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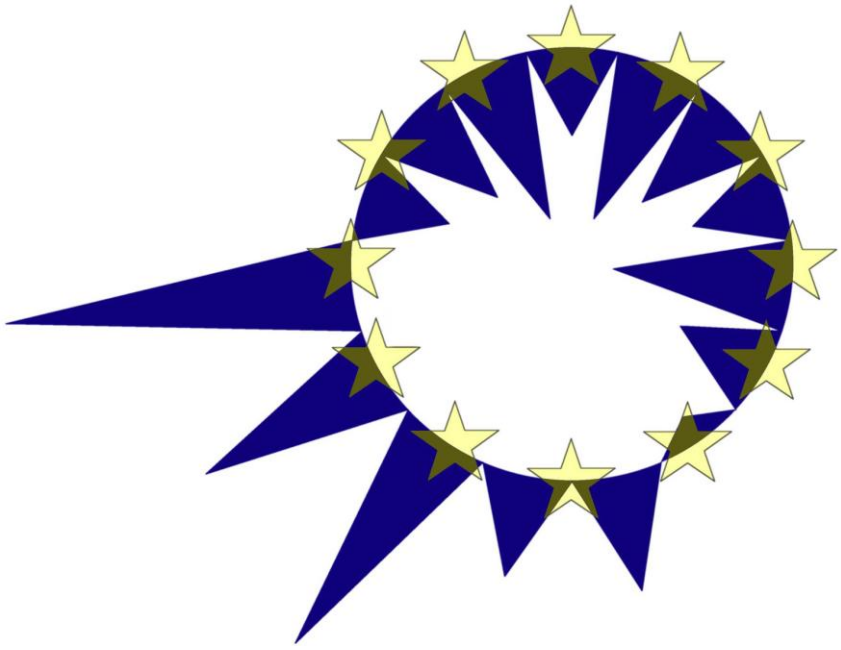

EUROMOD Working Paper No. EM3/2013

Baseline results from the new EU27 EUROMOD (2007-2010)

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March 2013

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February 2013

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with

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[1] This publication is supported by the European Union Programme for Employment and Social Solidarity - PROGRESS (2007-2013).

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Abstract

This paper provides a description of the latest public release of EUROMOD (version F6.0++), a tax-benefit microsimulation model for the EU. First, we briefly report the process of constructing and updating EUROMOD. We then present indicators for income inequality and risk of poverty using EUROMOD and discuss the main reasons for differences between these and EU-SILC based indicators. We further compare EUROMOD indicators across countries and over time between 2007 and 2010. Finally, we provide estimates of marginal effective tax rates (METR) for all 27 EU countries in order to explore the effect of tax and benefit systems on work incentives at the intensive margin. Throughout we highlight both the potential of EUROMOD as a tool for policy analysis and the caveats that should be borne in mind when using it and interpreting results.

JEL : C15**;** H24; H31; H55; I3

Keywords: microsimulation; redistribution; tax-benefit system; poverty; inequality; work incentives

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1. Introduction

EUROMOD is the tax-benefit microsimulation model for the European Union (EU) that enables researchers and policy analysts to calculate, in a comparable manner and based on micro-data, the effects of taxes and benefits on household incomes for the population of each country and for the EU as a whole. As well as calculating the effects of actual policies it is also used to evaluate the effects of tax-benefit policy reforms and other changes on poverty, inequality, incentives and government budgets.

The changes that it can be used to examine might be **actual changes in policy** over time, for example to show the extent to which reforms and other changes to public policies have contributed to reducing (or increasing) income poverty or inequality. Or they might be **alternative scenarios**, for tax-benefit policies and/or for the evolution of employment, hours of work etc. In particular, in the context of **Europe2020**, EUROMOD can provide the capacity for assessing the poverty-reducing (and budgetary) impacts of proposed and implemented policy changes in each member state, as well as for exploring the implications of alternative reform strategies or alternative economic or demographic scenarios for risk of poverty at national and EU levels. It can, for example, be used to examine the implications for income poverty of alternative employment scenarios.

EUROMOD is unusual in that it is **openly accessible**.[2] There are many potential applications and many potential users in both the scientific and policy monitoring/analysis communities. It is a highly flexible model, incorporating large amounts of complex information.

For more information see http://www.iser.essex.ac.uk/research/euromod

This short report presents baseline results from the first version of the new, EU27 version of EUROMOD being constructed with support from DG-EMPL of the European Commission. It updates and extends the material reported a year previously in a EUROMOD Working Paper.[3]

The next section provides a brief description of the project and its mode of working. This is followed, in section 3, by a presentation of estimates of poverty and income inequality calculated using incomes simulated by EUROMOD for 2007 policies, based on micro-data from the EU-SILC. These calculations cover 27 countries and provide a "baseline" or starting point for any simulations of changes that EUROMOD users may carry out. The next section assesses the quality of the data and simulations behind these results and explains why they differ from estimates calculated using the EU-SILC data on household income directly. Section 5 shows how indicators of poverty and inequality differ under later policy regimes (up to 2010). Section 6 describes estimates of Marginal Effective Tax Rates using EUROMOD and section 7 concludes and presents the next steps for EUROMOD.

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[2] Subject to permission to access the input micro-data (EU-SILC).

[3] EM1/12 http://www.iser.essex.ac.uk/publications/working-papers/euromod/em1-12

2. The EUROMOD*update* project

With the support of Progress funding the EUROMOD*update* project has constructed a new version of EUROMOD, covering all 27 member states, based on micro-data from the EU-SILC and simulating policies from recent policy years (such as 2010) as well as those corresponding to the income reference period in the SILC data (2007 in this release).

The results reported below are, with some exceptions, based on the EU-SILC of 2008 (2007 incomes).[4] The model has been built with the collaboration of national teams, which are listed in Annex 1. Eighteen countries updated the work done a year earlier (Belgium, Cyprus, Czech Republic, Estonia, Ireland, Greece, Spain, Hungary, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Slovenia, Slovakia, Sweden and the UK) and nine countries were constructed from scratch (Bulgaria, Denmark, Germany, France, Luxembourg, Malta, Austria, Romania and Finland). There were 4 key tasks: (1) building an input database, (2) building policy systems for 2007, 2008, 2009 and 2010, (3) validating the baseline outputs and (4) documenting the work in a Country Report. These are described briefly in turn.

- **Building an input database**

The original aim was to build input databases for all countries from the 2008 EU-SILC UDB.[5] However, the UDB does not contain all the information needed to inform tax-benefit calculations, in most countries. Where possible we have explored the possibility of merging variables from the underlying national data (often referred to as the "national SILC") into the EUROMOD input database that we create from the UDB. Eurostat has helpfully given us explicit permission to do this. However, whether NSIs agree to this, and for the merged data to be made available to EUROMOD users, is a matter for them and requires negotiation between us and them on a bilateral basis. As documented in Annex 2 in some cases this has been straightforward; in other cases the process is still ongoing.

In some countries it is possible to use the "national SILC" as an alternative (rather than a supplement) to the UDB. We have followed this route in cases where these data are provided for research uses under reasonable contract conditions; where they contain the necessary detailed variables; and where they give rise to the same values as the UDB for some of the key social indicators (e.g. median household disposable equivalised income; risk of poverty rates).

With only the UDB variables, the values for the individual components of many of the harmonised income variables that are necessary for EUROMOD must be imputed. The process depends on the specific components that have been aggregated (and a first step is to establish what these are: this information is not part of the standard UDB documentation). It is obviously imprecise and has implications for the results.

Exceptions to the use of the SILC 2008 in this report are:

[4] See annex 2 for a list of micro-data sources used in each country.

[5] A network contract with Eurostat for this purpose has been established [EU-SILC/2009/17] and renewed [EU-SILC/2011/55].

(a) use of Family Resources Survey for 2008/9 for the UK
(b) use of SILC 2009 for Malta (these are the first micro-data to be available for Malta)
(c) use of SILC 2007 for France (chosen to take advantage of good national SILC data for validation in this year).

- **Building policy systems for 2007, 2008, 2009 and 2010**

Based on detailed descriptions of policies provided by national teams, 2007 policies have been modelled using the EUROMOD tax-benefit modelling "language" for all 27 countries. Then, reforms to the structure of tax-benefit systems and parameter changes (e.g. inflation increases in the size of benefit amounts or tax thresholds) for the three subsequent policy years have also been included. Together with updating factors, to bring 2007 incomes from the 2008 EU-SILC data up to the level in each policy year (2008, 2009, 2010), it is now possible to simulate policies from each of these years for each of the 27 countries. These four alternative "baselines" also form the starting points for modelling possible reforms, making use of the EUROMOD language.

The aim has been to simulate as much as possible of the tax and benefit components of household disposable income. In practice, some parts of the tax or benefit system may be difficult to simulate and in that case the component is taken directly from the input database. This applies in the case of many contributory benefits and pensions (because of needing information on past work and contribution history which is not available in the EU-SILC or most other cross-sectional survey data sources) and many disability benefits (because of needing to know about the nature and severity of the disability, which is also not present in the data). The extent of these types of benefits varies across countries. For example in some countries it is possible to simulate non-contributory pensions; while in countries without such pensions, none of the pension system can be simulated.

In some cases it is possible to part-simulate eligibility, using assumptions based on the information that is available. For example, in this project we are simulating entitlement to unemployment benefits using information in the EU-SILC about number of years in work and how much individuals worked in the previous 12 months. In some countries the user is offered the choice over whether to use the recorded or simulated values of unemployment benefits in any analysis. In these cases the default is to make use of recorded values in analysis of income distribution, but to use simulated values when calculating indicators such as replacement rates or welfare resilience indicators. Another example is that of contributory parental benefits. In some countries it is possible to simulate these while in others it is not. In some cases (for example in Lithuania) it has been *necessary* to simulate parental benefits because this was part of the only feasible approach to simulating other components of the UDB SILC family benefit variable.

- **Validation**

Three distinct types of validation have been carried out. First, as part of the policy implementation, the coding of the rules governing each policy instrument as well as the interactions between instruments were checked using a range of tools, depending on what was available in the country concerned. This is known as "micro-validation".

Secondly, once EUROMOD was working, aggregate estimates for expenditure on each benefit and revenue from each tax were compared with external sources of administrative statistics. Where available, the numbers of recipients and taxpayers were also compared. This "macro-validation" initially helped to spot errors and problems in the implementation (either in the policy rules or the data, or in combination). Once finalised, a report on it is included in each Country Report, to inform model users about how and why the baseline results from EUROMOD do and do not correspond to other estimates.

