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ABSTRACT

Is a Flat Tax Feasible in a Grown-up Welfare State?*

The success of the flat rate tax in Eastern Europe suggests that this concept could also be a model for the welfare states of Western Europe. The present paper uses a simulation model to analyse 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 per cent 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 welfare states of Western Europe.

JEL Classification: D31, D60, H20

Keywords: flat tax reform, equity, efficiency, distribution, welfare

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1 Introduction

For a long period of time, flat rate taxes have only been implemented in tax havens like Hong Kong or the Channel Islands. But during the last decade, the flat tax idea has been very successful in Eastern Europe. Since its introduction in Estonia in 1994 several countries followed the example. In 2007, there were altogether 22 countries in the world having flat tax systems[1], half of them in Eastern Europe. This development has not yet reached the grown-up welfare states of "Old Europe". Nevertheless, flat rate taxes are high on the political agenda in various (Western European) countries.[2] 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.[3]

The introduction of flat rate tax systems is widely seen as a reform which may boost efficiency, employment and growth through simplification and higher incentives.[4] However, inequality is expected to increase as a consequence of a flat tax reform. 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".[5] 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 an empirical analysis of the economic effects of flat tax reforms for Germany. We study both equity and efficiency effects within the same microeconometric framework. We use a microsimulation model based on a unique database of German micro data to provide empirical evidence for our analysis. 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 systematically: The first flat tax reform is constructed such that the inequality of after tax incomes as measured by the Gini coefficient remains constant. This requires a rather high tax rate (32 per cent) and, accordingly, a large basic allowance (10700 Euros). The second flat tax under consideration holds constant the existing basic allowance (7664 Euros). Revenue neutrality then implies a tax rate of 27 per cent. Our analysis is

[1] C.f. Nicodeme (2007), Mitchell (2007) and Keen et al. (2006).

[2] See for example, Kuismanen (2000) for Finland, Jacobs et al. (2007) for the Netherlands, Adam and Browne (2006) for the UK.

[3] 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, chose (almost) flat schedules.

[4] In Russia, for example, tax compliance and revenue apparently improved by about one third (Ivanova et al. (2005)), although it is not clear whether it can be attributed solely to the flat tax reform of 2001 or improved law enforcement.

[5] Keen et al. (2006), p. 3.

based on a simulation model for the German tax and transfer system (FiFoSiM) using income tax microdata and household survey data. The qualitative results should be of interest to a wider range of countries, especially with a similar structure of the tax benefit system.

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 per cent of overall income tax revenue and employment increases by 0.3 per cent. However, this 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 inequality. But the higher tax rate reduces the 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. Moreover, the strength of the efficiency effects derived here is rather small. Note that the analysis abstracts from effects of flat rate tax reforms on compliance costs and tax evasion as well as investment and, hence, economic growth. Insofar, we are likely to underestimate the efficiency gains, at least in the long run. Nevertheless, the short-term first and second round effects which are part of the transition path to the new long-run equilibrium are most likely to be decisive regarding the political feasibility of a flat tax reform.

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

2 Economic effects of flat tax reforms in the literature

The introduction of a flat tax with a basic tax allowance, low uniform marginal tax rate, and a broad tax base to reform existing tax systems is supposed to have several advantages. Most importantly, positive effects on employment and GDP and reduced tax distortions are expected.[6] In addition, flat tax reforms are thought to reduce administration and compliance

[6]Moreover, Mirrlees (1971) simulated the optimal tax schedule being close to linearity.

costs as well as incentives for legal or illegal tax evasion.[7] 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 labour 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 concentrates on the effects of flat tax reforms on the income distribution. 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. In a study for the Netherlands, Caminada and Goudswaard (2001) also derive the result that a flat tax would yield redistribution at the expense of the lowest income deciles, whereas the magnitude of these effects is rather small.

The present paper differs from the existing literature mainly by analysing 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.

3 Flat Tax scenarios

Flat rate tax systems may differ considerably in their design. In the literal sense a "Flat Tax" is a uniform tax rate on the total tax base.[8] 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.[9] In particular, existing flat rate tax systems do not use cash flow taxes on corporate tax systems.

