Effects of flat tax reforms in Europe on inequality and poverty*

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Abstract

Flat income tax has become increasingly popular recently, yet its implementation is limited mainly to countries in Eastern Europe. One may argue that flat tax receives less political support in countries with a well-established middle class due to its distributional effects. The aim of this paper is to provide an empirical analysis of the distributional effects of different hypothetical flat tax reforms for selected European countries. We rely on EUROMOD, a tax-benefit microsimulation model for the EU15, which ensures comparable results through a common framework. Our simulations show that flat tax rates required to attain revenue neutrality with existing personal allowances are reasonable in terms of labour supply incentives. However, they do benefit mainly those with high incomes at the expense of low and middle income households, resulting in higher inequality, poverty and polarisation of the income distributions. On the other hand, flat rates necessary to keep the inequality levels unchanged are rather high, implying strong disincentive effects. Overall, this could explain why flat taxes have not been politically successful in Western Europe.

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*This paper uses EUROMOD version C13. EUROMOD is continually being improved and updated and the results presented here represent the best available at the time of writing. Any remaining errors, results produced, interpretations or views presented are the authors' responsibility. EUROMOD relies on micro-data from twelve different sources for fifteen countries.

This paper uses data from the European Community Household Panel (ECHP) User Data Base made available by Eurostat; the Austrian version of the EU-SILC made available by Statistik Austria; the Panel Survey on Belgian Households (PSBH) made available by the University of Liège and the University of Antwerp; the Income Distribution Survey made available by Statistics Finland; the public use version of the German Socio Economic Panel Study (GSOEP) made available by the German Institute for Economic Research (DIW), Berlin; the Greek Household Budget Survey by the National Statistical Service of Greece; the Socio-Economic Panel for Luxembourg (PSELL-2) made available by CEPS/INSTEAD; the Socio-Economic Panel Survey (SEP) made available by Statistics Netherlands through the mediation of the Netherlands Organisation for Scientific Research - Scientific Statistical Agency, and the Family Expenditure Survey (FES), made available by the UK Office for National Statistics (ONS) through the Data Archive. Material from the FES is Crown Copyright and is used by permission. Neither the ONS nor the Data Archive bears any responsibility for the analysis or interpretation of the data reported here. An equivalent disclaimer applies for all other data sources and their respective providers.

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1 Introduction

Flat income tax, referring broadly to a tax with a single marginal rate, has recently become increasingly popular. Before the 1990s it was only applied in a few countries, most prominently Hong Kong and the Channel Islands. Since 1994 however, after its introduction in Estonia, a number of countries have followed suit. In 2007 there were altogether 22 countries[1] worldwide with flat tax systems, of which half in Eastern Europe (see also Figure 8 in Appendix A), and such proposals being discussed in several other countries including some in Western Europe. However, among the latter only Iceland recently adopted a flat tax.

There are three main benefits usually associated with flat tax systems. Firstly, flat taxes can enhance labour supply incentives. Although there is a trend of lowering marginal statutory tax rates (and reducing the number of tax brackets), top rates can still be rather high, e.g. around 40-60% in EU15 (Eurostat (2007)). While the gains from lower tax rates are explicit for the top income range, they are not so obvious for low incomes. The results here depend on the chosen flat tax parameters and the underlying income distribution.

Secondly, a flat tax can increase tax compliance and reduce tax evasion. This argument is perhaps weaker in developed countries, but it is often central for this kind of reforms in developing countries. The best evidence is from the 2001 reform in Russia, where the compliance apparently improved by about one third (Ivanova et al. (2005)), although it is not clear whether it can be solely attributed to the flat tax or to improved law enforcement.

Thirdly, as a flat tax is often part of more fundamental tax reform, it can simplify income taxation significantly. The current systems in Europe on average have evolved to quite complex entities, therefore often violating the principle that taxes ought to be clear and simple. A simpler system is not only easier to grasp from the point of view of a single taxpayer, but is also more transparent at the aggregated level. Simplification can also dramatically decrease the costs of administration and compliance.

However, flat taxes can have a serious drawback in terms of their impact on the distribution of tax burdens which could be the main reason limiting its spread in developed countries. Previous flat tax reforms and typical proposals lower marginal tax rates at the high income levels but increase the tax burden for middle-income ranges, resulting in a widening of the distribution of after-tax incomes. The aim of this paper is to provide an empirical analysis of the distributional effects of different flat tax designs for selected European countries. In addition to our comparative dimension we undertake a systematic approach for choosing flat tax parameters, i.e. flat rate and basic allowance, which seems to be rather arbitrary in previous studies. Davies and Hoy (2002) show that in the case of revenue neutral flat tax reforms there

[1] C.f. Nicodeme (2007) and Mitchell (2007).

are critical parameter values: a lower bound of flat tax rates below which inequality always increases and an upper bound above which inequality always decreases. Estimating these critical values empirically allows us to better understand the feasibility of flat tax reforms.

We use EUROMOD, a tax-benefit microsimulation model for the EU15, to compare the results across countries in a common framework. We analyse which population subgroups gain and which lose from the introduction of flat taxes. We also ask whether different combinations of tax rates and allowances always have an adverse effect on the middle class and if there are indeed positive incentive effects. Furthermore, we concentrate on the short-term static effects, although there are possibly important long-term effects as well.

There have been several studies before, focussing on a single country and hypothetical reforms in most cases.[2] Only two actual reforms have been addressed earlier: the 2001 Russian reform by Ivanova et al. (2005) and the 2004 reform in the Slovak Republic by, among others, Brook and Leibfritz (2005). In the Russian case, the reform was followed by significant real growth in personal income tax revenue, but there was no strong evidence that this was caused by the reform itself, nor could any positive labour supply responses be identified. The reform did not pay for itself either. The Slovakian reform was expected to be revenue neutral, to increase the level and efficiency of capital formation and enhance the incentives of unemployed workers to seek work. However, no evidence apart from revenue-neutrality has been reported yet. While it is true that most real world reforms have been very recent, research on their effects is probably also limited due to the nature of those countries, i.e. no or little high-quality (micro-)data is available for the pre-reform period.

Our analysis yields the following results. Flat tax rates required to attain revenue neutrality with existing personal allowances are reasonable in terms of labour supply incentives. However, they do benefit mainly those with high incomes at the expense of low and middle income households, resulting in higher inequality, poverty and polarisation of the income distributions. On the other hand, flat rates necessary to keep the inequality levels unchanged are rather high, implying strong disincentive effects. Overall, this could explain why flat taxes have not been politically successful in Western Europe.

The rest of the paper is organised as follows: section 2 provides a brief discussion on the flat tax design and chooses proper parameters. Section 3 contains a short description of the model, datasets and our reform scenarios. Section 4 illustrates the distributional effects in terms of inequality, poverty and richness, polarisation, winners and losers. Section 5 concludes.

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

2 Flat tax design

Flat tax implies that some sort of proportionality is embedded in the income tax system, however its design can be very different. There are two dimensions to be distinguished: tax schedule and tax base.

A tax schedule can apply the same rate on all sources of income (i.e. comprehensive tax) or different rates on different types of incomes (i.e. schedular tax). Most countries with a flat tax system apply different rates to personal and business income, although a common rate has become more popular among the countries recently implementing these systems. Usually, the tax rate does not vary for components of personal income, an exception being Lithuania. There is also a number of countries which tax only capital income at a flat rate and levy a progressive rate schedule on labour income. However, these are usually not considered as flat tax systems but dual or semi-dual income tax systems.[3] A version of comprehensive income tax where the same flat rate is applied to business income on a cash-flow basis relates to the famous Hall and Rabushka (1995) proposal, which is essentially a consumption tax with an allowance.

For the tax base one can differentiate between concepts allowing or not allowing for any allowances or deductions. In a way, only the one without allowances and deductions is a "pure" flat tax as in this case tax payments are indeed proportional to incomes. A flat income tax as such has been applied only in Georgia so far. In all other cases, the tax incidence on incomes is progressive. A flat tax with a general personal allowance is the most common version which we also consider in this paper.

A further step towards overall flat tax incidence would be integrating income tax with other taxes and benefits. An example of this is a flat tax with a refundable tax credit, effectively combining taxes and benefits due to negative income tax at the low-income levels. Depending on the generosity of the tax credit, it is either labelled as negative income tax or basic income (flat) tax.[4]

An important aspect usually not given enough attention is the setting of optimal tax system parameters. In terms of flat tax reforms this translates into the question how to set the flat tax rate and the basic allowance. In our case we are interested in the relationship between flat tax parameters and distributional effects. Davies and Hoy (2002) show that inequality of after-tax distribution of income is monotonically declining in the flat tax rate and the associated level of basic allowance generating the same tax yield. Furthermore, for revenue neutral tax reforms replacing a graduated rate tax with a flat rate tax, they prove the existence of critical flat tax rates such that compared to the graduated rate tax after-tax income inequality is:

[3] See OECD (2006) for more about dual income tax systems.

[4] See Atkinson (1995) for this example.

- 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, $t = t_F^* \in (t_F^l, t_F^u)$.