A third type of validation takes place when the model is used comparatively. Whether a discrepancy can be considered large or small (important or unimportant) is sometimes made clearer in cross-national perspective. In addition, when differences between countries do not correspond to what is expected, this can point to problems. Or it can also be explained by country specific factors related to the nature of taxes and benefits. A first attempt at such an exercise is presented below, comparing baseline EUROMOD results with those of Eurostat using the EU-SILC directly.

Two particular issues were anticipated and have indeed arisen when validating macro statistics from EUROMOD: tax evasion and non take-up of benefits. Assuming full knowledge of and compliance with policy rules tends to result in over-simulation of taxes and of benefits and hence to under-estimate inequality of disposable incomes. At the same time, estimates based on an assumption of full compliance and take-up can be interpreted as showing the intended effects of the system.

The general approach to modelling non take-up or tax evasion is on the one hand to take the best available approach given the information available but on the other to make the treatment transparent and able to be switched off or adapted by the user, depending on the analysis they wish to do. Generally Country Reports show results with and without take-up and evasion approximations. See Annex 3 for a country-by-country description of the treatment of these issues.

- **Country Report**

Each national team has produced a country report conforming to common guidelines in terms of style and content. The intention is to provide comprehensive documentation for EUROMOD users and as a reference for developers and national teams in the future. [6]

3. Baseline poverty and inequality indicators

Table 1 presents some poverty and inequality indicators for 2007 incomes and policies. Risk of poverty rates for the whole population of each of the 27 countries are shown for three poverty thresholds: 50%, 60% and 70% of national median equivalised household incomes (using the modified OECD equivalence scale). Risk of poverty for children (aged under 18) and older people (aged 65 or more) using the 60% threshold are also shown. A commonly

[6] The country reports are available at http://www.iser.essex.ac.uk/research/euromod/resources-for-euromod-users/country-reports

used indicator of income inequality is also shown: the Gini coefficient. The statistics are also shown for the EU-27 combined, first showing the mean of the 27 country values ("unweighted") and secondly showing the value for the EU-27 population ("weighted"). In the remainder of this paper we provide weighted EU-27 statistics only.

In each case we have calculated the indicators using the same methods in principle as Eurostat although, as explained in the next section there are a number of reasons why the values may differ from those produced by Eurostat from the EU-SILC data directly.

The EUROMOD baselines can be used in many different ways that complement analysis using the SILC directly. One example is illustrated in Figure 1. This shows the role of some components of household income in reducing income inequality. The Gini coefficient for disposable income (as in Table 1) is plotted using triangles, and countries have been ranked according to the value of this indicator.[7] The country with the lowest disposable income inequality is Slovakia and that with the highest is Latvia. Considering inequality of market incomes, shown by the squares, Cyprus has the lowest inequality and Romania the highest. It is clear that taxes and benefits play a very varied role in reducing inequality with the largest absolute reduction in Hungary and Belgium and the smallest in Latvia and Cyprus.

However, the main purpose of the Figure is to illustrate the role of public pension incomes, in contrast with that of direct taxes and non-pension benefits which are usually considered to be the main instruments of redistribution. (Such a comparison would not be possible using the EU-SILC data directly because pension incomes are aggregated with other payments received by older people.) Inequality of market income including public pensions (before tax), shown by the diamond shape in Figure 1 is everywhere lower than inequality of market income but higher than that of disposable income. Public pensions play the major role in reducing the gap between market income inequality and disposable income inequality in all of the countries shown, with the exception of Ireland, the UK and the Netherlands (the effect is split equally in Denmark). In these countries occupational and other private pensions (included here in market income) make up a relatively large part of pension income. In addition, however, non pension benefits and taxes (income taxes and social contributions) vary in their effectiveness in reducing income inequality across countries. They have a relatively large role compared with other countries in Ireland, the UK, Belgium, Hungary, Germany and the Netherlands and a relatively small role in Bulgaria, Cyprus, the three Baltic countries and Poland.

[7] Note that the differences between countries are not necessarily statistically significant. See Social Situation Observatory estimates of confidence intervals at http://www.socialsituation.eu/monitoring-report/income-distribution/income-inequality/EU%

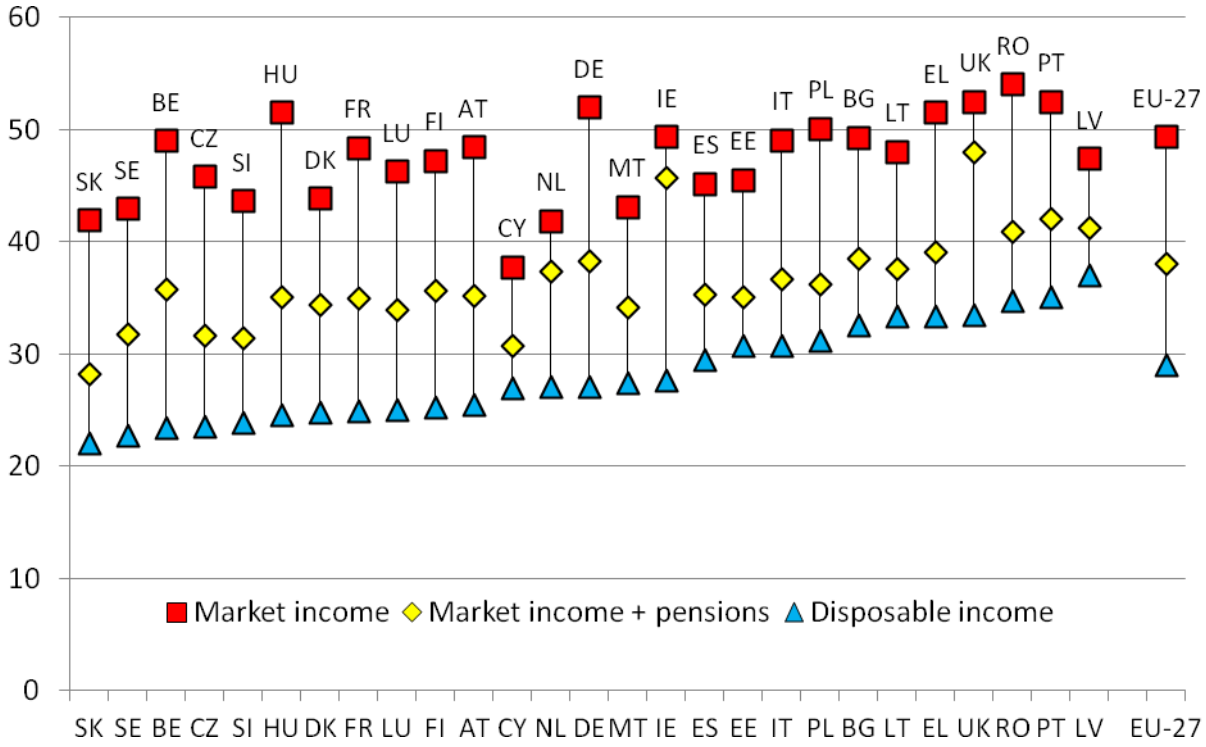
Table 1 EUROMOD poverty and inequality statistics 2007 incomes and policies

	Poverty risk: all			Poverty risk (60%)		Gini coefficient (%)
	50%	60%	70%	age <18	age>=65	
Belgium	5.5	12.2	20.7	13.0	18.8	23.4
Bulgaria	12.3	19.4	27.1	22.1	32.3	32.6
Czech Republic	4.0	8.3	15.7	10.6	7.1	23.5
Denmark	4.6	10.7	19.1	7.8	15.4	24.8
Germany	6.1	12.9	20.5	12.3	13.5	27.1
Estonia	11.3	19.5	27.8	16.2	39.3	30.7
Ireland	7.4	17.0	27.4	19.9	26.4	27.7
Greece	12.8	19.9	27.5	22.4	21.1	33.4
Spain	12.5	19.3	25.8	23.7	27.0	29.5
France	5.1	11.0	19.6	10.9	13.0	24.9
Italy	10.4	17.9	26.1	23.2	20.0	30.7
Cyprus	7.3	14.8	22.3	12.0	48.3	27.0
Latvia	17.1	25.3	31.5	25.3	47.9	37.0
Lithuania	13.1	19.6	27.2	23.4	25.1	33.4
Luxembourg	2.9	10.8	18.6	16.2	3.3	25.0
Hungary	6.6	11.5	19.1	18.5	2.7	24.6
Netherlands	4.5	10.9	19.7	14.1	7.6	27.0
Malta	8.7	15.7	24.3	18.5	22.7	27.4
Austria	5.9	11.9	20.0	15.1	10.0	25.4
Poland	9.6	16.1	24.3	19.4	13.7	31.2
Portugal	11.7	19.8	27.9	23.8	26.2	35.1
Romania	16.7	23.3	30.3	32.1	26.0	34.7
Slovenia	7.0	12.6	19.4	11.4	20.6	23.9
Slovakia	4.1	9.3	16.7	13.9	8.2	22.1
Finland	4.9	12.3	21.8	11.0	19.2	25.2
Sweden	5.6	10.4	20.0	11.8	7.5	22.7
United Kingdom	9.8	17.2	26.4	21.7	17.7	33.4
EU-27 (unweighted)	8.4	15.2	23.2	17.4	20.0	28.3
EU-27 (weighted)	8.6	15.3	23.4	18.1	17.2	29.0

Source: EUROMOD version F6.0++.

Notes: EUROMOD figures for Malta are based on SILC 2009 (2008 incomes), backdated, and those for UK are based on FRS2008/9, backdated. Figures for France are based on SILC 2007 (2006 incomes), updated.

Figure 1 Income Inequality (Gini coefficient expressed as %) and the role of public pensions and non-pension benefits and taxes (2007 incomes and policies)



Source: EUROMOD F6.0++.

Notes: EUROMOD figures for Malta are based on SILC 2009 (2008 incomes), backdated, and those for UK are based on FRS2008/9, backdated. Figures for France are based on SILC 2007 (2006 incomes), updated. Countries are ranked by the value of the Gini coefficient for disposable income.