[7] In Russia, for example, the revenue of the personal income tax increased by 25% in real terms, despite the sharp cuts in marginal tax rates on labour income. For Germany, Fuest et al. (2006) show that revenue neutral simplification of the tax base can reduce the compliance cost by appr. 8%.

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

[9] An earlier version of this paper included various measures to broaden the tax base. The results were qualitatively similar.

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 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 behaviour is not affected by tax system changes. The lower bound corresponds to a flat tax rate if the personal allowance is fixed, i.e. is at the same level as for the pre-reform graduated rate tax. The upper bound is such 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 analyse two different revenue neutral flat rate tax reform scenarios which vary in the marginal tax rate and the basic tax allowance. 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 value t_F^*).[10] The premise of ex-ante revenue neutrality is chosen for a better comparability of the different scenarios.[11] Table 1 presents the parameter values for the two scenarios.

	tax schedule parameters	
	basic allowance	marginal tax rate
2007	7664	15-45
LL	7664	26.9
HH	10700	31.9

Table 1: Reform scenarios

[10] We do not report the results for the upper bound here because such a scenario requires a marginal rate of about 45% which does not seem likely to be politically feasible as it indeed results in negative efficiency effects.

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

4 FiFoSiM: Database and Model

Our analysis is based on a behavioural microsimulation model for the German tax and transfer system (FiFoSiM) using income tax and household survey microdata. The basic module of FiFoSiM is a static microsimulation model for the German tax and benefit system using income tax and household survey micro data. The approach of FiFoSiM is innovative insofar as it creates a dual database using two micro data sets for Germany: FAST01 and GSOEP.[12] 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 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 ageing 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 current tax and benefit system in 2006 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 determined and to allocate it to the seven forms of income defined in the German income tax law. For each type of income, the tax law allows for certain income related expenses. Then 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 modelling of the tax and transfer system uses the technique of microsimulation.[13] FiFoSiM computes individual tax payments for each case in the sample considering gross incomes and deductions in detail. The individual results are multiplied by the 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

[12] 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.

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

each household. Based on these household net incomes we estimate the distributional and the labour supply effects of the analysed tax reforms. For the econometric estimation of labour supply elasticities, we apply a discrete choice household labour supply model. The result of this simulation is the benchmark for different reform scenarios which are also modelled using the modified database applying the different tax benefit rules using the technique of microsimulation. A detailed description of the FiFoSiM simulation model can be found in Peichl and Schaefer (2006).

5 Distributional effects

The introduction of a revenue neutral tax reform always yields winners as well as losers. To analyse the distributional effects of the two reform scenarios, we compute different distributional measures based on equivalised disposable incomes[14]. The main results are presented in table 2 which contains the changes of the mean disposable income for each decile, the measures of inequality and polarisation[15], and the fractions of households winning or losing disposable income[16] in per cent for each scenario before and after labour supply reactions (LS).[17]

Without taking labour 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 income 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.[18] 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

[14]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 equivalising household incomes do not differ qualitatively (see tables 7 and 8 in the Appendix).

[15]Schmidt (2004) creates a polarisation index which in analogy to the Gini index (Lorenz curve) is based on a polarisation curve for better comparability of the results and their interpretations. Generally speaking, polarisation is the occurrence of two antipodes. A rising income polarisation 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.

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

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

[18]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.

	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
Polarisation	0.62	-1.19	1.13	-1.81
	Winner / Loser			
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

Table 2: Distributional effects based on equivalised disposable incomes
Source: own calculations based on FiFoSiM

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 the labour supply reactions into account (after LS) without changing the decile classification, this 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 labour supply reactions. Inequality is slightly increased in this scenario, whereas the first scenario yields a strong increase in inequality.

The polarisation of the income distribution and therefore the gap between rich and poor increases in scenario LL but decreases in HH before and after labour 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.

