Int Tax Public Finance (2008) 15: 620–636
DOI 10.1007/s10797-008-9071-2

POLICY WATCH

Is a flat tax reform feasible in a grown-up democracy of Western Europe? A simulation study for Germany

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Published online: 24 April 2008

Abstract The success of the flat rate income tax in eastern Europe suggests that this concept could also be a model for countries of western Europe. The present paper uses a simulation model to analyze the effects of revenue neutral flat rate tax reforms on equity and efficiency for the case of Germany. We find that a flat rate tax with a low tax rate and a low basic allowance yields positive static welfare effects amounting to approximately 1.8% of income tax revenue but increases income inequality. The increase in income inequality can be avoided by combining a higher tax rate with a higher basic allowance. But in this case, the efficiency gains vanish. We conclude that due to their limited efficiency effects and their problematic distributional impact, flat tax reforms are unlikely to spill over to the grown-up democracies of western Europe.

Keywords Flat Tax reform · Equity · Efficiency · Distribution · Welfare

JEL Classification D31 · D60 · H20

1 Introduction

For a long period of time, flat rate income taxes only existed in tax havens like Hong Kong or the Channel Islands. But during the last decade, the flat tax idea has been

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remarkably successful in eastern Europe. Since its introduction in Estonia in 1994, several countries followed suit. In 2007, there were altogether 22 countries in the world with flat tax systems, half of them in eastern Europe.[1] This development has not yet reached the grown-up democracies of "Old Europe." Nevertheless, flat rate taxes are high on the political agenda in various western European countries. If the flat tax continues creeping up to the West, geographically, Germany would be the next and the first western country to adopt a flat tax. Recently, the council of economic advisors to the ministry of finance proposed a flat rate tax for Germany.[2]

The introduction of flat rate tax systems is widely seen as a reform which may boost efficiency, employment, and growth through simplification and better incentives. But at the same time, inequality is expected to increase. In the discussion of the flat tax "a notable and troubling feature [...] is that it has been marked more by rhetoric and assertion than by analysis and evidence."[3] Given that flat taxes have not yet been implemented in western countries, the effects of flat tax reforms in these countries can only be studied on the basis of simulation models.

This paper provides a simulation analysis of the economic effects of flat tax reforms for Germany. We study both equity and efficiency effects, and we do so within the same microeconometric framework. For reasons explained further below, we focus on two flat rate tax systems, which differ in the tax rate and the basic allowance. Both are revenue neutral and the parameter values are chosen as follows: The first flat tax holds constant the existing basic allowance (7664 Euros). Revenue neutrality then implies a tax rate of 27%. The second flat tax we consider is constructed so that the inequality of after tax incomes as measured by the Gini coefficient remains constant. This requires a rather high tax rate (32%) and, accordingly, a large basic allowance (10 700 Euros).[4] Our analysis is based on a simulation model for the German tax and transfer system (FiFoSiM) using income tax microdata and household survey data. With its socioeconomic and demographic structure, Germany can be seen as a typical western European democracy. Therefore, the qualitative results of our analysis are of interest to a wider range of countries.[5]

The simulation analysis yields the following results: The low tax rate reform does have positive efficiency effects, but these effects are quite small. The welfare gain equals 1.8% of overall income tax revenue and employment increases by 0.3%. However, this rather modest efficiency gain comes at the cost of an increase in income inequality. In particular, the top income decile benefits while the upper middle class suffers losses. The number of losers exceeds the number of winners. The second scenario, the high tax rate reform, by definition avoids a change in (Gini) income in-

[1] C.f. Nicodeme (2007), Mitchell (2007) and Keen et al. (2007).

[2] C.f. Wissenschaftlicher Beirat beim Bundesministerium der Finanzen (2004). Furthermore, the reform proposals of Kirchhof (2003) and Mitschke (2004), which have been controversially discussed before the election in 2005, include (almost) flat schedules.

[3] Keen et al. (2007), p. 3.

[4] This choice of tax parameters follows the systematic approach developed by Davies and Hoy (2002), which will be explained further below.

[5] It has to be taken into account, though, that the structures of the tax benefit systems do vary considerably among the countries of Western Europe.

equality. But the higher tax rate reduces efficiency gains. Employment remains constant and the aggregate welfare effect is also close to zero. Again, the households in the top income decile benefit at the cost of the upper middle class. A difference to the low tax rate reform is that households in the six lowest income deciles also benefit, albeit not very much. These results suggest that flat tax reforms cannot avoid the fundamental equity efficiency trade-off which dominates the tax policy debate.

The setup of the paper is organized as follows: Section 2 reviews the empirical literature on flat rate tax reforms. Section 3 describes our reform scenarios. Section 4 provides a short description of our model and the database. Section 5 presents the efficiency effects in terms of effective marginal tax rates, labour supply reactions and welfare effects. Section 6 illustrates the distributional effects in terms of inequality, polarisation, winners and losers. Section 7 concludes.