4. Assessing the results

We can assess the results from the baseline in two ways. One is to compare aggregate values for expenditure on benefits, revenue from taxes and contributions and recipients/payers of benefits/taxes with figures taken from external, usually administrative statistics. Another is to compare poverty and inequality indicators, such as those provided in Table 1 above, with similar estimates obtained directly from the EU-SILC data. These are considered in turn below. Of course more is expected of EUROMOD than for its baseline simulations to correspond to statistics that can be provided by EU-SILC, or other external statistics (taking methodological differences into account). But we cannot (usually) *validate* estimates of the effects of policy changes because no independent measures usually exist.

- **Comparison with external aggregate statistics**

This is the process known as "macro-validation" and the comparisons for each country are documented in detail in the Country Reports. Comparisons are made between the weighted number of recipients/payers for each policy instrument in the EUROMOD baseline (simulated or not simulated) with equivalent numbers taken from national administrative statistics for the

same period. Similarly the amount of annual expenditure or revenue is compared for EUROMOD and national administrative estimates. Comparisons are often not straightforward to carry out or are inconclusive for a number of reasons. First, the administrative statistics may refer to a different reference time period or unit of analysis than EUROMOD (this applies particularly to recipients/payers of an instrument). Secondly, the administrative statistics may not refer to the same distinct instruments or income components that are itemised in EUROMOD. They may refer to sub-instruments or to combinations of several income components. Thirdly, in some countries for some instruments the statistics may only be available at regional level. In some cases they are only available with a long time delay and in others they are not made publically available at all.

Furthermore, the process of validation is cumulative. If there is a problem with one income component this will affect the precision of simulation of the components which rely on it. An example is if earnings are under-reported in the survey not only will social contributions be under-estimated, but so will the size of any tax relief on the contributions. Thus income tax will be over-estimated for this reason but also under-estimated because of the under-reporting of earnings. The problem with the latter effect may seem less serious than it is, because of the former effect.

Here we note the features of the comparisons that arise across countries.

1) First, it is not the case that the same patterns of over- or under- estimation can be observed across countries. For example, income tax may be under-estimated because market incomes are under-reported or the survey generally does not adequately represent high income taxpayers (as in the UK). It may be over-estimated because of tax evasion that has not been modelled (as in Latvia). It may also be over-estimated because it is not possible to model or measure the size of some tax reliefs and common avoidance measures (as in Portugal). It may also be under- or over- estimated because of over- or under- estimation of simulated income components which are taxable.

2) The simulations are only as good as the underlying SILC data and, in the cases where it is necessary, as good as the imputation of income components from the UDB aggregates. This depends on the specifics of the national benefit and tax systems as well as the quality of the data.

3) Our assessment of whether a simulation is "good enough" depends on the importance of the instrument in household incomes generally. If it is small or affects few people then it is less likely to match external statistics (not least, due to sampling variability) – and it is less important that it does so – than if it is an important component of household incomes.

4) As indicated above non take-up of benefits, or the application of local discretion in the awarding of benefits, leads to EUROMOD over-simulating means-tested benefits in many instances (see also Annex 3). In many countries social assistance receipt is over-simulated by a factor or 2 or 3. The size of this effect (e.g. on poverty risk) varies with the emphasis on this type of benefit in each national system. Adjustments to account for non take-up behaviour can be applied but these can only be approximate. If the EU-SILC data

adequately capture social assistance benefit recipients and payments (for example) then one solution is to tie "eligibility" to those with recorded receipt in the data. This results in baseline estimates that compare will with the SILC but is not appropriate when modelling policy changes or "what if" scenarios involving new benefit entitlements or swapping policies across countries. Examples of the treatment of non take-up and tax evasion are given in Annex 3.

- **Why are indicators estimated by EUROMOD different from those calculated using EU-SILC data?**

Table 2 compares some indicators of poverty and inequality from the EU-SILC 2008 (as provided by Eurostat on its web site and through New Cronos) with broadly equivalent estimates from EUROMOD using 2007 policies and incomes. Given that EUROMOD uses 2008 SILC as its input data (except for Malta, France and the UK) one would expect the estimates for 2007 incomes (using 2008 SILC) to be the most closely related. This comparison is of some use for validation purposes as, if the two sets of estimates are very out of line, this may suggest some problem with the simulations or the input data. However, there are many reasons why the two sets of estimates should not be expected to be identical. These include:

- The release of EU-SILC: EUROMOD uses release 2 in most countries: see Annex 2. Statistics provided by Eurostat use the most recent release, we assume. To the extent that the relevant data change between releases, we would expect differences in the indicators from the two sources.

- In this analysis the Maltese results from EUROMOD use the 2009 EU-SILC, with incomes back-dated from 2008 to 2007. We make comparisons with the 2008 SILC estimates nevertheless as it is 2007 incomes that EUROMOD attempts to model. However if there are strong differences between the characteristics of the populations (or the samples provided in the SILC) between 2009 and 2008 these will not be captured in our estimates.

- In this analysis the French results from EUROMOD use the 2007 EU-SILC, with incomes up-dated from 2006 to 2007. We make comparisons with the 2008 SILC estimates nevertheless as it is 2007 incomes that EUROMOD attempts to model. However if there are strong differences between the characteristics of the populations (or the samples provided in the SILC) between 2007 and 2008 these will not be captured in our estimates.

- The UK uses a different data source in this version of EUROMOD: the Family Resources Survey for 2008/09. It is unlikely that two independent surveys with different questionnaires will produce the same results. Furthermore the FRS income data are one year more recent than the EU-SILC; they have been backdated to 2007 prices and incomes but this is an approximate process.

- The standard definition of household disposable income produced by EUROMOD and used here is slightly different from the definition of the UDB variable (HY020) used for the official indicator calculations. In EUROMOD we add in any income from private pensions and generally deduct any inter-household transfers paid as well as adding payment received. We do not include any non-cash employment income.[8] This is likely to have an effect on the income distribution for example by lowering the poverty risk of older people in EUROMOD relative to the SILC in countries with significant private (non-occupational) pensions (such as the UK) or reducing the median and the poverty threshold in countries with significant non-cash employment income.

- In the EUROMOD input database we drop observations (households) from the SILC where one or more persons in the household has missing data on income, and the imputation factor to correct for this is also missing. This is not necessary in many countries but where it is the number of such cases varies from a few to more than 50.

- In Luxembourg there are 267 households included in the SILC where one or more person is an international civil servant, not subject to the Luxembourg tax-benefit system. These households (731 individuals) have been excluded from the EUROMOD estimates.

- In constructing the input information used in the calculation of tax liabilities and benefit entitlements it is important that the different variables are as consistent as possible. One adjustment we make to ensure that the information on the income reference period (and EUROMOD policy year) is consistent with the characteristics of the household (current at the time of the survey) is to drop children born after the EU-SILC income reference period and before the interview. This will affect household composition and hence the equivalence scale and the calculation of household disposable income.

[8] In a definitive reconciliation of the two sources the income measures could in principle be adjusted to include the same components.

Table 2 Comparison of EUROMOD output poverty and inequality statistics for 2007 with Eurostat estimates from the EU-SILC 2008 UDB

		Poverty risk: all			Poverty risk (60%)		Poverty threshold (60%median) €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Belgium	Eurostat	7.5	14.7	23.8	17.2	21.2	10,791	27.5
	EUROMOD	5.5	12.2	20.7	13.0	18.8	10,523	23.4
Bulgaria	Eurostat	14.4	21.4	28.9	25.5	33.8	1,303	35.9
	EUROMOD	12.3	19.4	27.1	22.1	32.3	1,263	32.6
Czech Republic	Eurostat	4.7	9.0	16.5	13.2	7.4	3,641	24.7
	EUROMOD	4.0	8.3	15.7	10.6	7.1	3,500	23.5
Denmark	Eurostat	6.2	11.8	19.7	9.1	18.1	14,497	25.1
	EUROMOD	4.6	10.7	19.1	7.8	15.4	14,451	24.8
Germany	Eurostat	9.2	15.2	22.8	15.2	14.9	10,986	30.2
	EUROMOD	6.1	12.9	20.5	12.3	13.5	10,565	27.1
Estonia	Eurostat	11.5	19.5	27.8	17.1	39.0	3,328	30.9
	EUROMOD	11.3	19.5	27.8	16.2	39.3	3,307	30.7
Ireland	Eurostat	8.1	15.5	25.6	18.0	21.1	13,797	29.9
	EUROMOD	7.4	17.0	27.4	19.9	26.4	14,248	27.7
Greece	Eurostat	12.7	20.1	26.9	23.0	22.3	6,480	33.4
	EUROMOD	12.8	19.9	27.5	22.4	21.1	6,671	33.4
Spain	Eurostat	12.7	19.6	26.8	24.4	27.4	7,770	31.3
	EUROMOD	12.5	19.3	25.8	23.7	27.0	7,805	29.5
France	Eurostat	5.8	12.7	21.2	15.9	11.7	11,395	29.8
	EUROMOD	5.1	11.0	19.6	10.9	13.0	10,209.7	24.9

/continued

		Poverty risk: all			Poverty risk (60%)		Poverty threshold (60%median) €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Italy	Eurostat	11.6	18.7	26.2	24.7	20.9	9,383	31.0
	EUROMOD	10.4	17.9	26.1	23.2	20.0	9,280	30.7
Cyprus	Eurostat	7.7	15.7	22.9	14.4	46.4	9,926	28.3
	EUROMOD	7.3	14.8	22.3	12.0	48.3	10,130	27.0
Latvia	Eurostat	18.6	25.6	31.7	24.6	51.2	2,899	37.7
	EUROMOD	17.1	25.3	31.5	25.3	47.9	2,564	37.0
Lithuania	Eurostat	13.7	20.0	27.6	22.8	29.5	2,502	34.0
	EUROMOD	13.1	19.6	27.2	23.4	25.1	2,356	33.4
Luxembourg	Eurostat	6.6	13.4	21.2	19.8	5.4	18,550	27.7
	EUROMOD	2.9	10.8	18.6	16.2	3.3	18,146	25.0
Hungary	Eurostat	6.4	12.4	20.6	19.7	4.3	2,640	25.2
	EUROMOD	6.6	11.5	19.1	18.5	2.7	2,513	24.6
Netherlands	Eurostat	5.0	10.5	18.3	12.9	9.4	11,713	27.6
	EUROMOD	4.5	10.9	19.7	14.1	7.6	11,687	27.0
Malta	Eurostat	8.5	15.0	25.6	19.3	24.7	6,032	27.9
	EUROMOD	8.7	15.7	24.3	18.5	22.7	5,777	27.4
Austria	Eurostat	5.8	12.4	20.0	14.9	15.0	11,406	26.2
	EUROMOD	5.9	11.9	20.0	15.1	10.0	11,311	25.4
Poland	Eurostat	10.2	16.9	25.0	22.4	11.7	2,493	32.0
	EUROMOD	9.6	16.1	24.3	19.4	13.7	2,655	31.2
Portugal	Eurostat	11.9	18.5	27.2	22.8	22.3	4,886	35.8
	EUROMOD	11.7	19.8	27.9	23.8	26.2	5,094	35.1