These results apply 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. Additionally, the flat rate at the lower bound is supposed to exceed the lowest marginal tax rate under graduated rate and the flat rate at the upper bound remains below the highest marginal tax rate under graduated rate. The critical value between those boundaries cannot be determined a priori as it depends on a chosen inequality index. Chiu (2007) demonstrates further that for an index exhibiting downside inequality aversion this value is determined by the strength of the index's downside inequality aversion against its inequality aversion. In case of the Generalized Entropy Indices $E(\alpha)$, since a higher α indicates a weaker downside inequality aversion against inequality aversion, it also implies a higher critical flat tax rate between the boundaries.

However, these regularities are only approximations for empirical estimations because existing tax systems are further complicated by the presence of other tax deductions and allowances, and not all systems have a (well-defined) basic allowance to start with. More so, the definition of revenue neutrality is not straightforward. If this is only limited to income taxes under consideration then it might not preserve the mean of the disposable income distribution as there are often instruments which eligibility or amount depend on net income after taxes (e.g. means-tested non-taxable benefits) and, therefore, might change their value when tax systems are modified. If overall net balance from taxes and benefits is retained then income tax revenues rarely remain constant.

In practice, most countries have introduced a flat tax rate at or close to the level of previous lowest marginal rate, exceptions are Latvia and Lithuania who have chosen the opposite (Nicodeme (2007)). The Slovak Republic and Estonia initially opted for a rate in the middle range, although the latter is now gradually moving towards the former lowest marginal rate as well. The pattern of setting general allowances however is less clear. In most countries a fixed allowance was retained or introduced, exceptions include Russia with gradual withdrawal and Ukraine with sudden withdrawal above certain income levels which makes the effective marginal tax rate high at some stages. However, the amount of allowance varies significantly

with most countries having it increased during the reforms (Keen et al. (2006)). For example, Georgia has no allowance at all, Russia an allowance of about 12% of the average gross wage (in the year before and after the reform, i.e. 2000-01)[5], Estonia has an allowance of 40-74% of the minimum wage (in 1996-2007) and 11-21% of the average gross wage (in 1994-2006), and the Slovak Republic with an allowance exceeding the minimum wage and about 60% of the average wage in 2004, after more than doubling it during the reform[6].

3 Flat tax simulations

3.1 EUROMOD: model and database

We use the microsimulation technique to simulate taxes, benefits and disposable incomes under different scenarios for a representative micro-data sample of households. Simulations are done with EUROMOD, a static tax-benefit model covering the EU15 countries. Our analysis is based on the 2003 tax-benefit systems, which is the most recent wave currently available in EUROMOD but it is limited to 10 countries, excluding Denmark, France, Ireland, Italy and Sweden (see also Figure 8 in Appendix A).

The main stages of the simulations are the following. First, a micro-data sample and tax-benefit rules are read into the model. Then for each tax and benefit instrument, the model constructs corresponding units of assessment, ascertains who are eligible for that instrument and determines the amount of benefit or tax liability. The result is then assigned to either an individual or allocated to the persons sharing the tax unit. Finally, after all taxes and benefits in questions are simulated, disposable income is calculated.

EUROMOD is characterised by greater extent of flexibility compared to usual national models in order to accommodate a range of different tax-benefit systems. For instance, the model can easily handle different units of assessment, income definitions for tax bases and benefit means-tests, the order and structure of instruments. Overall, a common framework allows making comparisons between countries in a consistent way.

EUROMOD covers only monetary incomes, excluding also unrealised or irregular capital gains/losses and irregular lump sum incomes. It can simulate most of the direct taxes and benefits except those based on previous contributions as this information is usually not available from cross-sectional data often characterising EUROMOD input datasets. The model assumes full benefit take-up and tax compliance. Although the latter is an important aspect of flat tax reforms, we do not consider it here and limit our analysis to the first-order static effects only.

[5] See Ivanova et al. (2005).

[6] See Brook and Leibfritz (2005).

Table 2 in Appendix A gives an overview of the input datasets for EUROMOD. Their sample size varies from less than 2,500 to more than 11,000 households across countries. All monetary variables are updated to year 2003 using country-specific uprating factors, as the reference time period for incomes varies from 1999 to 2003. Where net incomes were recorded in the original data, gross incomes have been also imputed.[7]

3.2 Current income tax systems

The existing income tax systems in the 10 countries under consideration offer considerable variety. As of 2003, all have graduated rate schedules with a number of brackets ranging from 3 (UK) to 16 (Luxembourg) and the highest marginal tax rate from 38% (Luxembourg) to about 55% (Finland, state and local rate combined). All schedules are piecewise linear except that of Germany which has a unique continuous function for tax rates at some income levels. Seven countries have a general personal allowance, often integrated into the tax schedule, the Netherlands and Portugal apply general (wastable) tax credits and Austria uses both elements. About half of the countries tax capital income (and property income) together with other income and the rest tax it separately applying a flat rate (of 15-30%), in Belgium this is optional.

The countries also differ for the unit of assessment. Again, half of them allow only individual taxation, four countries apply either optional or compulsory joint taxation and Belgium provides limited income sharing for married couples. Nevertheless, even systems based on individual taxation have often elements assessed at family level or couple level (e.g. family or child allowances) or allow the sharing of non-labour income or household expenditures (e.g. property income, mortgage payments). See Table 3 in Appendix A for a summary of these characteristics.

Overall, although there are few countries with relatively simple income tax systems (e.g. UK), most of them can be characterised as rather complex systems with the combination of many different components and varying tax units. Different elements can be fixed amounts but also either decreasing or increasing at the level of taxable income. Additional examples of complexities include progression adjustments in Austria and Germany, income taxation both at the state and the local level in Finland, and an integrated schedule of social insurance contributions and income tax in the Netherlands. Therefore, our reform scenarios have a good potential to significantly simplify the systems and make them more transparent.

3.3 Reform scenarios

In our flat tax reform simulations we aim at replacing all existing personal income tax deductions, allowances and credits with a single personal allowance (which is equivalent to a wastable

[7]For further information on EUROMOD, see e.g. Sutherland (2001) and Sutherland (2007).

tax credit under flat tax rate), and graduated rate schedule with a single flat rate. We only keep refundable tax credits on the basis that these are equivalent to benefits.[8] The same rate is also applied on capital income where it is taxed separately.

In the current paper, we do not make an attempt to harmonise tax bases across countries. We limit ourselves to income taxes and do not modify existing social insurance contribution schemes or consider benefits (e.g. basic income flat tax). One could also carry out an exercise of simply flattening tax rate schedules, but this would result in higher flat tax rates due to retained exceptions, therefore, limiting gains in terms of labour incentives.

We simulate the following three flat income tax scenarios for each country:

- a flat rate with a basic allowance in the existing (or equivalent) amount (S1),
- a 10 percentage points higher flat rate compared to the first scenario (S2),
- a 20 percentage points higher flat rate compared to the first scenario (S3).

All scenarios are revenue neutral with the total income tax revenue within $\pm 0.1\%$ limits of its baseline value. In terms of Davies and Hoy (2002) approach, our first scenario should roughly correspond to the lower bound. The 10 and 20 percentage point higher tax rate under the second and the third scenario are chosen to explore the effect on inequality potentially around the upper bound. Because of additional complexities discussed in section 2 exact critical flat tax rates can be identified only by trial and error.

Figure 1 plots the flat tax rate under each scenario and the lowest and highest (positive) tax rate of the existing tax rate schedules. Because of revenue neutrality the tax allowance is not independent of the tax rate. There is notable variation in the flat tax rate under the first scenario (11.6-33.9%), resulting from the combination of the underlying pre-tax income distribution and average effective tax burden under the existing system, and affecting also other two scenarios. However, it turns out that for most countries the range of flat tax rates under three scenarios roughly matches the range of existing tax rates. A notable exception is the Netherlands with a very wide range of tax rates.

As expected, flat tax rates under the first scenario are above the lowest existing rates with only Portugal being slightly lower. Again, this is possible due to the elimination of additional tax allowances. Flat tax rates under the third scenario are around the previous highest marginal rates for six countries and below that for the rest.

[8] Examples include lone parent tax credit in Austria, tax credit for families with school children in Greece, working mother tax credit in Spain and working tax credit and child credit in the UK.

