ki} \tag{A.2}$$

$$\omega_{ki} = \max(0, \omega_{ki}^*) \tag{A.3}$$

The remaining $l = (1, \cdots, 11)$ shares are estimated by unrestricted OLS using c_i^{rest} as total expenditures. This is defined as total nondurable expenditures from these 11 categories: $c_i^{\text{rest}} = c_i^{nd} - \sum_{j=1}^{4} c_j$. This secures that predicted shares sum up

beverages; alcoholic beverages; tobacco; clothes and shoes; home fuels and electricity; rents; household services; health; private transport; public transport; communication; recreation and culture; education; restaurants and hotels; other expenditures. Durable consumption entails, among others, expenditures on furniture, home appliances, means of transport and household entertainment.

[26] This approach follows Beznoska and Ochmann (2013). Income and age groups are defined by quantiles within household types. The mean number of observations per cell is 324, with a minimum of 17.

[27] All estimations are carried out using sample weights; monetary amounts are in monthly terms.

to one.

$$\omega_{li} = \alpha_l + \beta_l \ln c_i^{\text{rest}} + \gamma_l \ln(c_i^{\text{rest}})^2 + \delta_l X_i + \varepsilon_{li} \tag{A.4}$$

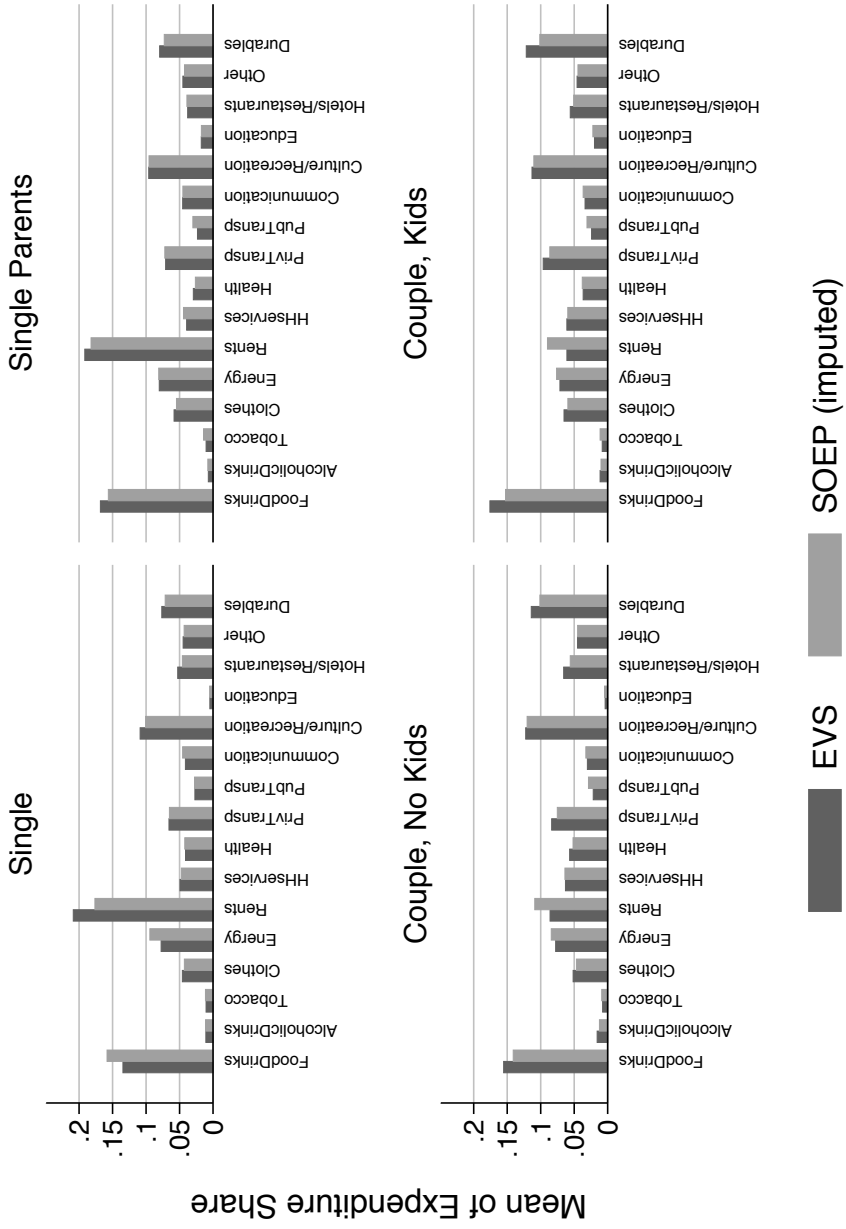
Based on these estimates, the 15 nondurable consumption shares $\widehat{\omega_{mi}}, m = (1, \ldots, 15)$ can be predicted based on imputed total amounts $\widehat{c_i^{nd}}$ and $\widehat{c_i^{rest}}$. For the tobit models, we predict the unconditional expenditure and assign a lower limit of zero. For the standard OLS estimates, negative predicted values occur in few cases. These amount however to single-digit values and are set to zero. The remaining expenditures are then corrected such that they sum up to one.