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		Poverty risk: all			Poverty risk (60%)		Poverty threshold (60%median) €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Romania	Eurostat	16.6	23.4	30.1	32.9	26.0	1,172	36.0
	EUROMOD	16.7	23.3	30.3	32.1	26.0	1,152	34.7
Slovenia	Eurostat	6.8	12.3	18.8	11.6	21.3	6,536	23.4
	EUROMOD	7.0	12.6	19.4	11.4	20.6	6,270	23.9
Slovakia	Eurostat	5.7	10.9	18.1	16.7	9.9	2,875	23.7
	EUROMOD	4.1	9.3	16.7	13.9	8.2	2,833	22.1
Finland	Eurostat	6.5	13.6	22.2	12.0	22.5	11,876	26.3
	EUROMOD	4.9	12.3	21.8	11.0	19.2	11,349	25.2
Sweden	Eurostat	6.5	12.2	20.6	12.9	15.0	12,344	24.0
	EUROMOD	5.6	10.4	20.0	11.8	7.5	12,088	22.7
United Kingdom	Eurostat	11.3	18.7	27.0	24.0	27.3	11,354	33.9
	EUROMOD	9.8	17.2	26.4	21.7	17.7	11,738	33.4
EU-27	Eurostat	9.8	16.4	24.3	20.1	19.0	n/a	30.8
	EUROMOD	8.6	15.3	23.4	18.1	17.2	8525.2	29.0

Source: Eurostat web site and New Cronos (accessed27/03/2013); EUROMOD version F6.0++.

Notes: EUROMOD figures for Malta are based on SILC 2009 (2008 incomes), backdated, and those for UK are based on FRS2008/9, backdated. Figures for France are based on SILC 2007 (2006 incomes), updated.

- While we have made every effort to avoid it, differences in the methods of calculating the indicators may explain differences in results. We are not aware of any differences in formulae, assumptions or definitions used.[9] We have not top- or bottom- coded the EUROMOD household disposable income variable. It is not clear whether Eurostat does this in their calculations of inequality indexes.

- Finally, as mentioned above our use of simulated values for benefits and taxes without allowing for non-take up of benefits nor tax evasion will tend to make the income distribution appear less unequal and, at least usually, risk of poverty rates less high than those calculated using the SILC directly, which itself may be subject to measurement errors. Adjustments have been made to account for non take-up in Belgium, Estonia, Greece, Ireland and the UK, and for tax evasion in Bulgaria and Italy.

The comparisons shown in Table 2 suggest that this is indeed the case. In most countries EUROMOD poverty rates for the populations (using three cut-offs: 50%, 60% and 70% of the median) are a little lower than those calculated by Eurostat using 2007 SILC. The exceptions are Ireland, Portugal, Romania and Slovenia where they are very close or a little higher using EUROMOD and Belgium, Luxembourg, and Slovakia where they are consistently and substantially lower. They are also notably lower using EUROMOD for particular groups in Denmark, France, Lithuania, Austria, Finland, Sweden, and the UK (older people) and Czech Republic, Poland and the UK (children). Inequality, as measured by the Gini coefficient, also tends to be lower using EUROMOD simulated incomes, particularly so in Belgium, Bulgaria, Germany, France and Luxembourg. In understanding these discrepancies among the factors to be taken into account are the following:

- Over-simulation of some particular means-tested benefits (without accounting for non take-up) appears to explain some of the low EUROMOD poverty rates: for example of (a) housing benefit in the Czech Republic leading to low child poverty estimates, (b) housing allowance within the social assistance benefit in Austria, leading to a low elderly poverty rate in EUROMOD, (d) old age pensions and pension supplement in Denmark and the means-tested age pension in Malta leading to underestimation of poverty rates for elderly in both countries, and (e) housing allowance for pensioners and local authority income support in Finland, also leading to low risk of poverty estimates for the elderly. Over-simulation might result from several factors alone or in combination: unobserved differences at the municipality level, lack of information to simulate asset tests where these exist (e.g. for housing allowance in Finland and old age pension in Malta), and non take-up.[10]

[9] We have followed Eurostat document LC-ILC/39/09/EN.

[10] It is worth noting that in some countries simulated means-tested benefits correspond very well to external statistics. This is the case for example with social assistance in Slovakia. Furthermore, higher poverty estimates in the SILC may also be due to under-reporting of benefits in the data. Comparison of SILC variables with external statistics suggests this is the case for means-tested pension payments in France.

- In many countries groups of elderly people are concentrated around the 60% median poverty threshold meaning that their risk of poverty is sensitive to small shifts in the threshold. This is one explanation for the poverty rate being higher in EUROMOD than in the SILC in Ireland (the threshold is also higher in EUROMOD) and also for the EUROMOD estimate being lower in Lithuania, as the EUROMOD threshold is also lower. In these two countries there is a concentration of elderly people around the threshold. Something similar applies in Portugal where taxes and contributions are some-what under-simulated, raising the median relative to that calculated from the SILC data resulting in an increased proportion of elderly people below the poverty threshold. Comparisons of the threshold itself are only straightforward for the euro-zone countries (or for those with long term fixed exchange rates).[11] Among those the difference is small in most cases and only more than 5% of the Eurostat estimate in Finland.

- Over-simulation of income taxes can lead to under-estimation of inequality and of median disposable income, and hence risk of poverty estimates. The main contributing factors are the existence of tax evasion, which is not typically captured, and the non-simulation of some tax deductions due to lack of necessary information.

  a) Tax evasion that is not yet accounted for in EUROMOD may mean that poverty thresholds are lower than they should be, leading to under-estimation of poverty particularly for groups who cannot or do not evade. This is likely to be the case in Latvia where we have evidence that there is a high rate of evasion of taxes. It means that the poverty threshold using simulated incomes is lower than it is actually. Since most income received by those aged 65+ is pensions, on which taxes are unlikely to be evaded, this is a possible explanation for the elderly poverty rate in Latvia being much lower than that estimated from the EU-SILC. A similar explanation is valid for Lithuania, where pensions are non-taxable and no adjustments are made for tax evasion.

  b) In Belgium, taxable income per tax unit is significantly higher in EUROMOD than shown by administrative data, especially so in the higher income decile groups. This is very likely to be due to the fact that some important deductible expenses are not simulated in EUROMOD due to lack of information in the input data (house bonus, actual costs incurred for the self-employed, ...) leading to a lower median income in EUROMOD which is at least partly responsible for the discrepancy between the two sets of poverty figures and contributes to the difference in the Gini index. Something similar also applies in Ireland and other countries with over-simulation of income taxes.

[11] For non euro-zone countries the comparison of the threshold is complicated by the choice of exchange rate to use and this makes a difference in cases where this is changing over the data and policy simulation reference period. In the policy simulation we use the exchange rate prevailing at 30th June 2007.

- The exclusion of households with international civil servants in Luxembourg may be one explanation for the lower poverty threshold shown in Table 2, and hence the lower poverty estimates that are produced by EUROMOD.

- In Malta the comparisons in Table 2 are for 2007 incomes and 2008 characteristics (Eurostat) with EUROMOD estimates using 2008 incomes back-dated to 2007 and 2009 characteristics. It is also worth comparing the EUROMOD statistics with those from Eurostat for 2009, shown in Table 2a. With the exception of the indicator for risk of poverty using the 50% threshold, the pairs of estimates are closer in value than those shown in Table 2.

Table 2a: Malta comparisons of poverty risk for 2008 incomes (%)

	Poverty risk: all			Poverty risk (60%)	
	50%	60%	70%	age <18	age>=65
EUROSTAT 2009 SILC	7.5	15.3	24.4	20.9	20.9
EUROMOD	8.7	15.7	24.3	18.5	22.7

- In France the comparisons in Table 2 are for 2007 incomes and 2008 characteristics (Eurostat) with EUROMOD estimates using 2006 incomes up-dated to 2007 and 2007 characteristics. It is also worth comparing the EUROMOD statistics for 2006 with those from Eurostat for 2007 (2006 incomes), shown in Table 2b. In this case the estimates are not much closer than those shown in Table 2, except for the elderly.

Table 2b: France comparisons of poverty risk for 2006 incomes (%)

	Poverty risk: all			Poverty risk (60%)	
	50%	60%	70%	age <18	age>=65
EUROSTAT 2007 SILC	6.8	13.1	20.8	15.3	13.1
EUROMOD	5.1	11.0	19.6	10.9	13.0

- In the UK the comparisons are not only of two different datasets but the UK data come from 2008 and are backdated to 2007 values. Comparisons of EUROMOD estimates of poverty risk for 2008 with national statistics using the same underlying data are shown below in Table 2c. They are quite close. The comparison is also shown for the 2009 SILC (using 2008 incomes) which is also much closer than the comparison with 2008 SILC shown in Table 2. The SILC shows UK poverty rates falling markedly

between the 2008 and 2009 surveys, particularly for older people. Differences between SILC and national statistics estimates are also sizeable.

Table 2c: UK comparisons of poverty risk for 2008 incomes (%)

	Poverty risk: all			Poverty risk (60%)	
	50%	60%	70%	age <18	age>=65
Eurostat 2009 SILC	10.2	17.3	25.6	20.7	22.3
EUROMOD 2008 incomes	9.8	17.2	26.4	21.7	17.7
HBAI 2008 incomes	10	17	26	20	19

Source: Households Below Average Income (HBAI) 1994/95 - 2008/09, Department for Work and Pensions (2010), UK.

5. Comparing poverty, inequality and redistributive effects across policy systems

Policies are simulated for four policy years. Table 3 shows some of the same statistics for the 2007 policy year as in Table 1, but contrasting them with statistics for the 2008, 2009 and 2010 policy years. This shows how policy changes in the period 2007-10 have affected poverty and inequality, abstracting from changes in population characteristics. Both sets of figures are based on the same input database. As above, this is the 2008 SILC, with three exceptions. The exceptions are the UK where the input database is FRS 2008/2009, Malta where it is the 2009 SILC and France where it is the 2006 SILC.