6 Efficiency effects

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

6.1 Effective marginal tax rates

The changes in effective marginal income tax rates faced by different groups of taxpayers are presented in table 3. The underlying idea is that the marginal income tax rate affects the labour supply and savings incentives. Therefore, the changes in effective marginal income tax rates may be considered as rough indicators for the distortions caused by the tax system.

Decile	EMTR 2007	LL	Diff.	HH	Diff.
1	0.00	0.01	0.01	0.00	0.00
2	4.40	6.97	2.57	0.24	-4.16
3	17.25	19.98	2.73	18.09	0.84
4	22.09	22.47	0.38	24.14	2.05
5	24.58	24.09	-0.49	22.99	-1.59
6	25.69	25.37	-0.32	22.95	-2.74
7	26.88	26.17	-0.71	26.71	-0.17
8	28.37	26.56	-1.81	30.04	1.67
9	30.50	26.67	-3.83	31.23	0.73
10	36.36	26.68	-9.68	31.46	-4.90

Table 3: Effective Marginal Tax Rates (and changes in percentage points)
Source: own calculations based on FiFoSiM

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

As a first conclusion from this section, we can state that ambivalent effects on effective marginal tax rates do not allow for a clear evaluation of incentive and efficiency effects of these scenarios. In particular, it becomes clear that, if marginal tax rates are used as an indicator

e.g. for labour supply incentives implied by the tax system, a flat tax reform does not improve incentives at all income levels. A detailed analysis of the labour supply effects follows in the next section.

6.2 Labour supply effects

To analyse the behavioural responses induced by different tax reform scenarios, we simulate the labour supply responses. Following Van Soest (1995) we apply a structural discrete choice household labour supply model.[19] In the standard continuous model (see Hausman (1985)), labour 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 analysed within this framework (Blundell and MaCurdy (1999)). Discrete choice labour supply models allow to analyse both the extensive (participation) and the intensive (hours worked) labour supply decision within the same modelling framework (Blundell and MaCurdy (1999), Van Soest and Das (2001), and 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 (pre-tax) labour 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 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 labour 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.

The results of our labour supply estimations are presented in Table 4, 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.

[19] A detailed description of the FiFoSiM labour supply module is provided in the technical appendix and by Fuest et al. (2005) where we also report the estimation results of the labour supply elasticities.

	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

Table 4: Labour supply effects (fulltime equivalents)
Source: own calculations based on FiFoSiM

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 labour 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 labour 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. It has to be emphasised that this larger intensive reaction does not indicate higher intensive than extensive labour supply elasticities. In line with recent empirical literature (see e.g. Immervoll et al. (2007)) we also find higher extensive elasticities (especially at the bottom of the income distribution). Nevertheless, the intensive reactions are stronger (especially at the top of the distribution, see also Table 5) 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 labour supply, while the total labour supply effect of scenario HH (high allowance and marginal tax rate) is approximately equal to zero. These differences are robust to parameter specifications in the sense that revenue neutral scenarios with higher parameter values always yield lower labour supply effects.

6.3 Welfare effects

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 long 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 labour-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 labour supply model described in the appendix. The equivalent variation EV_i for each individual i can be expressed as:

$$EV_i = E_i(p^0, U_i^0) - E_i(p^0, U_i^1) = E_i(p^1, U_i^1) - E_i(p^0, U_i^1)$$

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

$$\triangle W_i = -\left(EV_i - \triangle T_i\right)$$

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

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

Table 5 presents the estimated aggregate welfare changes for the different scenarios. For a more comprehensive analysis, the distribution of the welfare changes together with the changes in tax payments before ($T0$) and after ($T1$)[21] the labour supply effects (LS) for the income deciles is 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 (EV), and, on the other hand, the overall welfare effect generated by a given decile (W). 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

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

[21] The scenarios are designed to be revenue neutral before labour supply reactions (sum of $T0$). Therefore they are not revenue neutral when taking into account the labour supply reactions ($T1$). If the reforms were designed to be revenue neutral after labour supply reactions, different questions would be analysed. The ex post fiscal and efficiency effects, however, would be similar for both scenarios.