The accuracy of the matching procedure is evaluated in Figure A.1, comparing the mean expenditure share for each of the 16 categories, separately for four types of household composition (Single, Single Parents, Couples, Families with children). As can be seen, the major expenditure items are durable commodities, food and drinks, rents and culture and recreation. All observed expenditure shares are replicated in SOEP with minor deviations not exceeding two percentage points. Rents are the only group with larger deviations. This is however a minor issue for the accuracy of the imputed VAT burden, as the average VAT rate for this particular group is only 3.7%. One problem with our procedure may arise for top-income earners, as there are none in EVS (see Section A.1). As a consequence, their imputed VAT burden might be wrong if their expenditure behavior cannot be described by extrapolation from lower income groups. The direction of this bias is however not clear.

In order to allow household expenditures to react to price increases, we have to incorporate external estimates on the price elasticities of demand. To our knowledge, the only estimation of a full demand system based on EVS is provided by (Kohn and Missong, 2003). We make use of their own-price elasticities, differentiated by six household types (Table 5) while using the mean value over all income levels.[28] When simulating the tax reforms, the Engel curve estimations are used to depict consumption reactions from changing disposable income. Afterwards, the reaction due to prices is calculated.

[28]The authors were not able to identify cross-price elasticities.

Figure A.1: Mean Expenditure shares in both data sets



Calculation of VAT payments. In order to identify the consumption shares of goods with different VAT rates, we make use of the weighting scheme applied by the German Federal Statistical Office for capturing price level changes (the so-called "representative basket of products"). As an example, non-alcoholic drinks (taxed with the standard rate) are assigned a weight of 9.3% of total expenditures in expenditure category 1 (food and beverages). Therefore, 9.3% of this consumption component is allotted the standard VAT rate, while the rest is taxed with the reduced rate.

The treatment of VAT-exempted commodities for which no input tax deduction can be claimed deserves special attention. Despite their revenues being formally exempted, it is reasonable to assume that firms shift a certain share of their input tax burden to consumers through increased prices. The most notable case of exempted goods are rents. Landlords might be able to charge higher rents in order to compensate for taxes paid in connection to restorations or construction works. The extent to which this occurs is however hard to estimate, as the possibility to increase rents is restricted and depends on local market characteristics. Hence, there is no agreement in the literature on the extent to which rents are burdened with VAT.[29] Following RWI and FiFo (2007), we assume that 11% of expenditures on rents are subject to the standard VAT rate. This rather low assumption can be justified in light of the overall (rather short) time horizon of our model. Similar incidence assumptions are made for medical and financial services. Table A.1 depicts the resulting VAT rate shares by consumption category.

The corresponding distribution of VAT payments is visualized in Figure A.2. In line with other studies (OECD/Korea Institute of Public Finance, 2014), we clearly confirm a regressive pattern of the German VAT. As income rises, the VAT share of disposable income decreases from 12% for the first decile to 4% for decile 10, which is below OECD average. With regard to expenditures, the pattern is rather flat, the VAT burden ranging between 9% and 10%.