Incomes that are not simulated (e.g. market incomes) are updated from 2007 to 2008, 2009 and 2010 using indexes for each income source separately as much as possible (e.g. earnings indexes for earnings). While the construction of these indexes has followed common guidelines, in this set of statistics for 2008 to 2010 it is possible that some of the cross-country differences, or in the effects 2007-10, are due to the assumptions that have been made about the change in non-simulated incomes over the period. In some countries updating factors do not currently take account of the detailed differences in movements in incomes by source, which may be particularly important during periods of changing macro-economic conditions.

Table 3 shows how the poverty threshold shifts in nominal terms, in all euro-zone cases increasing 2007-2008 but by varying amounts. This is due to a combination of inflation and growth in non-simulated incomes and policy reforms and routine uprating of policy over this period. In the non euro-zone countries it is also affected by fluctuations in the exchange rate. After 2008 patterns diverge, with EUROMOD estimates showing nominal median incomes continuing to rise in some countries (e.g. Belgium, Germany, Cyprus, Slovenia and Finland), to fall consistently in others (e.g. Estonia, Ireland) and to fall in 2009 and rise again in 2010 (e.g. Czech Republic). Fluctuations in non-euro zone countries such as Poland and the UK are mainly due to exchange rate fluctuations. The trajectories can be compared with Eurostat's estimates of median income from the SILC up to 2009 incomes (not shown here but available on Eurostat's web site) which also capture the effects of changes to employment status over

the period. In most countries the trajectories are similar to those shown for the years 2007 to 2009 from EUROMOD in Table 3, but dampened to some extent. So where incomes are estimated to rise by EUROMOD, they rise by less in the Eurostat statistics. Where they are estimated to fall, they fall by more in Eurostat statistics. The main exceptions are Latvia and Lithuania where EUROMOD indicates growth in nominal incomes 2007-9 and Eurostat statistics show a large reduction and Estonia where the growth indicated by EUROMOD is much larger than that shown by EUROMOD. Loss of employment had a particularly dramatic effect in the Baltic states, which is not captured in the standard version of the EUROMOD baseline.

In most countries changes in poverty risk due to changes in tax-benefit policies and income levels tend to be relatively small, but with some major exceptions, as follows:

In Estonia, Ireland and Latvia the headline risk of poverty rate is estimated to fall dramatically (4 percentage points or more) due to changes in income levels and policies 2007-10. It also falls by around 2 percentage points in Lithuania and Luxembourg. Accounting for labour market change, especially in the Baltic States and Ireland would reduce this effect.

In Bulgaria, Estonia and Lithuania the reduction in poverty risk for elderly people in 2009 and 2010 can be explained by the fact that pensions were increased while average market incomes fell significantly. In Estonia, for example, earnings from employment fell on average by 5% between 2008 and 2009 and while some benefits were cut, pensions increased on average by 8%. Official national statistics (based on national SILC) show an even larger reduction in risk of poverty for elderly people: from 33.9% to 15.1%. A similar combination of circumstances explains the Lithuanian reduction in poverty among elderly people in 2009. Although there were structural cuts on pensions in Lithuania in 2010, poverty risk for elderly population remains at a low level as pensions were decreased progressively (lower pensions being affected less and no cut applied on the lowest pensions).

Table 3 Comparison of EUROMOD poverty and inequality statistics 2007, 2008, 2009 and 2010

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Belgium	2007	5.5	12.2	20.7	13.0	18.8	10,523	23.4
	2008	5.4	12.1	20.3	12.7	18.6	10,794	23.2
	2009	5.3	12.1	20.4	12.5	19.5	11,161	23.0
	2010	5.2	11.6	20.1	11.9	19.5	11,231	23.0
Bulgaria	2007	12.3	19.4	27.1	22.1	32.3	1,263	32.6
	2008	12.9	20.2	28.5	24.6	30.6	1,477	34.2
	2009	11.9	18.1	26.9	24.1	21.5	1,621	32.8
	2010	11.3	17.8	26.7	24.5	19.0	1,623	32.3
Czech Republic	2007	4.0	8.3	15.7	10.6	7.1	3,500	23.5
	2008	3.9	8.2	14.9	11.1	6.8	4,607	23.7
	2009	3.9	7.8	15.0	10.8	6.6	4,487	23.8
	2010	4.1	8.0	15.0	11.1	5.5	4,560	23.5
Denmark	2007	4.6	10.7	19.1	7.8	15.4	14,451	24.8
	2008	4.5	11.0	19.7	7.7	17.4	15,091	23.8
	2009	4.4	10.9	20.1	7.5	16.9	15,728	23.1
	2010	4.5	10.4	19.5	7.6	13.9	16,433	23.9
Germany	2007	6.1	12.9	20.5	12.3	13.5	10,565	27.1
	2008	6.4	13.1	20.8	12.6	13.9	10,793	27.3
	2009	6.4	13.1	20.6	12.1	14.0	10,868	26.8
	2010	6.6	13.1	20.6	11.9	14.3	11,090	26.9
Estonia	2007	11.3	19.5	27.8	16.2	39.3	3,307	30.7
	2008	10.3	18.5	26.7	15.9	34.6	3,874	30.1
	2009	9.2	15.8	25.0	17.1	18.7	3,718	29.0
	2010	8.9	15.5	24.6	17.2	17.3	3,702	28.9
Ireland	2007	7.4	17.0	27.4	19.9	26.4	14,245	27.7
	2008	6.8	16.1	26.7	19.1	23.9	14,696	27.2
	2009	5.0	13.4	23.9	17.1	17.1	13,913	25.0
	2010	4.9	13.0	24.2	17.3	10.7	13,418	25.3

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	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Greece	2007	12.8	19.9	27.5	22.4	21.1	6,671	33.4
	2008	13.0	20.4	27.7	22.8	22.2	6,987	33.8
	2009	13.2	21.1	28.3	23.3	23.5	7,212	34.1
	2010	13.4	20.8	27.3	23.3	23.1	6,856	33.4
Spain	2007	12.5	19.3	25.8	23.7	27.0	7,805	29.5
	2008	12.5	19.3	26.1	22.5	28.5	8,418	29.6
	2009	12.4	19.0	25.7	22.7	27.4	8,335	29.4
	2010	12.2	18.8	25.6	21.9	27.5	8,592	29.3
France	2007	5.1	11.0	19.6	10.9	13.0	10,210	24.9
	2008	5.0	10.0	18.2	10.1	11.0	10,468	24.6
	2009	4.5	9.0	17.1	8.8	11.3	10,611	24.1
	2010	4.6	9.3	17.3	9.2	11.8	10,775	24.2
Italy	2007	10.4	17.9	26.1	23.2	20.0	9,280	30.7
	2008	10.2	18.1	26.2	22.7	21.6	9,704	31.4
	2009	10.1	17.9	26.0	22.7	20.9	9,828	31.4
	2010	10.2	18.1	26.2	22.9	21.4	9,943	31.5
Cyprus	2007	7.3	14.8	22.3	12.0	48.3	10,130	27.0
	2008	7.7	15.1	22.8	12.4	49.3	10,773	27.1
	2009	7.4	14.8	22.8	11.9	48.8	11,080	27.1
	2010	6.8	14.6	22.8	11.9	47.5	11,375	26.9
Latvia	2007	17.1	25.3	31.5	25.3	47.9	2,564	37.0
	2008	16.1	24.5	30.7	24.6	45.8	3,153	36.9
	2009	13.9	21.5	29.3	24.5	30.3	3,262	35.6
	2010	12.6	20.1	28.1	24.4	22.4	2,985	34.4
Lithuania	2007	13.1	19.6	27.2	23.4	25.1	2,356	33.4
	2008	12.8	19.1	26.9	23.4	23.1	2,918	33.3
	2009	11.0	17.2	25.9	19.8	18.3	2,892	32.3
	2010	11.1	17.8	26.5	21.1	19.0	2,731	33.0

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	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Luxembourg	2007	2.9	10.8	18.6	16.2	3.3	18,146	25.0
	2008	2.0	8.8	17.8	11.5	3.3	18,568	24.8
	2009	1.3	7.7	17.0	10.0	1.9	19,536	24.4
	2010	1.5	8.2	17.1	10.9	2.5	19,807	24.5
Hungary	2007	6.6	11.5	19.1	18.5	2.7	2,513	24.6
	2008	6.9	11.9	19.7	19.1	2.5	2,709	24.7
	2009	7.0	12.1	20.2	20.3	1.8	2,463	24.7
	2010	7.0	11.8	19.7	18.4	3.4	2,190	25.5
Netherlands	2007	4.5	10.9	19.7	14.1	7.6	11,687	27.0
	2008	4.0	10.3	18.6	13.4	7.1	11,988	26.4
	2009	4.0	10.7	18.7	14.2	6.1	12,364	26.3
	2010	3.9	10.6	18.7	14.5	5.6	12,454	26.3
Malta	2007	8.7	15.7	24.3	18.5	22.7	5,777	27.4
	2008	9.2	16.2	25.2	19.0	23.1	6,088	27.8
	2009	9.1	16.6	25.1	19.9	22.2	6,008	27.7
	2010	8.8	16.0	25.0	18.8	20.5	6,152	27.4
Austria	2007	5.9	11.9	20.0	15.1	10.0	11,311	25.4
	2008	5.7	11.6	19.6	14.1	10.1	11,525	25.4
	2009	5.7	11.6	19.7	14.1	9.5	11,906	25.3
	2010	5.8	11.8	19.9	14.4	9.9	12,098	25.4
Poland	2007	9.6	16.1	24.3	19.4	13.7	2,655	31.2
	2008	10.1	17.2	25.2	21.1	16.0	3,375	31.6
	2009	10.4	17.6	25.5	22.0	15.7	2,699	32.3
	2010	10.0	17.3	25.2	21.7	15.1	3,013	32.1
Portugal	2007	11.7	19.8	27.9	23.8	26.2	5,094	35.1
	2008	11.5	19.5	27.7	22.6	26.6	5,258	34.9
	2009	11.3	19.0	27.7	21.5	26.4	5,401	34.7
	2010	11.2	19.1	27.9	21.7	25.7	5,471	34.5