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 efficiency gain generated in this decile is reduced to just over three bn Euros.

	LL					HH				
EQUI DEC	T0	T1	LS	EV	W	T0	T1	LS	EV	W
1	-34	10	-3,326	-38	-28	-27	-13	2,625	38	25
2	14	58	-9,114	-136	-78	-11	-20	3,497	82	62
3	180	199	-15,773	-291	-92	-216	-189	10,522	232	43
4	566	537	-22,999	-638	-101	-560	-483	8,053	419	-64
5	1,149	885	-25,796	-946	-62	-673	-574	-4,686	429	-145
6	1,656	1,420	-18,876	-1,460	-40	-290	-396	-14,671	258	-137
7	2,262	1,854	-10,755	-1,880	-26	190	-50	-22,509	-80	-130
8	2,312	1,699	10,547	-1,608	92	1,017	377	-22,841	-508	-131
9	1,842	1,485	41,622	-840	646	1,902	1,135	-18,435	-1,155	-20
10	-10,286	-5,372	143,713	8,664	3,292	-1,489	-412	58,358	1,867	1,455
Σ	0	2,775	89,243	827	3,602	0	-625	-87	1,582	957

Table 5: Distribution of labour supply (fulltime equivalents), tax payments and welfare changes (in million €)

Source: own calculations based on FiFoSiM.

What are the efficiency effects of the two reforms? Consider first the effects on overall welfare. A low marginal tax rate and basic allowance (LL) yields a welfare gain of 3.6 bn Euros. This is equal to 1.8 per cent of overall income tax revenue. The welfare gain emerges because the reform slightly reduces the labour leisure distortions caused by the tax system. Table 5 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 5 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 labour supply is more or less unaffected, and so is aggregate efficiency. Hence, it seems that the flat tax concept cannot overcome the familiar equity-efficiency trade-off. 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. Given that this group is usually thought to be very influential in the political process, it seems unlikely that flat tax scenarios have chances to gain political support.

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 analysis is based on microdata provided by a behavioural microsimulation model for the German tax and benefit system. In general, the effects of a flat tax reform differ considerably with changes in the marginal tax rate and the basic tax allowance. Table 6[22] compares both scenarios after labour supply reactions.

	LL				HH			
Decile	Distribution	EMTR	LS	Welfare	Distribution	EMTR	LS	Welfare
1	54.68	0.01	-3,326	-28	56.08	0.00	2,625	25
2	5.45	2.57	-9,114	-78	6.03	-4.16	3,497	62
3	-0.02	2.73	-15,773	-92	1.57	0.84	10,522	43
4	-0.97	0.38	-22,999	-101	1.09	2.05	8,053	-64
5	-2.60	-0.49	-25,796	-62	-0.45	-1.59	-4,686	-145
6	-2.76	-0.32	-18,876	-40	-1.50	-2.74	-14,671	-137
7	-3.62	-0.71	-10,755	-26	-2.76	-0.17	-22,509	-130
8	-2.58	-1.81	10,547	92	-2.67	1.67	-22,841	-131
9	0.03	-3.83	41,622	646	-1.44	0.73	-18,435	-20
10	4.41	-9.68	143,713	3,292	0.61	-4.90	58,358	1,455
mean/Σ	5.20	-1.12	89,243	3,602	5.66	-0.83	-87	957

Table 6: Summary of results
Source: own calculations based on FiFoSiM

The LL scenario, which combines a low tax rate (27 per cent) with the basic allowance existing under the status quo (7664 Euros), leads to an increase in employment of 0.3 per cent and an aggregate welfare gain equal to 1.8 per cent of overall income tax revenue. This goes along with redistributional effects. The households of the highest income decile gain whereas all other deciles lose. The second highest income decile maintains the level of disposable income but can only do so by working more. The two lowest income deciles increase their average income but also lose in terms of utility (see table 5). Overall, the LL variant of the flat tax reform achieves rather small efficiency gains which come at the price of a sharp 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 per cent with a basic allowance of 10700 Euros. This reform is constructed so that, before labour 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. But the strength of