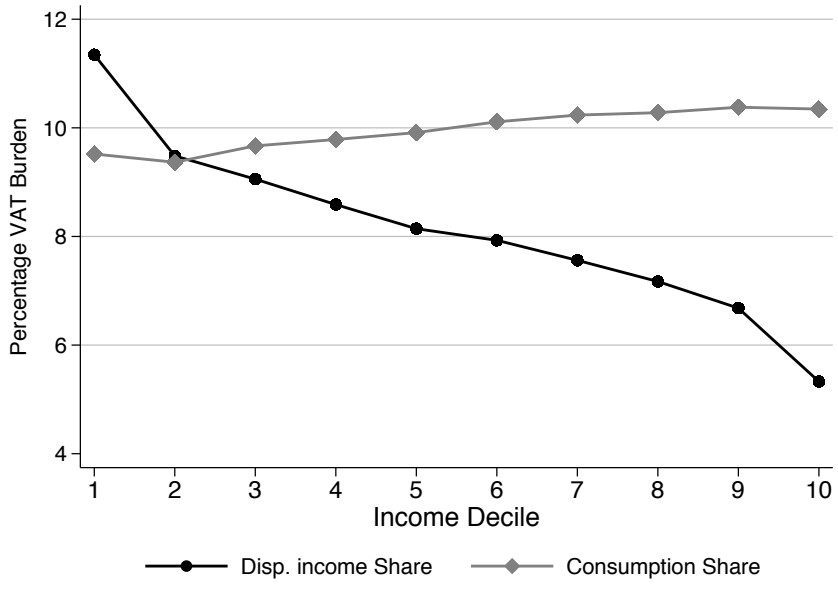
[29] See RWI and FiFo (2007), Fritzsche et al. (2003) and Bach (2005).

Table A.1: VAT Shares by Expenditure categories

	Expenditure category	Average Share of Total Expenditures	Share of VAT 0% (%)	Share of VAT 7% (%)	Share of VAT 19% (%)
1	Food and beverages	16.3	—	90.7	9.3
2	Alcoholic Beverages	1.3	—	—	100.0
3	Tobacco	0.9	—	—	100.0
4	Clothing and footwear	5.6	—	—	100.0
5	Household Fuels, Energy	8.0	—	15.6	84.4
6	Rents	11.8	80.3	—	19.7
7	Household Services	2.5	—	36.2	63.8
8	Health	4.6	43.2	16.2	40.6
9	Private Transport	8.5	—	—	100.0
10	Public Transport	2.5	5.0	57.0	38.0
11	Communication	3.7	—	7.4	92.6
12	Recreation and culture	11.9	9.4	33.4	57.2
13	Education	1.0	92.4	—	7.6
14	Restaurants and hotels	6.0	—	70.2	29.8
15	Other goods and services	4.7	30.6	—	69.4
16	Durable commodities	10.8	20.2	2.4	77.4
	Total	**100.0**	**17.3**	**27.8**	**55.0**

Source: Own calculations.

Figure A.2: VAT incidence



Own calculations with IZAΨMOD v.3.0.4. Income Deciles are computed using equivalence-weighted household incomes.

A.3 Tax-Benefit and Labor Supply Modules

We calculate household disposable income from gross income and household characteristics from the SOEP data by means of a tax-benefit calculator. It reproduces the regulations of the system of direct taxes, social security contributions and benefits in Germany. As the latest available EVS wave is from 2008, we apply the legal status of that year.

In the last decades, VAT has become the main source of revenue for the German government. VAT and income tax together nowadays account for about two thirds of total tax revenues. The personal income tax is designed progressively, with a rate of 14% for incomes just above the basic allowance and with a top marginal rate of 42%.[30] Social security contributions, in contrast, are calculated as a constant share of labor income until an upper threshold is reached. SSC payments are, in general, equally split between employer and employee.[31] Civil servants and self-employed do generally not contribute to the public social welfare system.

At the core of our microsimulation approach, a behavioral labor supply module estimates preference parameters for the optimal choice between leisure time and disposable income on the household level. The household decision is implemented following the discrete choice household labor supply model (see Löffler et al., 2014b, for technical details on discrete choice modelling). In case of couple households, it assumes a joint utility function for both spouses. The model is discrete in the sense that a household n can choose between a finite number of combinations in consumption and leisure, denoted with J_n. We restrict the choice set to seven time categories of weekly working hours $(0, 10, 20, 30, 40, 50, 60$ hours). For households that are flexible in their labor supply decision, this results in seven alternatives for singles and couples with one flexible spouse.[32] For couples with two flexible spouses, the choice set expands to 49 alternatives. In addition we further expand the choice set in order to account for an endogenous decision on whether or not to apply for public benefits (Hoynes, 1996). This way, we address the potential presence of welfare stigma. We specify the utility U for every choice alternative

[30] In addition, a so-called *solidarity surcharge* is levied, amounting to 5.5% of the total income tax burden. For earners of income above € 250,000 per year, a marginal tax rate of 45% is applied. In 2008, capital income was taxed the same way as earnings before introducing a dual income tax regime in 2009.

[31] In 2008, the following rates apply for employees (overall): Old Age Pension Insurance: 9.95% (19.8%); Health Insurance: 7.9% (14.9%); Unemployment Insurance: 1.65% (3.3%); Care Insurance: 0.85% (1.7%).