2 Economic effects of flat tax reforms in the literature

The introduction of a flat tax with a basic tax allowance, a low uniform marginal tax rate, and a broad tax base is supposed to have several advantages. Most importantly, positive effects on employment and GDP and reduced tax distortions are expected.[6] In the literature, there are several studies on efficiency and equity aspects of flat tax reforms. One focus of these studies is the impact on employment and growth. Browning and Browning (1985) estimate an increase in labor supply in the US by 5%, whereas Heer and Trede (2003) simulate an increase in employment by 2% in Germany using a macro data CGE model. Cajner et al. (2006) use a CGE model for Slovenia to simulate several tax reform scenarios. They find that in general, progressive tax systems yield better results in terms of welfare than flat tax regimes, but some flat tax scenarios might perform better in terms of growth and employment. A second group of studies focuses on the distributional effects of flat tax reforms. Ho and Stiroh (1998), Dunbar and Pogue (1998), and Ventura (1999) show for the US that high income households are relieved, whereas especially middle income households are burdened by a flat tax reform. Altig et al. (2001) conclude that the lowest income households lose through a flat tax.

There is a number of studies simulating the impact of flat tax reforms in other European countries. Although these studies partly use different methods and approaches, it is interesting to compare their results to our findings. In a study for the Netherlands, Caminada and Goudswaard (2001) derive the result that a flat tax would yield redistribution at the expense of the lowest income deciles, but the magnitude of these effects is quite small. Jacobs et al. (2007) analyze flat tax reforms on the basis of a computable general equilibrium model calibrated for the Netherlands. They also compare a scenario with a low flat rate and a low basic allowance to a scenario where these two parameters are high. Both reforms are revenue neutral. A difference to the German situation is that social security contributions are integrated into the

[6] Moreover, Mirrlees (1971) simulated the optimal tax schedule being close to linearity. More recent work on optimal income taxation has shown that this result is not very robust (see, e.g., Tuomala 1990), but there is no clear case for a schedule with increasing marginal tax rates either.

income tax system. This explains why the tax rate in the first bracket is already quite high (34.15%). The low flat rate scenario is one with an unchanged tax credit and a flat rate of 37.5%. This reform increases inequality because taxes on low incomes increase whereas high income earners benefit. There are positive effects on employment, which increases by 1.4%.[7]

In the second scenario, the general tax credit is higher and the flat rate is equal to 43.5%. Now, low incomes benefit, due to the higher tax credit, and very high incomes also benefit, even though their gains are smaller than in the low tax scenario. Middle income households, however, face an increasing tax burden. Aggregate inequality as measured by the Theil index remains unchanged, but labor supply and employment fall. These results are qualitatively similar to our findings, although the structures of the income tax systems are rather different in the two countries.[8] A difference in results is that the effects on labor supply in the low rate scenario are larger than in our simulation, where labor supply only increases by 0.3%. The larger employment effect can at least partly be attributed to the effect of lower tax rates on training, an aspect which is neglected in our simulation, where skills are taken as given.

The finding that flat rate reforms with low tax rates and low tax credits or allowances yield gains in work incentives, employment and output, but only at the cost of significant redistribution in favor of the highest incomes, is in line with simulation studies for the United Kingdom (Adam and Browne 2006), Belgium (Decoster and Orsini 2007), Finland (Kuismanen 2000)[9] and Spain (González-Torrabadella and Pijoan-Mas 2006).[10] Benedek and Lelkes (2007) simulate a flat tax reform for Hungary. They do not consider work incentives but also find that the reform would lead to a sharp increase in after tax income inequality. Overall, these results are broadly in line with our findings. This suggests that the case of Germany is to some extent representative for other western European countries.

The present paper differs from the existing literature mainly by analyzing the distributional effects as well as the effects on welfare and employment in a uniform microeconometric simulation model. Furthermore, we apply a systematic approach for choosing the flat tax parameters which is described in the following section.

[7] An interesting difference in results is that Jacobs et al. (2007) find a decrease in the female participation rate in the low rate scenario whereas we find an increase. A possible explanation for this difference is that Germany has a system of joint taxation of couples (see the discussion in Sect. 6.2), whereas the Netherlands have a system of individual taxation (moderated by transferability of tax credits).

[8] In particular, social security contributions are not integrated into the income tax system in Germany, and our tax reform experiment assumes that these contributions are unchanged.

[9] This study considers a reduction of the marginal tax rates in the two highest brackets from 44% and 37% to 35%, while the rest of the tax schedule remains unchanged. This reform increases labor supply by 4.5% and raises the after tax incomes of the three highest income deciles. Since the reform is not revenue neutral (income tax revenue declines by 13%), the results are not directly comparable to those derived in studies of revenue neutral reforms.