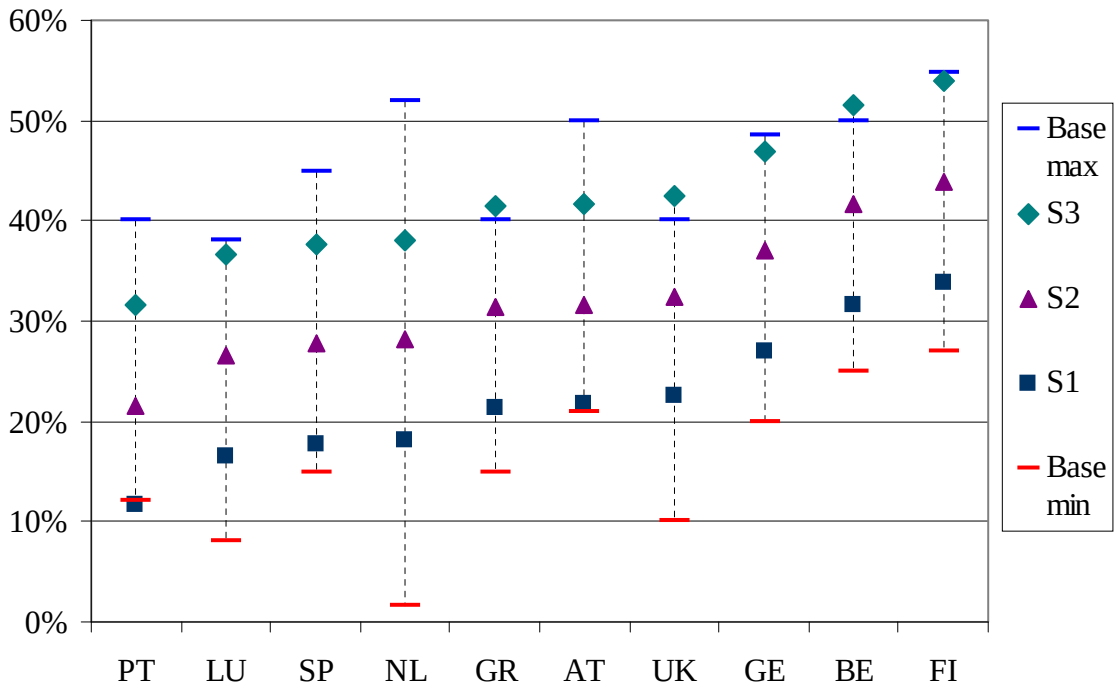

Figure 1: Simulated flat tax rates and existing lowest and highest marginal rate

4 Simulation results

In this section we present the results of our analysis. First, we consider distributional effects in terms of inequality, poverty and richness. This is followed by the presentation of the distribution of tax payments and disposable income, and then summarised by the share of winners and losers. Finally, we demonstrate how effective average and marginal tax rates change according to the simulated reform scenarios.

When interpreting the results one has to be aware of the fact that revenue neutrality in terms of (overall) tax payments does not necessarily imply a constant mean disposable income. This mainly depends on mean-tested benefits which are calculated on the basis of after-tax net income. In fact the pre- and post-reform mean disposable income varies between +0.4% and -1.4% in the revenue neutral scenarios modelled here.

4.1 Inequality, poverty and richness

We compute a number of distributional measures to cover several aspects of distribution: inequality, polarisation, poverty and richness. These are based on equivalised household dispos-

able incomes.[9] To analyse income inequality we use the Gini Coefficient and the Generalised Entropy Indices with sensitivity parameters $\alpha = 0$ (Mean Log Deviation), $\alpha = 1$ (Theil index) and $\alpha = 2$. We also calculate a polarisation index.[10] Figure 2 presents the Gini coefficient for each scenario, other measures are presented in Table 6 (Appendix B).

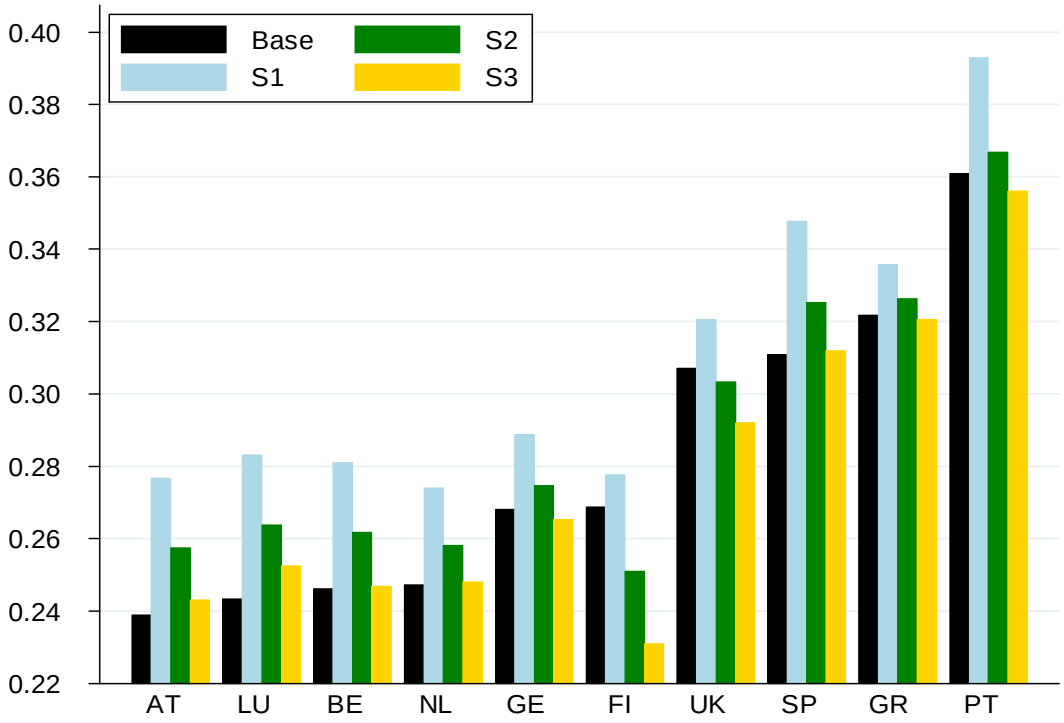

Figure 2: Gini coefficient

First of all, it is noteworthy that there are already distinct differences between the analysed countries in terms of inequality in the baseline scenario. Two groups become visible: inequality is rather high in Southern European countries (Greece, Portugal and Spain) and the UK, whereas it is rather low in Continental Europe (Austria, Belgium Germany, Luxembourg) and Finland.

Introducing a revenue neutral flat tax in combination with tax simplification increases in-

[9] We use the modified OECD equivalence scale which weights the household head with a factor of 1, household members aged 14 and older 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.

[10] 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.

equality unambiguously only under the first scenario (S1). In the second scenario (S2) inequality decreases for Finland and the UK (depending on the inequality measure for the latter) and in the third scenario (S3) also for Belgium, Germany, Greece and Portugal. The scenarios can be ranked according to the level of inequality as follows: $I(S1) > I(S2) > I(S3)$.[11] The increases in inequality, however, are similar in absolute terms for most countries with FI and UK being slightly lower. The fact that inequality levels under the third scenario are below or close to those in the baseline scenario show that they correspond approximately to the upper boundary. This is somewhat surprising considering that this scenario was constructed by a discrete increase in the flat tax rate compared to the first scenario. The polarisation of the income distribution increases in most countries and scenarios (except FI-2&3 and UK-2&3) implying a further declining middle class.

To analyse the effects of flat taxes on poverty we compute the headcount index and the measures of Foster et al. (1984) based on the poverty line taken from the baseline scenario.[12] We compute the poverty lines as 60% of median equivalent income for each country. The results for the head-count ratio (FGT0) are plotted in Figure 3 and the full results are presented in Table 4 (Appendix B). Measuring richness is a much less considered field in the literature than poverty. We compute the head-count index and the measures of Peichl et al. (2006) which are analogously defined to the FGT indices of poverty. The richness line is computed as 200% of median equivalent income. The results for the head-count ratio are presented in Figure 4 and the full results in Table 5 (Appendix B).

Again, there are already distinct differences between the analysed countries in the baseline. The same two groups of countries can be distinguished: poverty and richness (like inequality) is rather high in Southern European countries (Greece, Portugal and Spain) and the UK, and it is rather low in Continental Europe (Austria, Belgium Germany, Luxembourg) and Finland.

Poverty increases in terms of all measures in all scenarios, except FI-2&3, NL-3 and UK-2&3. When analysing poverty, one has to take into account that the lowest deciles of the income distribution seldom pay income taxes (see Fuest et al. (2006)). Therefore, a reduction in income poverty through reduced marginal tax rates is naturally restricted. Broadening and simplification of the tax base, in contrast, leads c.p. to increasing poverty as more (low income) households have to pay income taxes after such a reform. As a consequence, the increase in poverty is highest in scenario S1 with low parameter values.

The pattern of changes in richness measures matches closely the inequality measures, i.e.

[11] This ordering is stable when using any inequality index presented in Table 6 (Appendix B).

[12] We fix the poverty and richness lines at the value of the status quo taxation to account for (possible) changes in median income. Otherwise, if we would allow for changing poverty (richness) lines an increasing measure of poverty (or a decreasing index of richness) would not necessarily indicate a worse situation for people with low (high) incomes as a result of the changing poverty (richness) line.