[32] Self-employed persons and civil servants are assumed inflexible in their choice of labor supply. Even though they might adjust their labor supply, we assume that it is based their consumption/leisure decision follows a different rationale than those of employees. Hence, we treat their labor supply as fixed.

$j \in J_n$ as a function of household consumption C_{nj} (after subtracting consumption taxes), leisure of the spouses $L_j^s, s \in \{m, f\}$ and a dummy for welfare participation P_{nj}.[33]

$$\begin{aligned} U\left(C_{nj}, L_j^m, L_j^f, P_{nj}\right) = & \boldsymbol{x_{nj}^1}\boldsymbol{\beta_1'} \ln C_{nj} + \beta_2(\ln C_{nj})^2 + \beta_3 \ln C_{nj} \ln L_j^m + \beta_4 \ln C_{nj} \ln L_j^f \\ & + \boldsymbol{x_{nj}^2}\boldsymbol{\beta_5'} \ln L_j^m + \beta_6(\ln L_j^m)^2 + \boldsymbol{x_{nj}^3}\boldsymbol{\beta_7'} \ln L_j^f + \beta_8(\ln L_j^f)^2 \\ & + \delta' P_{nj} + \boldsymbol{x_{nj}^4}\boldsymbol{\gamma'} + \varepsilon_{nj} \end{aligned} \tag{A.5}$$

Leisure follows directly from working hours, assuming a time endowment of 80 hours per week. Disposable income for counterfactual choice categories are calculated by keeping hourly wages constant. The vectors $\boldsymbol{x_{nj}^1}$ to $\boldsymbol{x_{nj}^4}$ capture individual and household characteristics, such as age, number of children, handicap status and the presence of a needy person in the household. By interacting them with leisure and consumption, we account for observed heterogeneity.[34] The parameter δ captures welfare stigma. The vector $\boldsymbol{x_{nj}^4}$ contains dummies on part-time and full-time work. The hence reflect market restrictions due to working hours regulations. Equation A.5 simplifies for the case of single households, as leisure of the second person and interactions thereof are dropped.

Under the assumption that the error term ε_{nj} in Equation A.5 follows an extreme value type I distribution, McFadden (1974) showed that the probability of household n to choose alternative i over all other alternatives can be expressed as follows:

$$P\left(U_{ni} > U_{nj}, \forall j \neq i\right) = \frac{\exp\left(\varphi\left[C_{ni}, L_{ni}^f, L_{ni}^m\right]\right)}{\sum_{s \in J_n} \exp\left(\varphi\left[C_{ns}, L_{ns}^f, L_{ns}^m\right]\right)} \tag{A.6}$$

The term φ captures the observed part of the utility function A.5. The structural utility parameters can be obtained by estimating equation A.6 via maximum likelihood. Results are given in Table A.2. Based on these estimates, the individual reactions following a change in households' net income can be simulated. This is done by predicting the choice probabilities for each working time category under the old and the new regime. Labor supply for each household is then obtained by multiplying predicted probabilities with the respective amount of hours. The presented reform effects should thus be interpreted as an expected value of supplied hours. A similar logic applies to income amounts. The simulated labor supply elasticities are

[33] As Löffler et al. (2014b) demonstrate, the type of utility function is of minor importance for the implied elasticity of labor supply.

[34] We assume the coefficients β_1 to β_8 to be fixed. Assuming some of these to be random would allow for unobserved heterogeneity, but this is particularly more burdensome in terms of computation.

in line with extant micro-based literature and range from 0.1 for single men to 0.3 for women in couples (see Table 4 in (Löffler et al., 2014a)).