[10] The findings in González-Torrabadella and Pijoan-Mas (2006) differ from the other country studies in the magnitude of the simulated efficiency gains. While most studies find rather small gains, their model predicts an increase in output by more than 5%. They argue that this is driven mostly by an increase in capital formation, not in employment.

3 Flat Tax scenarios

Flat rate tax systems may differ considerably in their design. A "flat tax" in the literal sense is a uniform tax rate on the entire tax base.[11] Usually, a flat rate personal income tax is regarded as an indirectly progressive tax schedule with a basic tax allowance and a uniform marginal tax rate. The most popular flat rate tax proposal is the "Flat Tax" of Hall and Rabushka (1995), which has not been implemented in its pure form yet. This proposal combines a flat rate income tax with a cash flow tax on business profits. In the following, we consider reforms of the income tax schedule (tax rate(s) and basic allowance). We abstract from reforms of the tax base.[12] In particular, existing flat rate tax systems do not use cash flow taxes on corporate tax systems.

For the selection of our reform scenarios, we choose a systematic approach (see also, Paulus and Peichl 2007). Davies and Hoy (2002) demonstrate the existence of critical flat tax rates for revenue neutral tax reforms replacing a graduated rate tax with a flat rate tax (while keeping the tax base unchanged) such that compared to the graduated rate tax after-tax income inequality is:

- Higher according to any inequality index for any flat tax rate equal to or below a lower bound, $t \leq t_F^l$.
- Lower according to any inequality index for any flat tax rate equal to or above an upper bound, $t \geq t_F^u$.
- The same for a given inequality index at a certain flat tax rate, $t = t_F^* \in (t_F^l, t_F^u)$.

This applies to any inequality measure satisfying the Pigou–Dalton principle of transfers under the assumption that behavior is not affected by tax system changes. The lower bound corresponds to a flat tax rate where the personal allowance is fixed, i.e., is at the same level as for the prereform graduated rate tax. The upper bound determines that a person with the highest income pays the same tax under each scheme. The critical value between those boundaries cannot be determined a priori as it depends on the chosen inequality index.

We analyze two different revenue neutral flat rate tax reform scenarios which vary in the marginal tax rate and the basic tax allowance.[13] The first scenario (LL = low tax rate, low allowance) keeps the basic allowance of the current tax schedule constant and, therefore, corresponds to the lower bound t_F^l. In the second scenario (HH = high tax rate, high allowance) we choose a higher marginal rate (and basic allowance) such that the Gini index of inequality remains unchanged (corresponding to the critical

[11] At present, this form of a flat rate (personal income) tax is implemented only in Georgia.

[12] An earlier version of this paper included various measures to broaden the tax base (see Fuest et al. 2007). The results were qualitatively similar to the results derived here. Furthermore, to be able to apply the approach of Davies and Hoy (2002) as described further below, it is necessary for the flat tax to have the same tax base as the progressive rate schedule.

[13] We do not report the results for the upper bound here because such a scenario requires a marginal rate of about 45%. Such a reform is not discussed under the heading of flat tax reforms, and it would give rise to negative effects on welfare and employment while reducing inequality per definition.

Table 1 Reform scenarios

	Tax schedule parameters					
	G	M	S	t_e	t_m	t_s
2007	7664	12739	52151	0.15	0.2397	0.42
LL		7664		0.269		
HH		10700		0.319		

value t_F^*).[14] The premise of ex ante revenue neutrality is chosen for a better comparability of the different scenarios.[15]

Table 1 presents the parameter values for the two scenarios in comparison to the status-quo. One speciality of the German tax law is that Germany is the only country in Europe which uses a fairly complex tax schedule formula with steadily increasing marginal tax rates instead of piecewise linear brackets.[16]

4 FiFoSiM: database and model

Our analysis is based on a behavioral microsimulation model for the German tax and transfer system (FiFoSiM) using income tax and household survey microdata. The approach of FiFoSiM is innovative insofar as it creates a dual database using two microdata sets for Germany: FAST01 and GSOEP.[17] FAST01 is a microdataset from the German federal income tax statistics 2001 containing the relevant income tax data of nearly 3 million households in Germany. Our second data source, the German Socio-Economic Panel (GSOEP), is a representative panel study of private

[14] It would also be possible to construct this scenario with any other measure of inequality satisfying the Pigou–Dalton principle of transfers. Extensive sensitivity analyses with measures of the generalized entropy family (including both Theil coefficients) yield similar results in qualitative terms with respect to the flat tax parameters and, therefore, the economic effects. We chose the Gini coefficient as it is probably the most popular inequality measure used in the literature.