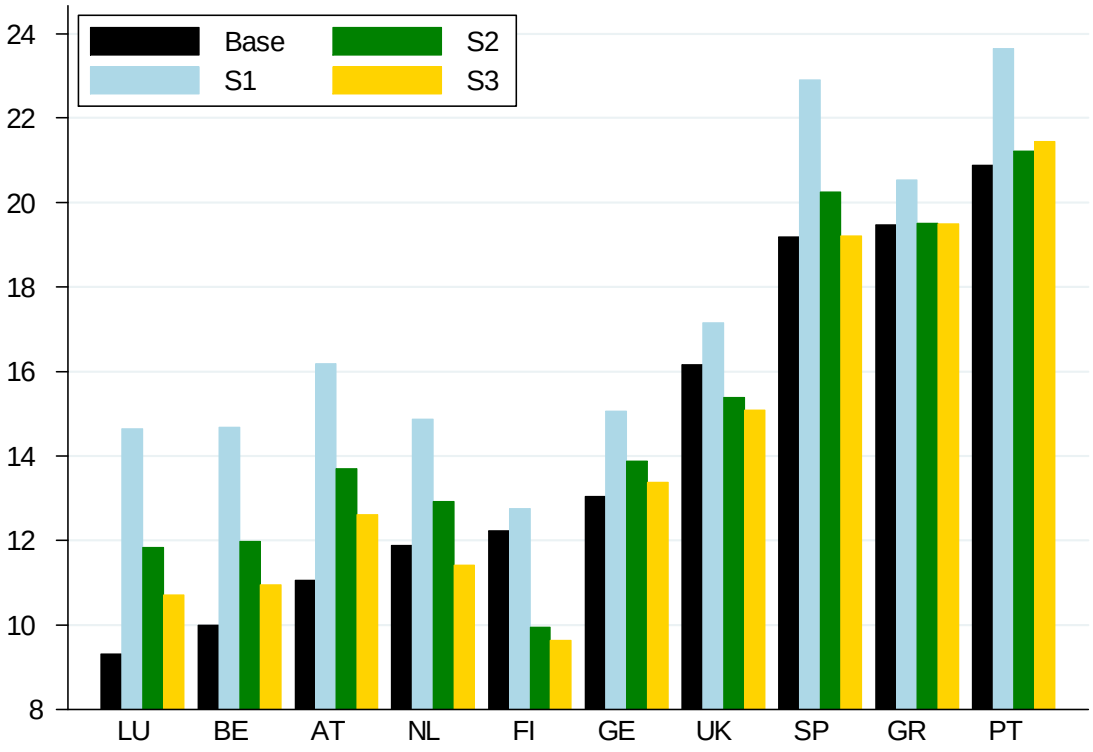

Figure 3: Poverty rates by head-count ratio (with constant poverty line), in %

increasing richness in the first scenario for all countries and measures, decreasing richness for Finland and the UK in the second scenario and additionally for Belgium and Germany in the third scenario. These effects differ slightly when using more sophisticated richness measures (R_α) that also account for changes in the dimension of richness and not only the number of people above a richness line.[13] Richness is then also decreasing for PT-3 and GR-3.

4.2 Distribution of tax payments and disposable income

The revenue neutral flat tax scenarios also change the distribution of tax payments (see Table 8 in Appendix C). The top decile that pays the largest share of the overall tax payments, pays less taxes in scenario S1 (all countries) and S2 (all but FI and UK) but more in S3 (except LU and NL) compared to the existing systems. Low and middle income households are more burdened in case of low basic allowance and tax rate (S1) due to tax base broadening. Households in the lowest deciles do not pay taxes in the status quo. Therefore, the broadening of the tax base yields that some of these households start paying taxes and therefore lose disposable income.

[13] C.f. Peichl et al. (2006).

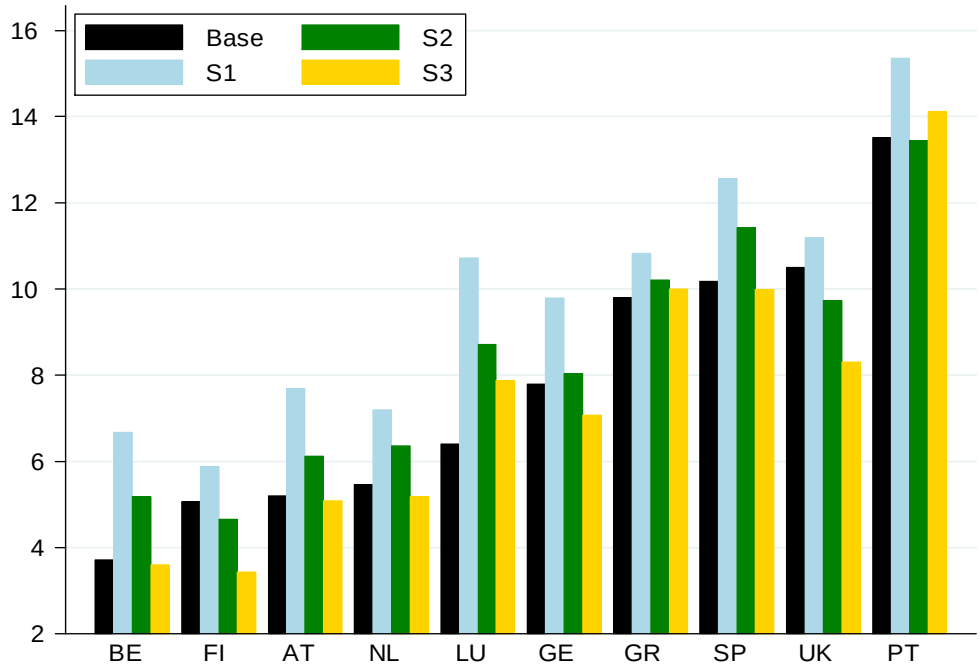

Figure 4: Richness rates by head-count ratio (with constant richness line), in %

To analyse the impact of flat tax reforms on the redistributive effects of the tax system we compute several measures of tax progression (see Table 9 in Appendix C). Figure 5 presents the values for the Musgrave-Thin index.

There are already distinct differences in the baseline scenario also in terms of progression between the analysed countries. In this case, however, it is not that easy to distinguish two homogeneous groups and the composition of potential groups differs from before. Progression is rather low in Finland, the UK, Germany, Austria and the Netherlands, whereas it is rather high in Belgium, Greece, Portugal, Luxembourg and Spain.

Tax progression decreases under scenario 1 with a low tax rate in all countries in comparison to the baseline scenario. The values for scenario 2 and 3 depend on a country. Nevertheless the scenarios can be ranked in terms of all indices of progression in the following way: $I_{PR}(S1) < I_{PR}(S2) < I_{PR}(S3)$.

Overall, the introduction of a revenue neutral tax reform always yields winners as well as losers. Different groups of taxpayers are differently affected by tax schedule flattening and tax base broadening. Table 7 in Appendix C presents the effect in terms of changes in mean disposable income by deciles. The range of changes is somewhat higher for the first (from -9.7% to +12.1%) and the third scenario (-13.1% to 8.0%) compared with the second scenario (-5.5% to 6.2%).

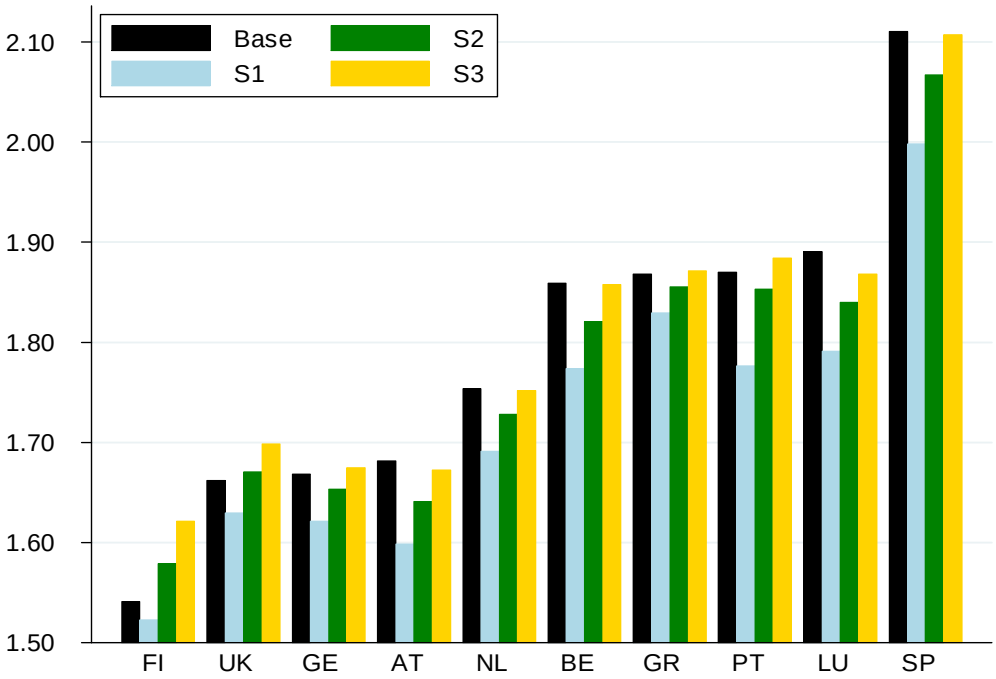

Figure 5: Tax progression by Musgrave-Thin index

In the first scenario with the lowest tax rates the gains are solely concentrated in the top 1-2 deciles (only in Belgium also involving 7th and 8th decile). In the second scenario some 9th deciles start losing instead of gaining; in the case of Finland and the UK the top decile is losing as well and bottom and middle deciles start gaining. In the third scenario only three countries are left with gains for the top decile (Luxembourg, the Netherlands and Spain); in addition to Finland and the UK also Greece, the Netherlands, Portugal and Spain show gains for the lowest deciles. Germany under the third scenario is an exceptional case where only middle income deciles gain. Although in a number of cases the gains are quite widespread and involve the middle income groups, the resulting flat tax rates are very high (40-55%). The only cases which seem plausible are PT-3 and UK-2 resulting in eight deciles gaining in disposable income and with 31.6% and 32.5% flat rate tax respectively. This is similar to Iceland which has currently the highest flat tax (33%).