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	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Romania	2007	16.7	23.3	30.3	32.1	26.0	1,152	34.7
	2008	17.8	23.5	31.2	34.9	21.2	1,374	34.9
	2009	17.5	23.5	30.7	34.1	19.9	1,325	34.5
	2010	17.1	23.0	30.0	34.3	16.3	1,331	33.9
Slovenia	2007	7.0	12.6	19.4	11.4	20.6	6,270	23.9
	2008	7.3	12.9	19.5	12.1	21.7	6,806	23.7
	2009	7.4	13.1	19.6	12.4	22.2	6,982	23.7
	2010	7.7	13.8	20.1	12.8	23.5	7,143	24.0
Slovakia	2007	4.1	9.3	16.7	13.9	8.2	2,833	22.1
	2008	4.4	9.8	17.3	14.1	10.4	3,249	22.5
	2009	4.2	9.4	16.8	13.6	9.8	3,581	22.1
	2010	4.4	9.4	16.6	13.7	9.1	3,716	22.0
Finland	2007	4.9	12.3	21.8	11.0	19.2	11,349	25.2
	2008	5.0	12.5	21.9	11.2	19.8	11,962	25.4
	2009	4.8	12.1	21.4	11.5	17.7	12,586	24.9
	2010	4.6	11.9	21.1	11.6	17.0	12,814	25.2
Sweden	2007	5.6	10.4	20.0	11.8	7.5	12,088	22.7
	2008	6.0	11.3	21.0	12.5	10.8	12,417	23.3
	2009	6.1	11.5	21.1	12.9	10.5	11,232	22.9
	2010	6.2	11.8	21.1	13.0	12.1	13,107	23.1
United Kingdom	2007	9.8	17.2	26.4	21.7	17.7	11,738	33.4
	2008	9.4	16.7	25.7	20.5	17.0	10,324	33.2
	2009	9.1	16.4	25.4	19.8	16.3	9,876	33.0
	2010	9.0	16.3	25.4	19.8	15.8	10,491	32.5
EU-27	2007	8.6	15.3	23.4	18.1	17.2	8,525	29.0
	2008	8.7	15.3	23.3	18.0	17.3	8,694	29.1
	2009	8.5	15.0	23.0	17.7	16.6	8,642	28.8
	2010	8.4	15.0	23.0	17.6	16.3	8,875	28.8

Source: EUROMOD version F6.0++.

Notes: EUROMOD figures for Malta are based on SILC 2009 (2008 incomes), backdated, and those for UK are based on FRS2008/9, backdated. Figures for France are based on SILC 2007 (2006 incomes), updated.

A similar explanation for falling relative risk of poverty also applies in Latvia and Ireland where pensions were frozen but other incomes were falling. National estimates indicate that in Latvia risk of poverty for elderly people fell from 47.5% to 18.6% in this period.

In Romania, pensions have been increased over the whole period and particularly in 2009-10, leading to the dramatic reduction in poverty risk among the elderly shown in Table 3. In Denmark where incomes from capital are particularly important for elderly people, fluctuations in the return to capital over the period (captured approximately in EUROMOD using updating factors) are part of the explanation for fluctuations in risk of poverty among the elderly.

The reduction of poverty risk for the general population and children in Lithuania in 2009 is also recorded by the Eurostat SILC data (not shown here), but to a much smaller extent. This can be explained by the fact that increased unemployment among the working-age population is not accounted for in the baseline EUROMOD scenario for Lithuania. An alternative scenario with employment adjustments (see Annex 3) helps to correct for this in 2009 and produces a more realistic scenario of an increase of poverty risk rates up to 19.9% for general population and 25.2% for children in 2010 (about 2 and 4 percentage points higher respectively than the rates shown in Table 3).

Inequality as measured by the Gini coefficient stays the same or falls a little in most countries. Exceptions are Latvia and Ireland where it falls more rapidly, especially towards the end of the period and Hungary where it rises.

It should be emphasised that these figures for 2010 are unlikely to coincide with the value of social indicators that will be produced by the EU-SILC 2011 (2010 incomes). The EUROMOD estimates show the implications for the movement in the indicators of policy changes over the period 2007-2010 relative to average changes in other incomes. For example, if benefits and tax thresholds were uprated in line with increases in (median) incomes generally we would expect to see no changes in these indicators. To the extent that they are not or that there is differential change across income sources or structural policy reform, differences can be observed in the indicators. The policy conclusion that one might draw from the general picture of declining poverty and inequality indicators in Table 3 is that policy changes were having a mild positive effect. This is informative if, for example, poverty and inequality are generally growing or predicted to do so (meaning that things would be worse without the policy effect) or if poverty and inequality are falling fast (meaning that policy effects are not the sole explanation). It is useful to know the direction and relative size of the policy effect since it is this that policy makers can influence directly.[12] On this basis the results for the EU as a whole show risk of poverty and inequality declining slightly over the period.

The role of taxes and benefits in reducing poverty risk is one area that EUROMOD is especially designed to address. Table 4 shows risk of poverty measured before taxes and benefits (i.e. for market income) so this can be compared with poverty risk after taxes and benefits (as in Table 3). The "before" measure is shown in two versions: one excluding public

[12] The analysis presented here goes part way towards doing this, by stripping out the effects of changes in population characteristics and behaviour. To focus solely on the effects of policy changes the analysis would require a "neutral" counterfactual scenario to be defined for the movement of policy parameters (such as tax thresholds) relative to the movement in the level and distribution of market incomes.

pensions from market incomes and another including these incomes as part of "before". Note that, the poverty threshold is the same throughout, using 60% of median household disposable income.[13]

Changes in original income only arise in this analysis because of average rates of growth that are applied in the updating process. The poverty threshold is also influenced by changes in taxes and benefits, so it is reasonable to expect some variation in poverty risk on the basis of original income. The same applies to original income including pensions although this is of course also affected by policies for the uprating of pensions. The effect of adding pensions to market income reduces poverty before taxes and benefits significantly in all countries, typically reducing the risk of poverty rate from over 30% to well under 20%, with the effect being notably smaller in Ireland and the UK (due to the prevalence of occupational and other private pensions which are included in original income).

The change in the effect due to policy changes between 2007 and 2010 is generally small and positive with some exceptions. In Estonia and Latvia where pensions increased or were frozen while other incomes fell (also in Ireland, where the effect is relatively small but the proportional increase shown in Table 4 is large). In Bulgaria, Poland and Romania the increase in effect is due to an increase in pensions in the period.

In a few countries the poverty reduction effect of pensions fell over the period, and by at least 0.5 percentage points in Spain, Finland and Greece. In the latter country this is due to pension cuts as part of the 2010 austerity measures.

The effect of non-pension benefits and taxes on all incomes is much smaller in comparison with that of pensions, except in Ireland and the UK where it is much larger and can be attributed to the prevalence of means-testing in these two countries. In some countries the effect is negative (the taxes being paid by people on low incomes being greater than the non-pension benefits they receive). This is the case for policies in both 2007 and 2010 in Bulgaria, Greece, Italy, Latvia, Lithuania, Poland, and Romania and for policies in 2007 in Portugal. The change in the effect due to policy changes between 2007 and 2010 is again small and generally positive except in Bulgaria, Estonia, Greece, Italy, Cyprus, Poland, Sweden and Slovenia where it is negative. The growth in effect is larger in Ireland (perhaps because of progressive austerity measures) and in Luxembourg where a means-tested benefit targeted on the poor (a heating allowance) was greatly increased in size in 2009 and a refundable tax credit introduced in 2008.

Taking both types of payment together (last column of Table 4), only in Greece, Italy, Cyprus, Sweden and Slovenia does the poverty-reducing impact of tax and benefit become smaller in percentage point terms over the period 2007-2010. It rises by more than 3 percentage points in the three Baltic States, Ireland and Luxembourg. Looking at the EU overall, the poverty-reducing effect of both pensions and other benefits and taxes has increased somewhat.

[13] The treatment is analogous to the Eurostat indicators "At-risk-of-poverty rate before social transfers" excluding and including pensions. The measures are different however. Eurostat deducts social transfers from disposable income leaving aside the effects of taxes. In the EUROMOD analysis shown here the "before" is also before the effects of taxes and any interaction of taxes and benefits (such as the taxation of benefits).

Table 4: EUROMOD estimates of poverty risk before and after taxes and benefits, 2007 and 2010 policies

	Policy year	Poverty risk before taxes & benefits: market incomes		Poverty risk after taxes & benefits	Reduction due to (ppts)		
		excluding pensions	including pensions		pensions	taxes & non pension benefits	total taxes & benefits
Belgium	2007	34.4	16.0	12.2	18.4	3.8	22.2
	2010	34.6	16.0	11.6	18.6	4.4	23.0
Bulgaria	2007	33.4	19.3	19.4	14.1	-0.1	14.0
	2010	35.6	16.9	17.8	18.7	-0.9	17.8
Czech Republic	2007	31.8	11.6	8.3	20.2	3.3	23.5
	2010	32.4	12.1	8.0	20.4	4.1	24.5
Denmark	2007	27.7	12.0	10.7	15.7	1.3	17.0
	2010	28.4	12.3	10.4	16.1	1.9	18.0
Germany	2007	36.2	16.0	12.9	20.2	3.1	23.3
	2010	36.5	16.2	13.1	20.2	3.1	23.4
Estonia	2007	31.6	20.0	19.5	11.5	0.6	12.1
	2010	32.4	15.7	15.5	16.8	0.1	16.9
Ireland	2007	37.1	33.0	17.0	4.1	16.0	20.1
	2010	37.3	32.1	13.0	5.2	19.1	24.3
Greece	2007	36.7	18.2	19.9	18.5	-1.7	16.8
	2010	36.4	18.6	20.8	17.8	-2.3	15.5
Spain	2007	32.9	20.2	19.3	12.7	0.9	13.6
	2010	32.6	20.4	18.8	12.2	1.6	13.8
France	2007	37.4	18.3	11.0	19.1	7.3	26.4
	2010	37.5	18.5	9.3	19.0	9.2	28.2
Italy	2007	34.6	16.6	17.9	18.0	-1.3	16.7
	2010	33.6	15.9	18.1	17.7	-2.2	15.5
Cyprus	2007	26.6	18.0	14.8	8.6	3.2	11.8
	2010	26.1	17.3	14.6	8.8	2.7	11.5
Latvia	2007	28.2	22.4	25.3	5.8	-2.9	2.9
	2010	29.6	18.2	20.1	11.4	-1.9	9.5
Lithuania	2007	31.9	17.5	19.6	14.4	-2.1	12.2
	2010	33.3	17.5	17.8	15.8	-0.3	15.5
Luxembourg	2007	33.0	15.2	10.8	17.8	4.4	22.2
	2010	33.4	15.5	8.2	18.0	7.2	25.2
Hungary	2007	38.6	14.4	11.5	24.3	2.9	27.2
	2010	39.4	14.8	11.8	24.5	3.0	27.6
Netherlands	2007	22.6	13.5	10.9	9.1	2.6	11.7
	2010	22.6	13.4	10.6	9.3	2.8	12.1
Malta	2007	30.1	17.4	15.7	12.7	1.7	14.4
	2010	31.8	18.9	16.0	12.9	2.9	15.8
Austria	2007	32.7	14.0	11.9	18.7	2.1	20.8
	2010	33.2	14.4	11.8	18.8	2.6	21.4
Poland	2007	33.0	13.1	16.1	19.9	-3.0	16.9
	2010	34.2	13.7	17.3	20.5	-3.6	16.9
Portugal	2007	35.7	19.3	19.8	16.4	-0.5	15.9
	2010	35.5	19.2	19.1	16.4	0.1	16.4
Romania	2007	40.6	23.1	23.3	17.5	-0.2	17.3
	2010	43.2	22.4	23.0	20.8	-0.6	20.2
Slovenia	2007	29.7	13.1	12.6	16.6	0.5	17.1
	2010	30.0	13.7	13.8	16.3	-0.1	16.2