[15] If the scenarios were chosen to be revenue neutral ex-post, i.e., after labor supply reactions, the marginal tax rates could be lower (higher) in case of increasing (decreasing) labor supply but the underlying research question would be different. Our aim is to analyze scenarios that are equal ex-ante and to reveal the ex-post differences by analyzing the economic effects of the scenarios in terms of equity and efficiency.

[16] The German income tax formula is given by

$$T(x) = \begin{cases} 0 & \text{if } x \le G \\ (\frac{t_m - t_e}{2(M-G)}(x-G) + t_e)(x-G) & \text{if } G < x \le M \\ (\frac{t_s - t_m}{2(S-M)}(x-M) + t_m)(x-M) + (M-G)\frac{t_m + t_e}{2} & \text{if } M < x \le S \\ t_s(x-S) + \frac{t_s + t_m}{2}(S-M) + \frac{t_m + t_e}{2}(M-G) & \text{if } x > S \end{cases}$$

where x indicates the tax base, $T(x)$ the tax payment, G is the basic personal allowance, M the upper limit of the first progression zone, S the lower limit applicable to the top rate t_s, t_e the lowest tax rate and t_m the highest tax rate of the lower progression zone (i.e., the lowest tax rate of the upper progression zone).

[17] In the last years, several tax benefit microsimulation models for Germany have been developed (see, for example, Peichl 2005 or Wagenhals 2004). Most of these models use either GSOEP or FAST data. FiFoSiM is so far the first model to combine these two databases.

households in Germany. The simultaneous use of both databases allows for the imputation of missing values or variables in the other dataset using techniques of statistical matching.

The layout of the tax benefit module follows several steps: First, the database is updated using the static aging technique which allows controlling for changes in global structural variables and a differentiated adjustment for different income components of the households. Second, we simulate the tax and benefit system in 2007 using the uprated data. This allows us to compute the disposable incomes for each person and household taking into account the detailed rules of the complex tax benefit system. The basic steps for the calculation of the personal income tax under German tax law are as follows. The income of a taxpayer from different sources is allocated to the seven forms of income defined in the German income tax law. For each type of income, the tax law allows for certain specific income related expenses. Then general deductions like contributions to pension plans or charitable donations are taken into account and subtracted from the sum of incomes, which gives taxable income as a result. Finally, the income tax is calculated by applying the tax rate schedule to taxable income. To derive the disposable income Y from gross income G, received benefits (like unemployment benefit, social assistance, child benefits, etc.) are added and taxes T and social insurance contributions S are subtracted:

$$Y = G + B - T - S$$

The modeling of the tax and transfer system uses the technique of microsimulation.[18] FiFoSiM computes individual tax payments for each case in the sample considering gross incomes and deductions in detail. The individual results are multiplied by individual sample weights to extrapolate the fiscal effects of the reform with respect to the whole population. After simulating the tax payments and the received benefits, we can compute the disposable income for each household. Based on these household net incomes, we estimate the distributional and the labor supply effects of the analyzed tax reforms. For the econometric estimation of labor supply elasticities, we apply a discrete choice household labor supply model.

Following Van Soest (1995), we apply a structural discrete choice household labor supply model. In the standard continuous model (see Hausman 1985), labor supply responds along the intensive margin: an infinitesimal change of the marginal tax rate changes the working hours only a little, whereas participation responses cannot be satisfactorily analyzed within this framework (Blundell and MaCurdy 1999). Discrete choice labor supply models allow to analyze both the extensive (participation) and the intensive (hours worked) labor supply decision within the same modeling framework (Blundell and MaCurdy 1999; Van Soest and Das 2001; Van Soest et al. 2002). The intensive decision depends on the effective marginal tax rate, whereas the extensive participation decision depends on the tax wedge between gross (pretax) labor costs and the after-tax net income of workers (see Kleven and Kreiner 2003).

The continuous model "appears not to capture the data, in the sense that the number of part-time jobs is strongly overpredicted" (Van Soest 1995). There seems to be

[18] Cf. Gupta and Kapur (2000) or Harding (1996) for an introduction to the field of microsimulation.

Table 2 Estimated labor supply elasticities

	Married male	Married female	Single male	Single female
Participation	0.14	0.15	0.17	0.13
Working hours	0.20	0.38	0.28	0.28

Source: Own calculations based on FiFoSiM

a lack of part-time jobs because of fixed costs of hiring workers or increasing returns to scale of the worker's production. Furthermore, because of fixed costs of working (Cogan 1981), individuals are not willing to work below a minimum number of hours. In addition, there are working time regulations that limit the number of possible working hours to a discrete set. Therefore, a discrete choice between distinct categories of working time seems to be more realistic than a continuum of infinitesimal choices. Using a discrete choice labor supply model has also the advantage to model nonlinear budget constraints as a result of, for example, nonlinear taxes, joint filing, and unemployment benefits (see MaCurdy et al. 1990; Van Soest 1995 or Blundell and MaCurdy 1999). Furthermore, a richer stochastic specification in terms of unobserved wage rates of nonworkers and random preferences can be incorporated into a discrete choice model.