The changes in mean disposable income are increasing (decreasing) with flat tax parameters (i.e. marginal tax rate and basic allowance) for low (high) income households. In other words, the lower (higher) the flat tax parameters the higher (lower) are the gains (losses) for high (low) income households. In most countries the (relative) losses in terms of disposable income remain high (or are even highest) for middle income households. These groups, however, usually play an important role in the political process of a mature welfare state. Thus, these effects might

explain why a flat tax is not as popular in Western Europe as in Eastern Europe.

Figure 6 and Table 10 (Appendix C) summarise gainers and losers[14] by presenting the exact share for each, which differs considerably between countries and scenarios. There are more losers than winners in every country under the first scenario. Belgium, Finland and Germany show about the same share of winners and losers under the second scenario, while Greece, Portugal and the UK have most of people with unchanged income. In the third scenario, only Austria and Luxembourg have still more losers; Germany, the Netherlands and Portugal have again roughly the same share those gaining and losing and most people in Greece remain still in the 'no-change' category. The highest fraction of winners appears in Belgium and Finland for all scenarios and it is increasing over scenarios for most countries (except for Austria, Germany and Greece). If one would choose disposable income as the only criterion for an election decision, only the third flat tax scenario would have a majority (in the sense of more winners than losers) in the population for most countries.

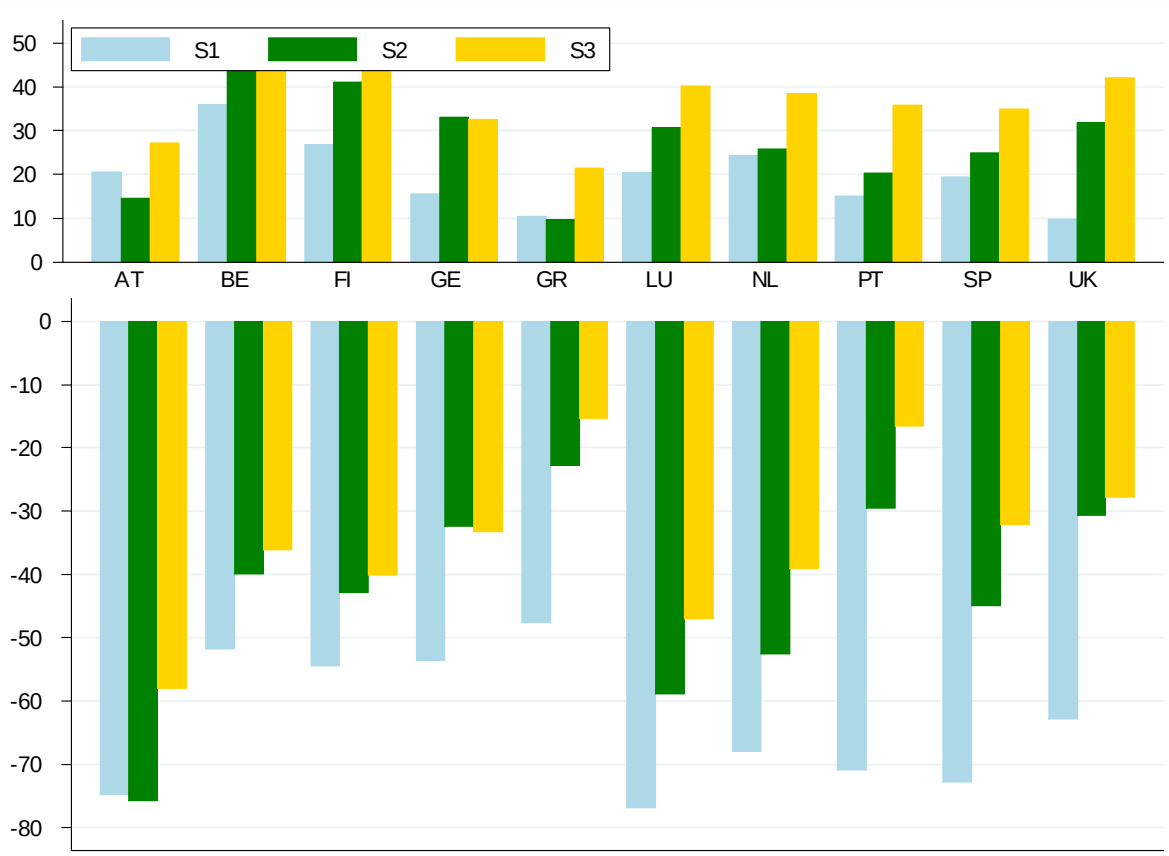

Figure 6: Share of winners and losers, %

[14]Households whose disposable income does not change more than 10 Euros per month in either direction are regarded as „unchanged".

4.3 Efficiency: effective average and marginal tax rates (TO BE COMPLETED)

In this section, we analyse the effects of flat tax reforms on the effective marginal (EMTR) and average (EATR) income tax rates faced by different groups of taxpayers as a measure for efficiency effects.[15] The underlying idea is that average and marginal income tax rates affect labour supply and savings incentives. Therefore, changes in effective income tax rates may be considered as rough indicators for distortions caused by the tax system. Changes in effective average tax rates are of special interest for the extensive labour supply margin which seems to be more important for particular subgroups at the bottom of the income distribution than the intensive margin which is affected by the effective marginal tax rate (see Heckman (1993) and Immervoll et al. (2007)). Figure 7 presents the EATRs for the revenue flat tax scenarios.[16]

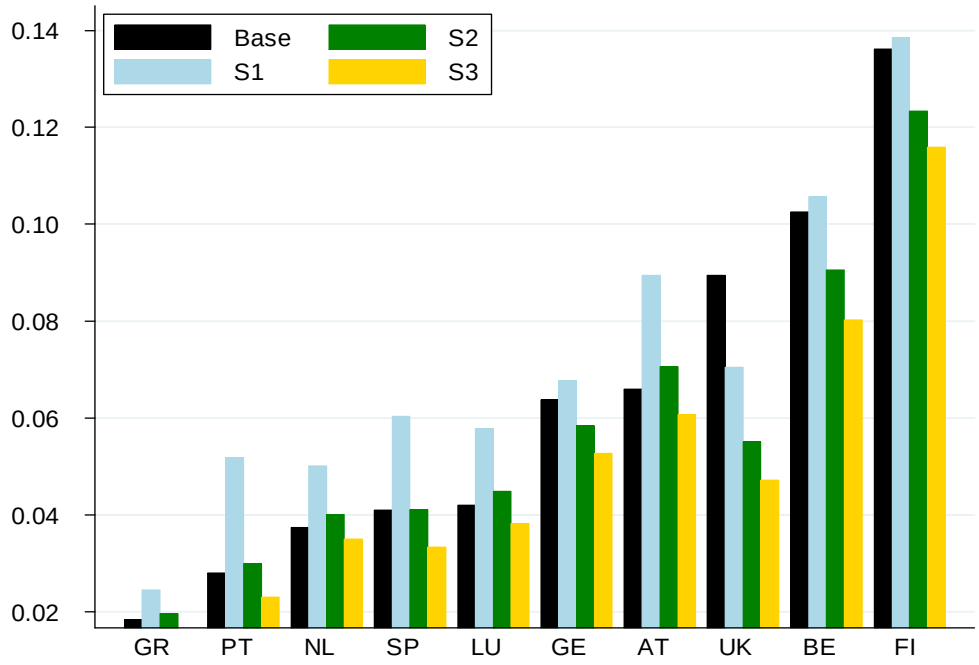

Figure 7: Effective average tax rate

The EATRs already differ distinctively in the baseline scenario. The average tax burden of the income tax system is rather low in Greece, Portugal, Netherlands, Luxembourg, and Spain,

[15] We compute EATRs for each tax unit i accorrding to the following formula: $t_i^A = \frac{T_i}{Y_i}$ with T_i total tax payments and Y_i gross income.

[16] Revenue neutrality does not imply constant individual EATRs. The overall average tax burden, however, could remain unchanged if total gross income does not change. Therefore, the mean of individual EATR will in general differ from the overall average tax burden: $EATR = \frac{1}{N}\sum \frac{T_i}{Y_i} \neq \frac{\Sigma T_i}{\Sigma Y_i} = \frac{T}{Y}$.

average in Germany and Austria and rather high in UK, Belgium and Finland.

The scenarios can be ranked in the following way: $EATR(S1) > EATR(S2) > EATR(S3)$. Therefore, increasing the allowance dominates the increase in (statutory) marginal rate and leads to decreasing EATR although revenue is kept constant. In scenario S1 the EATRs increase in all countries in comparison to the baseline, scenario S3 is always lower and S2 depends on the country.

The distribution of EATRs across deciles is presented in Table 12 (Appendix D). In scenario S1 EATRs decrease for high income households whereas low to middle income households have higher EATRs. This leads to ambiguous overall incentives effects depending on each groups elasticities. The effects remain ambiguous for all countries and all scenarios. Increasing (statutory) tax rate and basic allowance decreases (increases) EATRs at the lower (upper) end of the income distribution.

5 Summary and conclusion

Flat income tax has become increasingly popular recently especially in Eastern Europe. However, among Western European countries with well-established middle class only Iceland has adopted a flat tax. Using EUROMOD, a tax-benefit microsimulation model for the EU15, we provide an empirical analysis of the distributional effects of different flat tax designs for selected European countries in a common framework. In addition to our comparative dimension we aim at a systematic approach for choosing flat tax parameters. We model revenue neutral scenarios where all existing income tax deductions and allowances are replaced with a single basic allowance and the tax schedule with a flat rate, therefore significantly simplifying the systems and making them more transparent.