/continued

	Policy year	Poverty risk before taxes & benefits: market incomes		Poverty risk after taxes & benefits	Reduction due to (ppts)		
		excluding pensions	including pensions		pensions	taxes & non pension benefits	total taxes & benefits
Slovakia	2007	30.1	10.9	9.3	19.3	1.6	20.9
	2010	31.0	11.6	9.4	19.4	2.2	21.6
Finland	2007	32.4	16.3	12.3	16.1	4.1	20.1
	2010	32.5	17.1	11.9	15.3	5.2	20.6
Sweden	2007	29.4	12.9	10.4	16.5	2.5	19.0
	2010	30.1	14.0	11.8	16.2	2.1	18.3
United Kingdom	2007	35.0	28.8	17.2	6.2	11.6	17.8
	2010	35.4	29.0	16.3	6.4	12.7	19.0
EU-27	2007	34.6	18.4	15.3	16.2	3.1	19.2
	2010	34.8	18.4	15.0	16.4	3.4	19.8

Source: EUROMOD version F6.0++.

Notes: EUROMOD figures for Malta are based on SILC 2009 (2008 incomes), backdated, and those for UK are based on FRS2008/9, backdated. Figures for France are based on SILC 2007 (2006 incomes), updated. The poverty threshold is 60% of median equivalised disposable household income. Columns may not add due to rounding.

6. Marginal Effective Tax Rates

EUROMOD can be used to calculate the effect of tax and benefit systems on work incentives. Here we provide estimates of marginal effective tax rates (METR) under the four policy systems. These are calculated for all individuals with earned income, taking account of the effect of earning 3% more such income on their household disposable income. Table 5 shows the mean and median METR for each of the four policy systems. The calculations include some zero values (e.g. for people earning small amounts, below tax and contribution thresholds and in households with other income, making them ineligible for any means-tested benefit that might be withdrawn). They also include some very high values, exceeding 100%, corresponding to situations where people are near discontinuities in the tax-benefit schedules.

There are many different ways of calculating statistics such as these, depending on the interpretation that one wished to place upon them, and comparability issues should be borne in mind. One such issue is illustrated by the relatively very low values of mean METRs exhibited by Bulgaria in Table 5. This is because the Bulgarian calculations assume that those that appear in the data to evade some taxes (see Annex 3) are assumed to earn their marginal earnings in the black economy. Thus the low mean METR results from averaging over some zero values (for the evaders) with the non-zero values for those paying taxes. In the other country where tax evasion is modelled – Italy – it is assumed that the marginal earnings arise partly in the black economy according to the proportion estimated for existing earnings. In the remaining countries, all of the marginal earnings are assumed to be earned in the official economy and are subject to taxes, contributions and benefit withdrawal, assuming full compliance. Two issues arise from this. First, this lack of comparability should be borne in mind when interpreting these results. Secondly, whether or not to take evasion into account at all when measuring work incentives is clearly an issue to consider. This depends very much on whether the METRs are to be considered as indicators of the effects of the design of the tax-benefit system on marginal earnings that are retained; or whether they are to be interpreted

as calculations of the marginal return to additional work in practice, taking into account opportunities to evade.

Table 5: Marginal effective tax rates for policy systems in 2007, 2008, 2009 and 2010

		200	2008	2009	2010
Belgium	mean	50.9	51.2	50.1	50.3
	median	54.9	54.9	54.9	54.9
Bulgaria	mean	26.8	21.8	21.1	20.4
	median	31.7	21.7	21.7	20.9
Czech Republic	mean	31.4	31.4	30.2	30.1
	median	29.1	32.8	31.1	31.1
Denmark	mean	48.5	48.6	47.0	44.0
	median	47.7	47.8	42.2	41.0
Germany	mean	51.0	51.0	48.0	48.5
	median	46.6	46.2	46.0	45.6
Estonia	mean	22.8	21.4	21.8	22.8
	median	24.0	23.0	22.6	23.2
Ireland	mean	29.1	30.4	38.6	37.9
	median	31.5	31.9	39.4	38.0
Greece	mean	23.4	23.3	23.9	22.9
	median	19.5	27.0	25.0	19.5
Spain	mean	24.5	23.6	23.1	25.8
	median	28.8	28.8	28.8	28.8
France	mean	35.9	36.3	37.4	37.1
	median	31.6	31.6	31.6	31.6
Italy	mean	38.4	38.8	39.1	39.7
	median	38.2	38.9	39.1	39.5
Cyprus	mean	18.7	18.8	19.9	20.4
	median	20.0	20.0	20.0	22.8
Latvia	mean	31.1	30.4	29.1	32.7
	median	31.8	31.8	29.9	32.7
Lithuania	mean	28.0	25.9	26.3	27.0
	median	30.0	27.0	27.0	27.0
Luxembourg	mean	39.1	39.8	40.2	40.1
	median	40.2	39.6	39.7	39.6
Hungary	mean	44.8	45.0	41.9	37.7
	median	40.0	44.6	44.6	38.6
Netherlands	mean	39.2	39.4	39.0	39.2
	median	44.2	44.0	43.3	43.3
Malta	mean	26.7	24.4	24.0	25.3
	median	25.0	23.3	23.2	23.3
Austria	mean	44.8	42.2	41.5	33.0
	median	49.6	49.6	48.1	48.1
Poland	mean	31.0	28.9	26.5	26.7
	median	35.2	31.2	30.3	30.3
Portugal	mean	26.7	29.0	26.9	27.6
	median	24.0	24.0	24.0	24.6
Romania	mean	35.3	35.5	34.7	36.1
	median	30.3	31.9	31.0	31.0
Slovenia	mean	32.4	33.5	32.9	32.7
	median	32.5	32.6	32.6	32.5
Slovakia	mean	28.0	27.6	29.6	28.6
	median	29.9	29.9	29.9	29.9
Finland	mean	40.6	40.6	40.0	40.1

	median	44.8	44.1	43.3	43.8
Sweden	mean	37.8	36.9	34.8	34.3
	median	31.9	31.1	29.8	28.9
United Kingdom	mean	36.5	36.0	35.5	35.8
	median	33.0	31.8	31.8	31.9

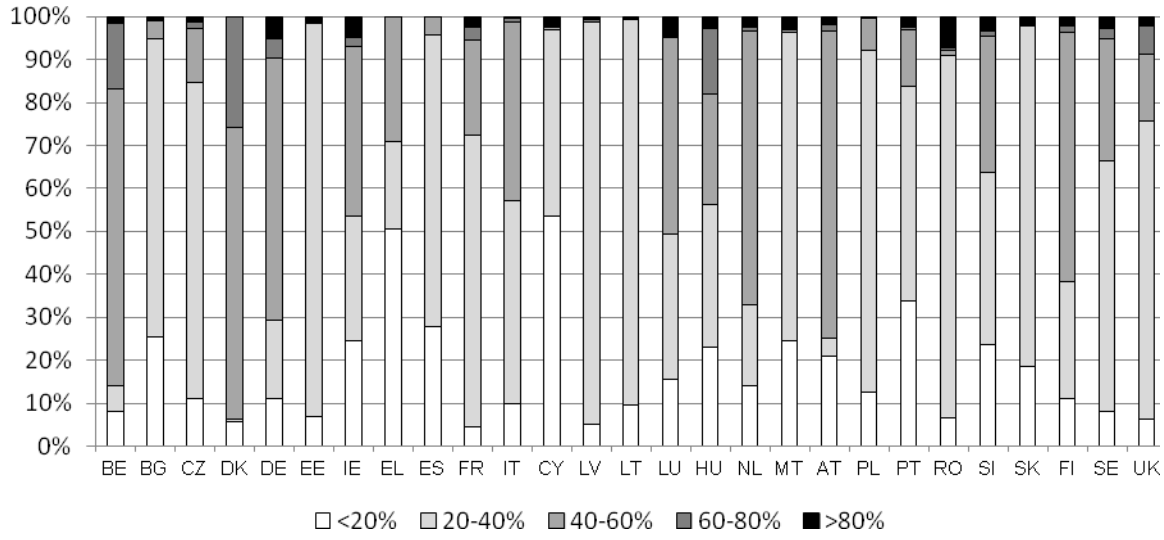
Source: EUROMOD version F6.0++. All EUROMOD figures are preliminary and should not be cited. Notes: EUROMOD figures for Malta are based on SILC 2009 (2008 incomes), backdated, and those for UK are based on FRS2008/9, backdated. Figures for France are based on SILC 2007 (2006 incomes), updated.

Countries with low mean marginal rates (below 25%) in 2007 include Cyprus, Estonia, Greece and Spain and those with high mean rates (over 40%) include Belgium, Denmark, Germany, Hungary, Austria and Finland. Belgium and Germany have mean METRs in excess of 50%.

Over the period 2007 to 2010 mean METRs decline slightly in some countries (e.g. Hungary, Poland and especially Austria) and rise slightly in others (e.g. Cyprus, and especially Ireland), probably generally due to changes in earnings relative to tax thresholds in this period in some countries, combined with changes in policy.