After estimating the coefficients of the conditional logit model, the labour supply elasticities can be derived with respect to a 1% change in gross wages. Following the method of McDonald and Moffitt (1980), the total hours effect can be decomposed into a working hours effect (i.e., the change in working hours of currently employed people) and a participation effect (i.e., the change in labor force participation). The results are summarized in Table 2. The elasticity of labor market participation (extensive margin) is close to 0.15, whereas the elasticities with respect to working hours (intensive margin) are slightly larger. These results are in line with other findings for Germany.[19]

The computation of welfare measures is another important aspect for the evaluation of efficiency effects of tax reforms. Several methods and measures have been developed in the vast literature on welfare economics.[20] The empirical application of these methods mostly focuses on the ex-post evaluation of consumer demand using time-series data from before and after a tax reform. Creedy and Kalb (2006) propose a method for the ex ante analysis of the effects of tax reforms on the labor-leisure decision. Following this method, we compute the changes in the equivalent variation as a money metric welfare measure based on the microeconometrically estimated utility function of the labor supply model described in the Appendix. The equivalent variation EV_i for each individual i can be expressed as:

$$\mathrm{EV}_i = E_i\left(p^0, U_i^0\right) - E_i\left(p^0, U_i^1\right) = E_i\left(p^1, U_i^1\right) - E_i\left(p^0, U_i^1\right)$$

where E_i is the expenditure function, p the price (wage) vector, and U_i the utility level before (superscript 0), and after (1), the reform. The change in the welfare

[19] See, e.g., Haan (2007) or Arntz et al. (2007).

[20] See Slesnick (1998) for a comprehensive survey.

Table 3 Labor supply effects (full-time equivalents)

	Married male	Married female	Single male	Single female	Σ
Full time equivalents participation effect					
LL	−31,401	21,130	−1,469	17,413	5,673
HH	2,480	−11,749	4,784	10,938	6,453
Full time equivalents working hours effect					
LL	9,564	19,750	20,190	34,064	83,568
HH	−4,477	−3,659	4,518	−2,921	−6,539
Full time equivalents total effect					
LL	−21,837	40,880	18,721	51,477	89,241
HH	−1,997	−15,408	9,302	8,017	−86

Source: own calculations based on FiFoSiM

(in terms of the (negative) excess burden) of the individual $\triangle W_i$ can be expressed as

$$\triangle W_i = -(\mathrm{EV}_i - \triangle T_i)$$

where $\triangle T$ is the change in tax revenue. Assuming a Utilitarian aggregation function, the overall changes in welfare can be expressed as

$$\triangle W = \sum_i \triangle W_i.$$

A detailed description of the FiFoSiM simulation model can be found in Peichl and Schaefer (2006).

5 Efficiency effects

There are many ways in which a tax reform affects the efficiency of the tax system. In this section, we analyze the effects of the flat tax reform scenarios on the effective marginal tax rates, the labor supply decisions, and the welfare of households.

We start the analysis with the labor supply responses to the two tax reform scenarios which are presented in Table 3, differentiating between single and married men and women. The participation effect (extensive decision) and the working hours effect (intensive decision) as well as the total effect are reported in full time equivalents.

The participation effect in total does not significantly differ from zero in both scenarios. Nevertheless, the differences between both scenarios for the different groups are noteworthy. In scenario LL, married men reduce their labor supply whereas married women increase it. This can be explained by the German system of joint taxation which makes it unattractive for secondary earners to work as both spouses face the same effective marginal tax rate. Therefore, in many households, only the husband is employed (often even working overtime) whereas the wife does not work (or more

precisely: specializes in household production). Lowering the statutory (and effective) marginal tax rates decreases the incentives for this type of employment distribution within a given household. As a consequence, women increase their labor force participation whereas men decrease it. In scenario HH, where the marginal tax rate is higher, the opposite occurs. Men even further increase their participation whereas women decrease it.

The working hours effect is significantly positive for scenario LL and slightly negative for scenario HH. In line with recent empirical literature (see, e.g., Immervoll et al. 2007), we find higher extensive elasticities at the bottom of the income distribution. However, the overall elasticities with respect to working hours (intensive margin) are slightly larger than those with respect to participation.[21] Therefore, the intensive reactions are stronger (especially at the top of the distribution, see also Table 4) because of the higher absolute changes in disposable income at the upper end of the distribution.