There are already distinct differences between the analysed countries under the present systems. Two groups of countries can be distinguished: inequality, polarisation, (relative) poverty and richness are rather high in Southern European countries (Greece, Portugal and Spain) and the UK, whereas they are rather low in Continental Europe (Austria, Belgium Germany, Luxembourg) and Finland.

In general, the effects of a flat tax reform differ considerably with changes in the marginal tax rate and the basic tax allowance. The distributional effects are summarised in Table 1.[17] To sum up, flat tax rates required to attain revenue neutrality with existing personal allowances are reasonable in terms of labour supply incentives. However, they do benefit mainly those with high incomes at the expense of low and middle income households, resulting in higher

[17]Note: the symbols have the following meanings: + / - : significant increase (decrease) in all measures considered, (+) / (-): significant increase (decrease) in most measures, (˜): ambigous results or no significant changes.

	Inequality			Progression			Poverty			Richness		
	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
AT	+	+	+	-	-	(-)	+	+	+	+	+	(+)
BE	+	+	(-)	-	(-)	(-)	+	+	+	+	+	-
FI	+	-	-	-	+	+	(+)	-	-	+	-	-
GE	+	+	-	-	(-)	+	+	+	+	+	+	-
GR	+	+	-	-	-	(+)	+	(~)	(~)	+	+	(~)
LU	+	+	+	-	-	(-)	+	+	+	+	+	+
NL	+	+	+	-	-	(~)	+	(+)	-	+	+	(+)
PT	+	+	-	-	-	+	+	+	(+)	+	+	+
SP	+	+	(~)	-	-	(-)	+	+	+	+	+	(-)
UK	+	-	-	-	+	+	+	-	-	+	-	-

Table 1: Summary of distributional changes

inequality, poverty and polarisation of the income distributions. On the other hand, flat rates necessary to keep the inequality levels unchanged are rather high, implying strong disincentive effects.

When interpreting these results, one has to be aware of the fact that we limit our analysis to static models (and so far to inequality effects). However, flat rate taxes are also supposed to have positive dynamic efficiency and growth effects.[18] In combination with tax simplification, compliance and administrative costs are reduced, as well as incentives and possibilities for legal or illegal tax evasion. As a result of positive employment and growth effects increasing inequality might be acceptable. Nevertheless, the question arises whether a personal income tax reform has enough potential to increase growth and employment. The user costs of labour and capital play an important role in determining the demand for labour and investment. These user costs, however, are rather determined by social security contributions and corporate taxes than by personal income tax.

Nevertheless, the immediate and short-term distributional effects analysed in this paper are most likely to be decisive for the political feasibility of a flat tax reform. The main problem of implementing a flat rate tax could be to convince a majority of the population that redistribution in favour of the highest income decile is acceptable. These distributional effects at the expense of the middle class help to explain why flat rate taxes have not been successful in the political process in Western Europe.

[18] C.f. Stokey and Rebelo (1995) or Cassou and Lansing (2004).

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Appendices

A EUROMOD

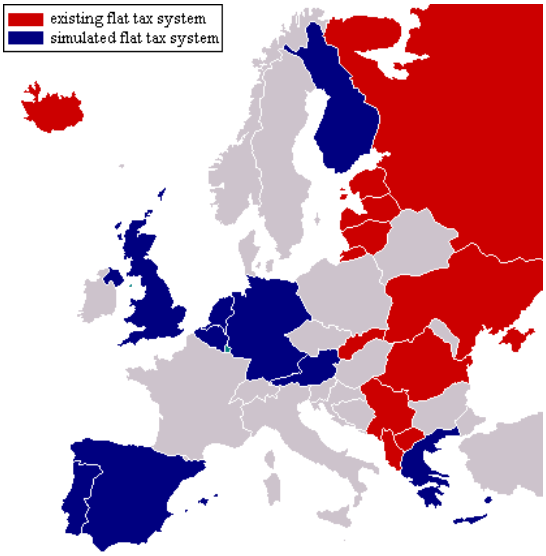

Figure 8: Existing and simulated flat tax systems in Europe

Country	Input dataset for EUROMOD	No of house-holds	Date of collection	Reference time period for incomes
Austria	Austrian version of EU-SILC	4,521	2004	annual 2003
Belgium	Panel Survey on Belgian Households	2,975	2002	annual 2001
Finland	Income distribution survey	10,736	2001	annual 2001
Germany	German Socio-Economic Panel	11,303	2002	annual 2001
Greece	Household Budget Survey	6,555	2004/5	annual 2003/4
Luxembourg	PSELL-2	2,431	2001	annual 2000
Netherlands	Sociaal-economisch panelon-derzoek	4,329	2000	annual 1999
Portugal	European Community House-hold Panel	4,588	2001	annual 2000
Spain	European Community House-hold Panel	5,048	2000	annual 1999
UK	Family Expenditure Survey	6,634	2000/1	month in 2000/1

Table 2: EUROMOD input datasets (version C13)

	No of brackets	Lowest (pos) rate	Highest rate	Form of the main tax relief	Capital taxation	Tax unit
AT	4	21%	50%	0% tax bracket, tax credit	flat tax (25%)	individual
BE	5	25%	50%	tax allowance	optional flat tax (15%)	some sharing
FI	5	state 12%, local 15%	state 35%, local 19.75%	0% tax bracket (state), tax allowance (local)	flat tax (29%)	individual
GE	4	19.9%	48.5%	0% tax bracket	integrated	optional joint
GR	3	15%	40%	0% tax bracket	integrated	individual
LU	16	8%	38%	0% tax bracket	integrated	joint
NL	4	1.7%	52%	tax credit	flat tax (30%)	individual
PT	6	12%	40%	tax credit	flat tax (20%)	joint
SP	5	15%	45%	tax allowance	integrated	optional joint
UK	3	10%	40%	tax allowance	one bracket slightly reduced	individual

Table 3: Income tax systems 2003

B Inequality, poverty and richness

	PL	FGT0 (HCR)				FGT1				FGT2			
		Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3
AT	859.22	11.06	16.19	13.70	12.61	1.93	2.97	2.45	2.25	0.58	0.87	0.73	0.69
BE	809.52	10.00	14.68	11.97	10.94	3.39	4.10	3.74	3.63	1.99	2.25	2.16	2.14
FI	838.33	12.24	12.76	9.95	9.64	2.17	2.17	1.75	1.74	0.63	0.60	0.52	0.52
GE	801.56	13.04	15.06	13.88	13.38	2.74	3.00	2.84	2.81	0.97	1.02	1.00	1.00
GR	437.40	19.48	20.54	19.51	19.50	6.36	6.50	6.37	6.36	3.34	3.37	3.34	3.34
LU	1,274.24	9.31	14.64	11.83	10.72	1.10	2.09	1.46	1.30	0.25	0.46	0.31	0.28
NL	871.00	11.87	14.87	12.93	11.41	2.37	2.82	2.42	2.28	1.20	1.30	1.19	1.16
PT	347.43	20.89	23.65	21.22	21.44	4.75	5.59	4.78	4.71	1.40	1.71	1.40	1.38
SP	548.13	19.18	22.89	20.26	19.21	5.40	6.78	5.75	5.41	2.47	3.03	2.58	2.47
UK	575.07	16.17	17.16	15.38	15.08	3.00	3.13	2.90	2.88	1.05	1.08	1.03	1.03

Table 4: Poverty line and rate
Sources: own calculation using EUROMOD version C13.

	RL	HCR				R1				R2			
		Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3
AT	2,864.06	5.19	7.68	6.12	5.08	1.02	1.83	1.40	1.03	0.35	0.70	0.51	0.36
BE	2,698.39	3.72	6,67	5.17	3.61	0.78	1.37	0.97	0.72	0.32	0.51	0.37	0.28
FI	2,794.42	5.06	5.88	4.65	3.43	1.23	1.52	1.12	0.79	0.53	0.65	0.47	0.33
GE	2,671.85	7.79	9.79	8.03	7.07	1.48	2.16	1.66	1.29	0.46	0.76	0.55	0.39
GR	1,458.00	9.81	10.82	10.21	10.00	2.24	2.77	2.46	2.23	0.82	1.13	0.95	0.80
LU	4,247.46	6.41	10.72	8.71	7.88	1.22	2.37	1.86	1.51	0.38	0.86	0.63	0.47
NL	2,905.09	5.46	7.20	6.36	5.18	0.96	1.63	1.28	1.01	0.29	0.59	0.44	0.34
PT	1,158.09	13.51	15.36	13.44	14.12	4.16	5.31	4.34	4.00	1.83	2.59	1.98	1.69
SP	1,827.09	10.18	12.57	11.42	9.99	2.12	3.26	2.60	2.11	0.70	1.25	0.93	0.71
UK	1,921.48	10.51	11.19	9.73	8.30	2.40	2.86	2.23	1.76	0.87	1.12	0.83	0.61

Table 5: Richness line and rate
Sources: own calculation using EUROMOD version C13.