[22] Distributional effects in per cent, changes in effective marginal tax rates in percentage points, labour supply effects in fulltime equivalents and welfare effects in million €.

these effects is much smaller than in the LL scenario. The HH scenario implies that labour supply in the highest income decile and in the four lowest deciles increases, whereas labour supply in the middle income range declines. 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 redistributive effects emerging in the LL scenario can be avoided, but only at the cost of sacrificing the modest efficiency gains. Note that we limit our analysis to revenue-neutral scenarios. If we allow for a loss of tax revenue (which could be financed through cuts in government spendings), the efficiency gains are positive but inequality increases as well.[23]

These results suggest that flat rate tax reforms are unlikely to bring about efficiency gains which are large enough to convince the electorate that an increase in inequality implied by this type of tax reform is justified. One objection to this view would be that our analysis does not take into account the effects of the flat rate tax on investment and capital accumulation. But Germany and many other countries address this issue by introducing variants of dual income tax systems. Although we have derived our results for the case of Germany, we do think that similar patterns would be observed in other countries of Western Europe. Of course, this remains to be shown. If this proves to be correct, it will be hard for flat tax reforms to invade the grown-up welfare states of "Old Europe".

[23]For example, a further simulation of the non revenue neutral combination of high allowance with low marginal rates results in a loss of revenue of about 26.4 billion euros, an increase in labour supply of about 400,000 fulltime equivalents, a welfare gain of about 8 billion and an increase of the Gini coefficient of about 3.5%.

Appendix A: Results based on disposable income

	before LS		after LS	
	LL	HH	LL	HH
Decile	changes in per cent			
	disposable income			
1	-0.02	0.00	46.76	48.05
2	-0.04	0.05	5.55	6.41
3	-0.82	0.75	1.47	3.03
4	-1.30	0.24	-1.94	-0.17
5	-1.32	-0.29	-2.65	-1.43
6	-1.10	-0.30	-1.84	-0.85
7	-0.88	0.18	-2.32	-1.93
8	-0.97	0.11	-3.10	-2.43
9	-0.78	-0.47	-0.02	-0.87
10	2.58	0.15	2.86	-0.55
	Inequality			
Gini	1.40	0.00	2.38	0.20
Theil	3.99	0.58	5.67	0.78
Polarisation	0.85	0.04	1.51	-0.16
	Winner / Loser			
Winners	11.06	23.45	9.72	21.17
unchanged	43.26	44.93	51.15	52.77
Losers	45.68	31.62	39.14	26.06

Table 7: Distributional effects based on disposable (not equivalence-weighted) income
Source: own calculations based on FiFoSiM

	LL					HH				
DEC	T0	T1	LS	EV	W-EV	T0	T1	LS	EV	W-EV
1	4	63	-3,159	-80	-17	-4	-49	2,014	51	1
2	16	161	-8,385	-220	-58	-83	-94	3,135	129	35
3	455	315	-14,894	-409	-94	-443	-342	9,558	356	14
4	917	671	-20,162	-761	-89	-200	-263	1,258	222	-41
5	1,134	921	-14,038	-908	14	233	27	-6,322	-37	-10
6	1,133	803	-7,269	-698	105	289	60	-3,053	-98	-38
7	1,086	729	-3,088	-400	329	-235	-324	2,325	348	24
8	1,464	1,173	-4,247	-803	370	-164	-563	-12,361	649	86
9	1,506	1,447	23,759	-915	532	899	273	-37,509	-360	-87
10	-7,714	-3,509	140,723	6,020	2,511	-291	649	40,867	324	973
Σ	0	2,775	89,240	827	3,602	0	-625	-88	1,582	957

Table 8: Distribution of labour supply, tax payments and welfare changes (in million €)
Source: own calculations based on FiFoSiM.