To sum up, the variant with a low basic allowance and marginal tax rate (LL) increases total labor supply by approximately 90,000 full time equivalents or 0.3%, while the total labor supply effect of scenario HH (high allowance and marginal tax rate) is roughly equal to zero. These differences are robust to parameter specifications in the sense that revenue neutral scenarios with higher tax parameter values always yield lower labor supply effects.

Table 4 presents the distribution of the estimated efficiency effects across income deciles for the different scenarios. For a more comprehensive analysis, the distribution of the welfare changes together with the changes in tax payments before (Tax0) and after (Tax1)[22] the labor supply effects and the changes in the effective marginal tax rates (EMTR) are presented. It is important to distinguish between, on the one hand, the effects of a reform on the welfare of households in a given income decile as measured by the equivalent variation (Equiv. Var.), and, on the other hand, the overall welfare effect generated by a given decile (Welfare). The difference is that households in a decile may be better off because their tax payments decline. But this implies that they do not generate a welfare gain for society as a whole because the tax revenue has to be generated by other households. For instance, in the case of the low tax rate reform (LL), the highest income decile experiences a utility gain which is equivalent to over 8 bn. Euros. But part of this utility gain is a consequence of a decline in taxes paid by these households. If this is taken into account, the welfare gain generated in this decile is reduced to just over three bn Euros.

The introduction of a flat rate tax increases effective marginal tax rates for the lowest deciles and decreases those of the highest deciles. Absolute and relative changes of effective marginal tax rates depend on the parameter combinations. Scenario LL yields sharp increases in marginal tax rates for the lower deciles, while the rates faced by the highest deciles decrease strongly. In scenario HH, the magnitude of these effects is smaller. The decrease in the effective marginal tax rate of the highest decile

[21] This is in line with other findings for Germany, see Sect. 4.

[22] The scenarios are designed to be revenue neutral before labor supply reactions (sum of Tax0). Therefore, they are not revenue neutral when taking into account the labor supply reactions (Tax1). Alternatively, the reforms could be designed to be revenue neutral after labor supply reactions. The ex post fiscal and efficiency effects, however, would be similar for both scenarios.

is not as strong as before, while the lower to middle deciles' effective rates increase less or even decline.

The average changes in EMTRs can be seen as rough indicators for the work incentives. Lower (higher) EMTRs imply higher (lower) labour supply incentives. However, the consumption-leisure decision implies an income and a substitution effect of the change in disposable income induced by the tax reform. Therefore, increasing (decreasing) incentives do not necessarily trigger higher (lower) labor supply. Nevertheless, the sign of the labor supply effects of each decile is, in general, negatively correlated with the changes in effective marginal tax rates. However, this is not true for all deciles as, for example, deciles 5–7 in scenario LL face decreasing effective marginal tax rates (increasing incentives), but also reduce their labor supply.

What are the overall welfare effects of the two reforms? A low marginal tax rate and basic allowance (LL) yields a welfare gain of 3.6 bn. Euros. This is equal to 1.8% of overall income tax revenue. This gain is achieved because the reform slightly reduces the labor leisure distortions caused by the tax system. Table 4 shows that the welfare effects generated in the different deciles correlate with the employment effects. The efficiency gain goes along with considerable redistributive effects. Table 4 shows that the reform reduces the utility of all deciles except the decile with the highest income, which gains as mentioned above.

The high tax rate scenario (HH) avoids this redistribution. Here, all households except for the deciles 6–9 experience utility gains on average (this does not, of course, exclude heterogeneity within deciles), and the magnitudes of gains and losses are smaller. But this comes at the cost of vanishing aggregate welfare gains. Aggregate labor supply is more or less unaffected, and so is aggregate efficiency. Even if more income inequality is accepted, as in the case of the LL reform, the efficiency gain is not very large. It is a striking aspect of both variants that the middle class seems to be the main loser of flat tax reforms, not just in terms of income, but also in terms of their level of welfare.

6 Distributional effects

The introduction of a revenue neutral tax reform always yields winners as well as losers. To analyze the distributional effects of the two reform scenarios, we compute different distributional measures based on equivalized disposable incomes.[23] The main results are presented in Table 5, which displays the changes of the mean disposable income for each decile, the measures of inequality and polarisation,[24] and

[23] We use the new OECD equivalence scale which weights the household head with a factor of 1, household members over the age of 14 with 0.5, and under 14 with 0.3. The households net income is divided by the sum of the individual weights of each member (= equivalence factor) to compute the equivalence weighted household income. The results without equivalizing household incomes do not differ qualitatively.

[24] Schmidt (2004) creates a polarization index which in analogy to the Gini index (Lorenz curve) is based on a polarization curve for better comparability of the results and their interpretations. Generally speaking, polarization is the occurrence of two antipodes. A rising income polarization describes the phenomenon of a declining middle class resulting in an increasing gap between rich and poor. The proportion of middle income households is declining while the shares of the poor and the rich are both rising.