	Gini				GE0				GE1				GE2				PS			
	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3
AT	0.239	0.277	0.257	0.243	0.095	0.127	0.110	0.099	0.102	0.143	0.122	0.106	0.131	0.211	0.172	0.141	0.228	0.259	0.242	0.231
BE	0.246	0.281	0.262	0.247	0.108	0.128	0.112	0.101	0.116	0.142	0.121	0.105	0.196	0.237	0.189	0.150	0.231	0.270	0.251	0.237
FI	0.269	0.278	0.251	0.231	0.127	0.134	0.112	0.096	0.175	0.186	0.151	0.122	0.587	0.618	0.452	0.315	0.243	0.251	0.224	0.206
GE	0.268	0.289	0.275	0.265	0.119	0.137	0.125	0.117	0.120	0.144	0.128	0.117	0.141	0.183	0.156	0.136	0.261	0.277	0.267	0.262
GR	0.322	0.336	0.326	0.321	0.191	0.205	0.195	0.189	0.175	0.198	0.183	0.173	0.209	0.258	0.228	0.205	0.305	0.310	0.306	0.304
LU	0.243	0.283	0.264	0.252	0.094	0.127	0.110	0.101	0.099	0.139	0.119	0.107	0.117	0.178	0.149	0.129	0.242	0.275	0.258	0.249
NL	0.247	0.274	0.258	0.248	0.103	0.126	0.113	0.105	0.102	0.132	0.116	0.105	0.119	0.174	0.148	0.128	0.245	0.265	0.251	0.244
PT	0.361	0.393	0.367	0.356	0.211	0.250	0.218	0.206	0.229	0.282	0.240	0.220	0.313	0.416	0.337	0.292	0.321	0.335	0.322	0.323
SP	0.311	0.348	0.325	0.312	0.177	0.216	0.191	0.178	0.167	0.216	0.188	0.169	0.210	0.315	0.260	0.221	0.293	0.319	0.302	0.295
UK	0.307	0.321	0.303	0.292	0.153	0.167	0.151	0.140	0.166	0.189	0.166	0.149	0.235	0.302	0.248	0.206	0.298	0.302	0.293	0.289

Table 6: Income inequality
Sources: own calculation using EUROMOD version C13.

C Distribution of tax payments and disposable income

	AT			BE			FI			GE			GR		
	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
1	-8.01	-4.44	-2.79	-7.05	-3.68	-2.46	0.70	5.27	5.83	-1.18	-0.54	-0.51	-0.13	0.01	0.01
2	-9.70	-5.51	-2.73	-8.19	-4.09	-1.34	-1.47	4.80	7.98	-3.62	-1.19	-0.05	-1.29	-0.04	0.08
3	-8.22	-4.76	-1.73	-9.01	-5.07	-1.15	-1.51	3.96	7.72	-5.14	-1.40	0.97	-1.90	-0.40	0.22
4	-7.51	-4.44	-1.68	-6.48	-2.98	0.21	-1.72	2.54	6.17	-4.76	-1.46	1.05	-2.66	-0.66	0.47
5	-6.04	-3.53	-1.24	-4.38	-1.19	1.59	-1.90	0.51	3.07	-4.32	-1.84	0.53	-2.65	-0.95	0.22
6	-4.73	-3.04	-0.99	-1.59	-0.30	1.22	-1.90	-0.71	1.01	-3.49	-1.12	1.20	-2.89	-1.43	-0.26
7	-3.42	-2.57	-1.47	0.27	0.79	1.75	-1.35	-1.36	-0.67	-2.64	-1.27	0.31	-2.90	-1.39	-0.21
8	-1.70	-1.85	-1.27	2.26	1.31	0.81	-1.13	-2.26	-2.56	-1.59	-1.14	-0.34	-2.01	-0.96	0.11
9	1.21	-0.45	-1.19	4.24	2.28	1.00	0.07	-2.58	-4.41	0.70	-0.88	-1.88	-1.71	-0.94	0.38
10	11.57	5.16	-0.52	9.26	2.63	-3.49	3.62	-5.01	-13.13	7.38	2.02	-2.68	6.88	2.51	-0.89
	LU			NL			PT			SP			UK		
	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
1	-8.08	-2.64	-1.13	-3.41	0.14	1.29	-3.66	0.10	0.21	-7.59	-0.82	0.26	-0.58	0.54	0.66
2	-9.15	-4.36	-2.11	-4.34	-1.05	0.70	-5.38	-0.34	0.42	-9.22	-2.89	0.05	-1.32	1.44	2.54
3	-8.16	-3.99	-1.54	-5.09	-1.66	0.11	-6.42	-1.69	-0.30	-8.08	-3.05	0.15	-1.99	1.43	3.23
4	-8.75	-5.23	-2.94	-4.60	-2.16	-0.43	-6.45	-0.35	0.89	-7.51	-3.43	-0.84	-2.24	1.80	4.27
5	-7.92	-5.30	-3.51	-3.86	-2.08	-0.53	-6.08	-0.69	1.30	-5.76	-2.36	0.41	-2.45	1.15	4.21
6	-6.10	-4.61	-2.79	-2.50	-1.59	-0.41	-6.57	-0.88	1.78	-5.30	-2.53	-0.12	-2.40	0.50	3.17
7	-4.58	-4.42	-3.73	-2.53	-2.08	-1.10	-5.82	-1.02	1.77	-2.65	-1.34	0.28	-2.15	-0.07	2.45
8	-2.65	-2.97	-2.51	-0.88	-1.21	-1.03	-4.07	-1.60	1.84	-0.81	-1.20	-0.69	-1.42	-0.85	0.31
9	2.63	0.45	-0.46	1.37	-0.10	-0.73	0.06	-1.08	0.95	1.76	-0.16	-0.67	-0.48	-1.60	-1.61
10	12.05	6.16	1.51	9.75	4.91	0.95	11.24	2.59	-2.99	11.79	5.19	0.05	6.23	-0.26	-5.77

Table 7: Changes in disposable income in percentage points by income decile
Sources: own calculation using EUROMOD version C13.

	AT				BE				FI				GE				GR			
	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3
1	7.66	543.09	98.97	-25.07	0.29	9,863.46	4,441.63	2,606.60	44.74	-12.37	-69.79	-75.43	0.56	585.90	-24.44	-92.66	-0.05	-299.30	21.87	21.87
2	33.61	146.72	44.63	-13.40	30.64	230.57	111.32	32.78	86.44	14.17	-36.22	-61.46	11.96	140.40	3.80	-47.83	0.49	583.40	15.07	-37.04
3	60.99	73.92	25.14	-16.20	61.26	120.10	60.47	5.82	132.39	10.37	-20.63	-42.37	39.59	74.48	7.19	-29.96	2.05	265.30	54.17	-31.88
4	84.84	54.51	21.67	-8.59	111.08	46.52	18.93	-6.31	178.49	9.72	-9.39	-26.28	64.78	50.99	8.01	-22.96	4.10	225.53	50.55	-40.45
5	114.04	37.67	15.23	-4.95	160.26	25.13	6.45	-9.92	222.20	9.31	0.07	-10.22	102.78	33.54	9.65	-13.19	10.76	103.57	34.21	-10.66
6	149.05	24.79	11.95	-3.03	227.20	6.70	0.90	-5.87	268.66	8.24	4.43	-1.62	150.92	21.56	4.38	-12.52	17.41	79.45	35.02	1.62
7	185.30	14.25	8.43	0.95	291.79	0.27	-2.32	-6.30	326.57	5.84	6.36	4.26	208.77	13.63	4.63	-5.81	27.72	58.98	24.96	0.26
8	250.15	4.83	5.21	1.83	370.76	-6.36	-3.85	-2.76	395.46	4.52	8.69	9.95	305.01	6.46	3.49	-1.17	51.24	28.22	11.30	-3.93
9	355.53	-7.48	-0.56	2.51	491.19	-11.33	-6.35	-3.23	518.16	0.84	8.79	14.18	453.96	-2.90	2.14	5.00	81.44	18.08	8.62	-6.45
10	914.86	-31.31	-14.51	0.42	993.50	-19.46	-5.82	6.77	1,080.43	-7.49	13.22	32.61	988.16	-18.71	-5.56	5.91	342.60	-26.08	-9.57	3.08
	LU				NL				PT				SP				UK			
	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3
1	5.35	816.08	88.44	-97.10	11.35	122.97	-20.78	-59.29	0.33	1,634.80	-54.17	-100.00	0.48	2,924.37	282.53	-97.00	2.33	114.37	-82.14	-96.11
2	12.34	496.20	119.38	-43.21	19.91	135.04	18.80	-28.50	0.82	1,194.20	60.55	-96.38	3.88	751.69	199.89	-9.13	12.12	57.93	-50.02	-83.00
3	28.16	254.62	82.20	-9.69	29.62	124.23	28.24	-10.32	3.12	483.39	102.51	3.02	14.16	226.00	76.63	-7.30	23.27	53.04	-30.76	-61.43
4	37.38	219.80	98.18	23.56	44.57	84.14	30.67	-0.63	4.83	370.87	17.91	-52.96	23.32	148.22	60.49	9.79	42.55	31.99	-24.71	-53.65
5	55.37	162.49	90.43	42.26	63.10	57.29	25.86	0.12	8.64	232.86	23.95	-51.64	41.31	73.97	27.63	-9.13	67.98	23.93	-12.27	-41.34
6	110.48	71.58	45.34	12.48	95.52	31.91	17.23	-0.55	12.77	203.50	24.59	-55.36	52.03	60.32	27.14	-2.19	92.04	19.67	-5.10	-27.48
7	168.60	35.53	31.02	20.00	119.30	29.80	22.16	8.09	20.82	127.71	22.74	-38.98	87.10	22.01	9.99	-4.85	133.36	14.00	-0.42	-17.62
8	242.43	12.76	13.91	7.93	169.36	11.53	12.01	7.86	42.29	54.09	21.58	-23.98	125.00	5.87	7.09	2.21	185.32	8.34	4.30	-3.04
9	442.46	-16.78	-6.03	-2.27	268.54	-5.11	2.68	4.85	91.40	1.37	9.01	-7.36	198.57	-7.90	1.27	2.89	258.12	3.36	7.82	6.96
10	1,134.19	-39.52	-21.09	-6.68	671.41	-33.01	-16.32	-2.87	371.10	-39.06	-8.53	10.80	517.62	-35.29	-15.41	0.05	637.00	-17.39	1.79	17.89

Table 8: Changes in average tax payment by income decile, %
Sources: own calculation using EUROMOD version C13.