Appendix B: Labour supply model

To analyse the behavioural responses induced by the different tax reform scenarios, we simulate their labour supply effects. Following Van Soest (1995) we apply a discrete choice household labour supply model,[24] assuming that the household's head and his partner jointly maximise a household utility function in the arguments leisure of both partners and net income. Household i $(i = 1, ..., N)$ can choose between a finite number of combinations $(y_{ij}, lm_{ij}, lf_{ij})$, where $j = 1, ..., J$, y_{ij} the net income, lm_{ij} the leisure of the husband and lf_{ij} the leisure of the wife of household i in combination j. Based on our data we choose seven working time categories for men and women $(t \in [0, 8, 16, 24, 32, 40, 48])$.

We model the following translog[25] household utility function

$$V_{ij}(x_{ij}) = x'_{ij} A x_{ij} + \beta' x_{ij} \tag{1}$$

where $x = \left(\ln y_{ij}, \quad \ln lm_{ij}, \quad \ln lf_{ij} \right)'$ is the vector of the natural logs of the arguments of the utility function. The elements of x enter the utility function in linear (coefficients $\beta = (\beta_1, \beta_2, \beta_3)'$), quadratic and gross terms (coefficients $A_{(3\times3)} = (a_{ij})$). Using control variables z_p $(p = 1, ..., P)$[26] we control for observed heterogeneity in household preferences by defining the

[24] A detailed description of the FiFoSiM labour supply module can be found in Fuest et al. (2005).

[25] Cf. Christensen et al. (1971).

[26] We use control variables for age, children, region and nationality, which are interacted with the leisure terms in the utility function because variables without variation across alternatives drop out of the estimation in the conditional logit model (see Train (2003)).

parameters β_m, α_{mn} as

$$\beta_m = \sum_{p=1}^{P} \beta_{mp} z_p \tag{2}$$

$$\alpha_{mn} = \sum_{p=1}^{P} \alpha_{mnp} z_p \tag{3}$$

where $m, n = 1, 2, 3$.

Following McFadden (1973) and his concept of random utility maximisation[27], we add a stochastic error term ε_{ij} for unobserved factors to the household utility function:

$$\begin{aligned} U_{ij}(x_{ij}) &= V_{ij}(x_{ij}) + \varepsilon_{ij} \\ &= x'_{ij} A x_{ij} + \beta' x_{ij} + \varepsilon_{ij} \end{aligned} \tag{4}$$

Assuming joint maximisation of the households utility function implies that household i chooses category k if the utility index of category k exceeds the utility index of any other category $l \in \{1, ..., J\} \backslash \{k\}$, if $U_{ik} > U_{il}$. This discrete choice modelling of the labour supply decision uses the probability of i to choose k relative to any other alternative l:

$$P(U_{ik} > U_{il}) = P\left[(x'_{ik} A x_{ik} + \beta' x_{ik}) - (x'_{il} A x_{il} + \beta' x_{il}) > \varepsilon_{il} - \varepsilon_{ik}\right] \tag{5}$$

Assuming that ε_{ij} are independently and identical distributed across all categories j to an Gumbel (extreme value) distribution, the difference of the utility index between any two categories follows a logistic distribution. This distributional assumption implies that the probability of choosing alternative $k \in \{1, ..., J\}$ for household i can be described by a conditional logit model[28]:

$$P(U_{ik} > U_{il}) = \frac{\exp(V_{ik})}{\sum_{l=1}^{J} \exp(V_{il})} = \frac{\exp(x'_{ik} A x_{ik} + \beta' x_{ik})}{\sum_{l=1}^{J} \exp(x'_{il} A x_{il} + \beta' x_{il})} \tag{6}$$

For the maximum likelihood estimation of the coefficients we assume that the hourly wage is constant across the working hour categories and does not depend on the actual working time.[29] For unemployed people we estimate their (possible) hourly wages by using the Heckman correction for sample selection[30]. The household net incomes for each working time category are computed in the microsimulation module of FiFoSiM.

[27] Cf. McFadden (1981), McFadden (1985) and Greene (2003).

[28] McFadden (1973). Cf. Greene (2003) or Train (2003) for textbook presentations.

[29] Cf. Van Soest and Das (2001).

[30] Cf. Heckman (1979). A detailed description of these estimations can be found in Fuest et al. (2005).

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