Table 4 Distribution of labor supply (fulltime equivalents), tax payments, and welfare changes (in million euro)

LL							
Decile	EMTR	Δ to 2007	Tax0	Tax1	Labour Supply	Equiv. Var.	Welfare
1	0.01	0.01	−34	10	−3,326	−38	−28
2	6.97	2.57	14	58	−9,114	−136	−78
3	19.98	2.73	180	199	−15,773	−291	−92
4	22.47	0.38	566	537	−22,999	−638	−101
5	24.09	−0.49	1,149	885	−25,796	−946	−62
6	25.37	−0.32	1,656	1,420	−18,876	−1,460	−40
7	26.17	−0.71	2,262	1,854	−10,755	−1,880	−26
8	26.56	−1.81	2,312	1,699	10,547	−1,608	92
9	26.67	−3.83	1,842	1,485	41,622	−840	646
10	26.68	−9.68	−10,286	−5,372	143,713	8,664	3,292
Σ			0	2,775	89,243	827	3,602
HH							
Decile	EMTR	Δ to 2007	Tax0	Tax1	Labour Supply	Equiv. Var.	Welfare
1	0.00	0.00	−27	−13	2,625	38	25
2	0.24	−4.16	−11	−20	3,497	82	62
3	18.09	0.84	−216	−189	10,522	232	43
4	24.14	2.05	−560	−483	8,053	419	−64
5	22.99	−1.59	−673	−574	−4,686	429	−145
6	22.95	−2.74	−290	−396	−14,671	258	−137
7	26.71	−0.17	190	−50	−22,509	−80	−130
8	30.04	1.67	1,017	377	−22,841	−508	−131
9	31.23	0.73	1,902	1,135	−18,435	−1,155	−20
10	31.46	−4.90	−1,489	−412	58,358	1,867	1,455
Σ			0	−625	−87	1,582	957

Source: Own calculations based on FiFoSiM

the fractions of households winning or losing disposable income[25] in percent for each scenario before and after labor supply reactions (LS).[26]

Without taking labor supply reactions into account (before LS), the highest decile, which generates the largest part of the overall tax payments, gains in both flat tax scenarios. In case of a low basic allowance (LL), the tax burden on middle income deciles increases strongly. Households in the lowest deciles seldom pay taxes in the status quo. Overall, the LL reform leads to redistribution from poor and middle in-

[25]Households whose disposable income does not change more than 50 Euros in either direction are regarded as "unchanged".

[26]We have also computed various indicators of poverty and richness. These measures, however, do not differ significantly from the status quo values.

Table 5 Distributional effects based on equivalized disposable incomes

	Before LS		After LS	
	LL	HH	LL	HH
Decile	Changes in per cent			
	Disposable income			
1	0.20	0.13	54.68	56.08
2	−0.03	−0.01	5.45	6.03
3	−0.50	0.37	−0.02	1.57
4	−1.15	0.89	−0.97	1.09
5	−1.63	0.56	−2.60	−0.45
6	−1.78	−0.02	−2.76	−1.50
7	−1.74	−0.51	−3.62	−2.76
8	−1.29	−0.82	−2.58	−2.67
9	−0.39	−0.96	0.03	−1.44
10	3.85	0.94	4.41	0.61
	Inequality			
Gini	2.11	0.00	3.41	0.47
Theil	5.58	1.14	7.28	1.21
Polarization	0.62	−1.19	1.13	−1.81
	Winners/Losers			
Winners	10.93	23.00	9.66	20.92
Unchanged	43.71	45.78	51.47	53.22
Losers	45.37	31.22	38.87	25.86

Source: Own calculations based on FiFoSiM

come households to the "rich": all other deciles finance the relief of the 10% richest taxpayers. This result is reflected in an increase of both the Gini and the Theil coefficient of disposable incomes.[27] If a higher tax rate is combined with a higher basic allowance, as in the HH scenario, the gains for the highest decile decline while the upper middle class loses less. In this case, not only the highest but also some of the lower deciles benefit. The Gini coefficient does not change by construction of the reform, but the top sensitive Theil index still indicates a small increase in inequality.

When taking labor supply reactions into account (after LS) without changing the decile classification, the picture changes. Especially, the lowest deciles gain above average in relative terms in both scenarios. These high relative changes can be explained by the low absolute values for disposable incomes in these deciles, which consist mostly of transfers. If some of these persons start working, they often earn a multiple of their previous income. This explains the large changes in relative terms. Still, for low parameter values (LL), the highest decile gains most in absolute terms. In contrast, in scenario HH the highest decile remains almost unchanged after la-

[27] The Gini coefficient of the distribution of tax payments (not shown in the table) is decreasing in both scenarios indicating less redistribution through the income tax system. This prediction is confirmed when looking at more comprehensive measures of tax progressivity and redistribution. These report a decrease in both dimensions for both scenarios with the decrease being larger in scenario LL than in HH.

bor supply reactions. Overall inequality is only slightly increased in this scenario, whereas the LL scenario yields a strong increase in inequality.