	Kakwani				Musgrave-Thin				Reynolds-Smolensky				Redistributive effect (RE)			
	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3
at 2003	0.212	0.061	0.168	0.237	1.682	1.598	1.641	1.673	0.431	0.413	0.421	0.427	0.309	0.271	0.290	0.304
be 2003	0.126	0.067	0.134	0.185	1.859	1.773	1.821	1.858	0.491	0.477	0.483	0.487	0.348	0.314	0.333	0.348
fi 2003	0.125	0.101	0.175	0.223	1.541	1.523	1.579	1.621	0.390	0.389	0.401	0.410	0.257	0.248	0.275	0.295
ge 2003	0.223	0.196	0.253	0.290	1.668	1.621	1.653	1.675	0.436	0.424	0.427	0.429	0.293	0.272	0.287	0.296
gr 2003	0.285	0.223	0.276	0.304	1.868	1.829	1.855	1.871	0.513	0.510	0.510	0.510	0.315	0.301	0.311	0.316
lu 2003	0.197	0.074	0.181	0.239	1.891	1.791	1.840	1.868	0.501	0.480	0.485	0.487	0.356	0.317	0.336	0.347
nl 2003	0.252	0.125	0.228	0.283	1.753	1.691	1.728	1.752	0.464	0.459	0.461	0.462	0.323	0.297	0.313	0.323
pt 2003	0.227	0.067	0.212	0.258	1.870	1.776	1.853	1.884	0.511	0.502	0.509	0.511	0.297	0.265	0.291	0.302
sp 2003	0.182	0.065	0.171	0.221	2.111	1.998	2.067	2.107	0.570	0.563	0.565	0.565	0.363	0.326	0.348	0.362
uk 2003	0.197	0.143	0.230	0.279	1.662	1.630	1.671	1.698	0.437	0.436	0.440	0.442	0.276	0.262	0.280	0.291

Table 9: Tax progression
Sources: own calculation using EUROMOD version C13.

	S1			S2			S3		
	W	0	L	W	0	L	W	0	L
AT	20.52	4.67	74.81	14.62	9.56	75.81	27.14	14.87	57.99
BE	36.04	12.18	51.78	43.67	16.46	39.87	46.04	17.86	36.10
FI	26.78	18.77	54.44	41.06	16.14	42.79	48.72	11.22	40.06
GE	15.58	30.84	53.58	33.08	34.55	32.38	32.54	34.20	33.26
GR	10.44	41.87	47.69	9.71	67.51	22.78	21.46	63.26	15.28
LU	20.46	2.62	76.92	30.69	10.43	58.88	40.29	12.69	47.03
NL	24.26	7.85	67.89	25.79	21.61	52.60	38.55	22.39	39.06
PT	15.08	13.97	70.95	20.26	50.19	29.55	35.88	47.64	16.48
SP	19.40	7.79	72.81	24.91	30.07	45.02	34.88	33.02	32.10
UK	9.79	27.37	62.85	31.71	37.66	30.63	42.08	30.14	27.78

Table 10: Share of winners and losers, %
Note: category '0' if disposable income changes less than 10 euros per month.
Sources: own calculation using EUROMOD version C13.

D Efficiency: EATR and METR

	Base	S1	S2	S3
AT	0.09	0.12	0.09	0.08
BE	0.15	0.16	0.14	0.12
FI	0.17	0.17	0.15	0.14
GE	0.08	0.09	0.07	0.07
GR	0.03	0.04	0.03	0.03
LU	0.06	0.08	0.07	0.06
NL	0.05	0.07	0.05	0.05
PT	0.04	0.08	0.04	0.03
SP	0.06	0.09	0.06	0.05
UK	0.11	0.09	0.07	0.06

Table 11: Effective average tax rate
Sources: own calculation using EUROMOD version C13.

	AT				BE				FI				GE				GR			
	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3
1	0.82	7.24	1.36	0.35	-0.29	2.48	0.92	0.57	4.45	3.32	1.09	1.01	0.06	0.41	0.03	0.00	-1.29	-1.20	-1.30	-1.30
2	2.90	8.91	4.02	1.93	2.09	6.79	3.78	2.06	6.10	6.31	3.05	1.70	1.08	2.59	0.82	0.36	0.55	1.97	0.57	0.46
3	4.88	9.94	5.82	3.18	3.45	8.48	5.48	3.03	7.54	7.79	4.90	3.25	3.11	5.28	2.66	1.57	1.69	4.11	2.04	1.38
4	6.32	11.55	7.57	4.97	6.89	9.02	6.49	4.59	8.92	9.32	7.05	5.48	4.71	6.85	4.16	2.57	1.90	5.96	2.56	1.20
5	7.92	12.98	9.12	6.85	11.89	10.68	8.02	6.15	9.41	9.99	8.53	7.36	6.64	8.58	6.20	4.34	4.05	8.66	5.13	3.42
6	9.70	14.18	10.98	8.61	10.37	10.87	9.37	8.20	10.19	10.82	9.78	8.84	9.23	10.99	8.50	6.58	5.71	11.27	7.30	5.15
7	10.75	14.81	11.96	10.07	14.37	12.10	10.91	9.85	11.04	11.65	11.07	10.43	11.75	13.05	10.97	9.23	8.23	14.93	10.00	7.41
8	13.85	16.80	14.98	13.39	15.19	12.54	11.95	11.48	12.24	12.85	12.81	12.55	15.51	16.22	14.43	12.86	13.36	20.06	14.88	11.56
9	17.45	18.24	17.78	17.11	16.45	14.52	14.51	14.28	13.81	14.12	14.62	14.90	19.47	18.63	18.22	17.77	19.83	27.20	21.87	16.62
10	25.42	20.90	23.36	25.61	19.58	15.66	16.99	18.19	16.30	15.54	17.64	19.56	28.44	23.62	25.67	27.39	45.97	40.60	43.77	45.15
	LU				NL				PT				SP				UK			
	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3	Base	S1	S2	S3
1	0.74	7.53	1.29	0.02	0.40	4.78	1.22	0.55	0.85	6.17	0.08	0.00	0.17	5.33	0.47	0.07	10.24	0.77	0.04	0.01
2	1.29	8.65	2.55	0.54	2.92	9.09	4.49	3.36	0.53	9.53	0.70	0.01	0.94	10.10	2.27	0.64	5.26	2.24	0.48	0.13
3	2.73	10.45	4.36	2.00	0.57	8.38	3.98	2.55	1.58	12.79	2.07	0.70	2.81	11.33	4.19	1.87	5.80	3.62	1.13	0.55
4	3.12	10.68	5.37	2.97	5.31	10.13	5.71	3.91	2.71	14.93	2.37	0.71	4.12	12.52	5.48	3.08	6.73	5.15	2.25	1.18
5	4.51	12.44	7.38	4.79	6.34	11.23	7.38	5.04	4.86	17.06	4.28	1.19	7.04	14.02	7.64	4.56	7.83	6.92	4.01	2.25
6	7.65	14.62	10.63	6.96	8.85	12.83	9.59	6.95	5.71	20.45	6.45	1.84	8.45	15.28	8.91	5.72	8.69	8.22	5.40	3.55
7	10.19	14.83	12.49	10.34	9.94	15.07	12.25	9.63	8.68	23.52	9.86	4.23	11.52	16.82	11.45	8.25	10.87	10.40	7.83	5.79
8	13.81	16.69	15.19	13.23	12.49	16.99	14.72	12.81	13.12	24.74	16.25	8.67	14.82	17.72	14.07	11.41	12.27	11.96	10.00	8.46
9	20.91	18.55	19.47	18.99	19.78	20.60	19.74	18.65	21.05	25.68	24.08	18.48	20.47	21.16	19.68	17.94	14.33	13.82	12.89	11.76
10	35.06	23.08	28.00	31.31	33.40	25.24	28.15	30.40	40.92	29.80	40.88	46.45	29.66	22.77	26.09	27.94	17.98	15.70	17.59	19.04

Table 12: Effective average tax rate by income decile
Sources: own calculation using EUROMOD version C13.