Table A.2: Estimates of structural labor supply model

	(1) SingleM	(2) SingleF	(3) CoupleM	(4) CoupleF	(5) CoupleMF
C	-5.725***	-2.607	3.512*	-1.907	2.391*
	(1.360)	(1.460)	(1.451)	(1.564)	(1.037)
C^2	0.199***	0.197***	0.172***	0.118*	0.221***
	(0.0290)	(0.0303)	(0.0399)	(0.0516)	(0.0165)
$C\times$					
Age_m	0.0413		0.0475		0.0866*
	(0.0291)		(0.0580)		(0.0348)
Age_m^2	-0.000516		-0.000351		-0.00103**
	(0.000337)		(0.000744)		(0.000371)
Handc_m	-0.100		0.789		0.208
	(0.116)		(1.354)		(0.242)
Age_f		0.0958*		0.214*	-0.0336
		(0.0396)		(0.105)	(0.0386)
Age_f^2		-0.00112*		-0.00251*	0.000464
		(0.000480)		(0.00126)	(0.000434)
Handc_f		-0.322*		-0.359	0.0612
		(0.161)		(0.399)	(0.200)
Care		-0.301		-0.745	-0.0971
		(0.231)		(0.417)	(0.159)
Child $\leq$ 2y		0.441		0.0448	0.217
		(1.020)		(1.581)	(0.260)
Child 3–6y		0.132		-0.138	-0.0403
		(0.369)		(1.066)	(0.138)
Child 7–16y		0.376		0.826	-0.00863
		(0.217)		(0.570)	(0.0730)
$C \times L_1$	0.943***	-0.00331	-1.274***	-0.522*	-0.894***
	(0.246)	(0.272)	(0.233)	(0.205)	(0.125)
L_1	18.96***	23.20***	55.75***	22.64***	47.04***
	(4.312)	(4.456)	(4.862)	(3.542)	(2.641)
$(L_1)^2$	-3.095***	-2.073***	-6.586***	-1.884***	-5.452***
	(0.459)	(0.396)	(0.597)	(0.356)	(0.261)
$L_1\times$					
Age_m	-0.241**		-0.0361		-0.205***
	(0.0773)		(0.0868)		(0.0451)
Age_m^2	0.00297**		0.000845		0.00262***
	(0.000929)		(0.00100)		(0.000518)
Handc_m	1.844***		0.683		0.508
	(0.458)		(1.046)		(0.314)
Age_f		-0.424***		-0.269**	
		(0.0837)		(0.0932)	
Age_f^2		0.00582***		0.00396***	
		(0.00103)		(0.00108)	
Handc_f		-0.103		0.365	
		(0.544)		(0.555)	
Care		4.369**		-0.170	
		(1.342)		(0.623)	
Child $\leq$ 2y		2.393		1.421	
		(1.239)		(0.900)	

Child 3–6y		2.166***		2.008***	
		(0.489)		(0.568)	
Child 7–16y		1.353***		1.118***	
		(0.240)		(0.246)	
$C \times L_2$					-0.192
					(0.147)
L_2					18.16***
					(2.657)
$(L_2)^2$					-1.899***
					(0.221)
$L_2\times$					
Age_f					-0.221***
					(0.0518)
Age_f^2					0.00352***
					(0.000632)
Handc_f					0.434
					(0.393)
Care					1.433**
					(0.487)
Child $\leq$ 2y					3.380***
					(0.394)
Child 3–6y					1.694***
					(0.188)
Child 7–16y					1.148***
					(0.0935)
$L_1 \times L_2$					0.451*
					(0.181)
Dummy Variables					
Work_m	-4.460***		-6.851***		-5.773***
	(0.380)		(0.586)		(0.239)
Parttime_m	0.135		0.834*		0.199
	(0.260)		(0.418)		(0.190)
Fulltime_m	0.928***		1.148***		1.145***
	(0.0946)		(0.116)		(0.0510)
Benefit Takeup	-1.052***	-0.992***	-1.789***	-1.448***	-1.619***
	(0.186)	(0.114)	(0.215)	(0.230)	(0.0928)
Work_f		-1.292***		-1.259***	-1.039***
		(0.186)		(0.153)	(0.0849)
Parttime_f		-0.0593		0.370***	-0.0177
		(0.117)		(0.0975)	(0.0593)
Fulltime_f		0.968***		0.704***	0.806***
		(0.0842)		(0.101)	(0.0574)
N	8237	12133	6405	8397	205897
AIC	2707.9	4249.2	2225.9	4001.8	21022.9

Own estimations with IZAΨMOD v.3.0.4based on SOEP 2009. Standard errors in parentheses * ($p<0.05$), ** ($p<0.01$), *** ($p<0.001$). Columns (3) and (4) encompass men and women respectively with a non-flexible spouse (due to retirement, self-employment or disability). The choice contains 7 choices for weekly hours in the first 4 columns, and 49 choices in the last column. The choice set is further expanded to allow for endogeneity of benefit take-up. L_1 and L_2 indicate leisure of the first and the second adult in the household respectively. Handicap indicates a handicap degree $\geq$ 50. Care indicates the presence of a person in need of care in the household. Household utility is specified as translog (Equation A.5.). AIC = Akaike Information Criterion.