The polarization of the income distribution and, therefore, the gap between rich and poor increases in scenario LL but decreases in HH before and after labor supply reactions. Furthermore, the number of winners is higher and the number of losers is lower with the higher tax rate (and basic allowance). Nevertheless, in terms of disposable income, the number of losers exceeds the number of winners in both scenarios.

7 Summary and conclusion

In this paper, we have examined the economic effects of different flat tax reform scenarios for Germany in terms of equity and efficiency. The LL scenario, which combines a low tax rate (27%) with the basic allowance existing under the status quo (7664 Euros), leads to an increase in employment of 0.3% and an aggregate welfare gain equal to 1.8% of overall income tax revenue. This goes along with redistributional effects. The households of the highest income decile gain whereas all other deciles lose. Overall, the LL variant of the flat tax reform achieves rather small efficiency gains, which come at the price of a significant increase in inequality.

The redistributional effects are mitigated if a higher tax rate is chosen, as in the HH scenario, which combines a tax rate of 32% with a basic allowance of 10,700 Euros. The reform is constructed so that before labor supply adjustments, the Gini coefficient of income inequality is the same as in the status quo. This reform also implies that the highest income decile benefits, whereas the tax burden on middle income households increases. The overall employment effect does not differ significantly from zero, and the effect on aggregate welfare is also negligible. It thus turns out that the adverse distributive effects emerging in the LL scenario can partly be avoided, but only at the cost of sacrificing the efficiency gains.

Note that we limit our analysis to revenue-neutral scenarios. If we allowed for a loss of tax revenue (which could be financed through cuts in government spending), the efficiency gains would be larger, but inequality would increase as well.[28] Another objection to our analysis could be that we do not take into account the effects of the flat rate tax on investment and capital accumulation. However, Germany and many other countries address this issue by introducing variants of dual income tax systems. Flat rate taxes for all types of income do not seem necessary to improve investment incentives, although rate differentiation for different types of income clearly has its own problems. A further aspect neglected in our analysis is the impact of tax reforms on training and human capital accumulation. The results in Jacobs et al. (2007) suggest that flat tax reforms may increase investment in skill formation, and thus change the composition of the labor force in the long term. But the question arises whether the income tax is the best instrument to achieve this.

[28] For example, a further simulation of the nonrevenue neutral combination of high allowance with low marginal rate results in a loss of revenue of about 26.4 billion Euros, an increase in labor supply of about 400,000 full-time equivalents, a welfare gain of about 8 billion and an increase of the Gini coefficient of about 3.5%.

Furthermore, our analysis abstracts from effects of the flat tax reform on compliance. Flat rate tax systems are widely expected to improve taxpayer compliance. The 2001 tax reform in Russia is widely thought to be an example for this effect. Indeed, tax compliance and revenue apparently improved by about one third after the 2001 tax reform (Ivanova et al. 2005). However, it is not clear whether this can be attributed solely to the flat tax or to improved law enforcement and tax administration which was also part of the 2001 reform (see also Gaddy and Gale 2005 and Gorodnichenko et al. 2007). Moreover, the case of Russia differs from Germany insofar as the latter has a long tradition of income taxation in a market economy and a well-established tax administration to ensure tax compliance. In addition, since we do not change social insurance contributions, the marginal tax rate on labor still remains high. This suggests that positive effects of a flat tax reform on compliance are probably less important in Germany than in the transition countries of eastern Europe.

Since our analysis focuses on Germany, the question arises whether the main findings are likely to apply to other countries as well. Existing studies for other countries, mostly western European countries and the US, partly use different approaches and methods. But most of the main results are qualitatively similar, as pointed out in Sect. 2. Although more country studies are required to complete the picture, the pattern that emerges suggests that the flat tax concept cannot overcome the familiar equity efficiency trade-off, at least not in the short or medium term. Another robust result seems to be that flat tax reforms will increase the tax burden of the middle class. This is important from a political economy perspective. A strong and politically powerful middle class is a typical characteristic of most western European countries. This suggests a series of difficulties for flat tax reforms to invade the grown-up democracies of "Old Europe."

Acknowledgement The authors would like to thank Frank Brenneisen, Frank Fossen, Giorgia Maffini, Ruud de Mooij, Alari Paulus and two anonymous referees for their helpful contributions. The usual disclaimer applies.

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