As well as averages, the distribution of METRs is of interest. Figure 2 shows, for the 2007 policy systems, the shares of the populations in paid work who face METRs in certain ranges: under 20%, 20% to under 40%, 40% to under 60%, 60% to under 80% and 80% and above.

Figure 2: Marginal effective tax rates 2007: share of population in paid work (%) by range of METR



Source: EUROMOD version F6.0++.

Notes: EUROMOD figures for Malta are based on SILC 2009 (2008 incomes), backdated, and those for UK are based on FRS2008/9, backdated. Figures for France are based on SILC 2007 (2006 incomes), updated.

Marginal rates below 40% predominate in many countries. There are exceptions where higher rates are the norm (Belgium, Denmark, Netherlands, Austria) as well as cases where a wide range of rates is faced by large proportions of the population in paid work (Ireland, Italy, Luxembourg. Slovenia, Finland). In almost all countries there is a minority facing very high rates (i.e. over 80%) which typically occurs because of the interaction of tax and contributions with benefit withdrawal, or because of discontinuities in entitlement to benefits or tax

concessions. The share with such high METRs is 5% or more in Germany, Ireland and Romania.

These estimates are preliminary and show a very small selection of indicators that may be of interest. Breakdowns by gender and family status, analysis of METRS across the income distribution and decomposition by income source (tax, contribution, type of benefit etc) are examples of analysis that will be carried out in due course.

7. Conclusions and next steps

The results from EUROMOD shown above are both limited to some simple analysis of the baselines for 2007-10 policies. On the one hand improvements and refinements are possible that will improve the quality, comparability and applicability of the baseline results. On the other hand, EUROMOD is mainly intended not simply to generate baseline statistics for a particular policy year, but also as a tool to explore alternative scenarios in terms of both policies and the characteristics of the populations on which they have impact. Next steps in the development will include:

- Consideration of adjustments to improve the baseline in relation to external statistics while at the same time maintaining transparency in the model and its responsiveness to the effects of simulated policy changes. Adjustments for non take-up of benefits and evasion of taxes are one important area for future work. Another is improving understanding of when and how EUROMOD simulations better capture the situations of households than variables that may be under- or mis- reported in surveys.

- Another important development concerns adjustments for changes in labour markets (or demographics) so that simulations of 2009 (and later) policies can also take account of the effects of the economic downturn (and recovery). Some preliminary work on Estonia and Lithuania suggests that in countries like these where there have been dramatic changes such adjustments can make a considerable difference to estimates of poverty and inequality and the effects of policies.

- Also, we will explore how to improve the precision and level of detail (as well as cross-country consistency) in the treatment of the updating of non-simulated incomes from the data to the policy year.

- An additional area for development is the expansion of the number of countries using national SILC data in place of the UDB, in order to overcome the imprecision resulting from imputing the components of UDB income aggregations.

- There is plenty of scope for further analysis of marginal effective tax rates and other indicators of work incentives.

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Annex 2 EUROMOD input datasets used in the analysis in this paper[14]

Country	Input data
Belgium	EU-SILC version 2008-2
Bulgaria	EU-SILC version 2008-2
Czech Republic	EU-SILC version 2008-2 (+ additional national variables)
Denmark	EU-SILC version 2008-1
Germany	EU-SILC version 2008-2
Estonia	EU-SILC version 2008-2
Ireland	EU-SILC version 2008-2
Greece	National SILC 2008
Spain	National SILC 2008
France	EU-SILC version 2007-3
Italy	National SILC 2008
Cyprus	EU-SILC version 2008-2
Latvia	EU-SILC version 2008-3
Lithuania	EU-SILC version 2008-2 (+ additional national variables)
Luxembourg	EU SILC 2008-2 (+ additional national variables)
Hungary	EU-SILC version 2008-2
Malta	EU-SILC version 2009-1
Netherlands	EU-SILC version 2008-2
Austria	National SILC 2008
Poland	EU-SILC version 2008-2 (+ additional national variables)
Portugal	EU-SILC version 2008-2
Romania	EU-SILC version 2008-2
Slovenia	EU-SILC version 2008-2
Slovakia	National SILC 2008
Finland	EU-SILC version 2008-2
Sweden	EU-SILC version 2008-2
United Kingdom	National non-SILC data (Family Resources Survey 2008/9)

We are grateful for access to micro-data from the EU Statistics on Incomes and Living Conditions (EU-SILC) made available by Eurostat under contracts EU-SILC/2009/17 and EU-SILC/2011/55, the Italian version of the EU-SILC (IT-SILC) made available by ISTAT, the Austrian version of the EU-SILC made available by Statistics Austria, the Lithuanian version of the EU-SILC (PGS) made available by the Lithuanian Department of Statistics, variables from Bulgarian version of the SILC made available by the National Statistical Institute, variables from the Greek SILC Production Database (PDB) made available by the Greek Statistical Office and the Family Resources Survey (FRS), made available by the UK Department of Work and Pensions (DWP) through the UK Data Archive. Material from the FRS is Crown Copyright and is used with permission. Neither the DWP nor the

[14] In some countries, alternative input datasets are available or in the process of being developed.

Data Archive bears any responsibility for the analysis or interpretation of the data reported here. An equivalent disclaimer applies to all other data sources and their respective providers cited in this acknowledgement.

Annex 3 Country notes: tax evasion, benefit non take up and labour market adjustments

Tax evasion

For **Bulgaria** tax evasion adjustments have been made because of oversimulation of taxes and social insurance contributions. The adjustment is based on a comparison between net and gross employment incomes. Under this approach, it is assumed that an individual is involved in the shadow economy if her (positive) net and gross employment incomes are equal. Such an individual is assumed to be a full tax evader and hence, no income tax and social insurance contributions are simulated for her. Furthermore, for the simulation of the income test for child and social assistance benefits, the earnings of a tax evader are not taken into account because it is assumed that they will not be reported and thus, will not be part of the income test. No correction for individuals with self-employment income has been done. These adjustments lead to more accurate simulations of the tax and benefit instruments.

For the **Czech Republic** full compliance is assumed in the simulation of social contributions and income taxes. This assumption does not lead to overestimation of contributions, except for the self-employed. In fact, the number and amount of employee and employer social contributions simulated by EUROMOD is consistent with external statistics. On the other hand, income tax revenue is underestimated probably due to underreporting of capital, property and self-employment incomes.

For **Germany** full compliance is assumed. Social insurance contributions are only slightly over-simulated. Although number of taxpayers has been only slightly under-simulated, the aggregated amount of the simulated taxes is by almost 20ppt larger than the external statistics. This deviation can be partially explained by the under-simulation of tax allowances. Adjustments to account for this are planned for the future.

For **Greece** full compliance is currently assumed although it is known that extent of tax evasion in Greece is rather high. Adjustments to take tax evasion into account are planned for the future.

For **Spain** full compliance is assumed in the simulation of social contributions and income taxes. This leads to some overestimation of the number and amount of employee and employer social contributions. The same does not happen to income tax suggesting that there may be some evasion of contributions among employees who are exempt from income tax but not from contributions.

For **France** all social insurance contributions and personal income tax estimates are very close to external benchmarks and no tax evasion adjustment is made.

For **Italy** Self-employment income has been calibrated in order to take into account tax evasion behaviour. Since we implement our own net-to-gross procedure (starting from net incomes reported in SILC data), we split the recorded self-employment income into two components: the first component declared to the tax authorities (and hence grossed up) and the second component not declared (but still included in the definition of disposable income). The coefficient used to separate the two components allows us to get a total aggregate gross self-employment income corresponding to the aggregate amount of reported self-employment income as reported in the official statistics.

For **Cyprus** full compliance is assumed in the simulation of personal income taxes, the special contribution for defence and social insurance contributions. Self employed incomes are strongly over reported in the SILC survey compared with tax statistics and it is planned to investigate a tax evasion adjustment in the future..

For **Latvia** although we have evidence of income under reporting to the tax authorities, full compliance is assumed in the simulation of personal income tax and social insurance contributions. The number of recipients and the amounts of the simulated instruments are currently overestimated.

For **Malta** full compliance is assumed n the simulation of social contributions and income taxes. For certain groups such as the self employed social insurance contributions are overestimated by almost 100% and for employees and employers overestimated by approximately 20%. Income tax estimates are close to external statistics.

For **Poland** full compliance is assumed in the simulation of social contributions and income taxes. This assumption does not lead to overestimation. In fact, the number and amount of contributions and income taxes simulated by EUROMOD are consistent with external statistics.

For **Portugal** full compliance is assumed in the simulation of social contributions and income taxes. The amount of income tax is overestimated. However, detailed results show that this is not due to tax evasion but to the non simulation of some tax credits (In particular, education, health and private insurances tax credits are not simulated due to lack of data such expenditures).

For **Romania** it is assumed that there is no tax evasion assumed. Social contribution estimates are very close to administrative data; income tax on the other hand is under-estimated by around 30%. The reasons for this remain to be explored.

For **Slovakia** full compliance is assumed in the simulation of both social insurance contributions and the personal income tax. Social insurance contributions roughly match external figures while income tax is under- rather than over- estimated.

For the **UK** full compliance is assumed in the simulation of both social insurance contributions and the personal income tax. Both are under- rather than over- estimated.

For **Belgium**, **Denmark, Estonia**, **Ireland**, **Lithuania**, **Luxembourg**, **Hungary**, **the Netherlands, Austria**, **Slovenia, Slovenia, Finland** and **Sweden** full compliance is assumed for both income taxes and social contributions.

Benefit non take-up

For **Belgium** and the **UK** we employ a simple non take-up correction of the main means-tested benefits by applying the take-up proportions estimated on a caseload basis (own calculations in case of Belgium; using statistics from the Department of Work and Pensions and HM Revenue and Customs in case of the UK). Take-up probabilities are applied at the household level (so that people entitled to the same benefits within a household exhibit the same take-up behaviour), for each benefit separately. In general we assume that take-up behaviour is not

affected by changes in the size of benefit or tax credit entitlements. However, by applying differential take-up probabilities according to type of claimant, some of this effect is captured. Following the judgement of the national team, the baseline results for Belgium refer to the case which excludes the simulation of Income Support and Income Support for elderly from the results (and the values are taken from the data). Results including the simulation of the Income support benefits are included in the Country Report.

For the **Czech Republic** full take up is assumed in the simulation of child allowances, social allowance, birth grant and social assistance. In general, the simulated number and amount of these benefits are consistent with official statistics. Housing and social assistance housing supplement benefits are also simulated under the assumption of full take up, but in this case both number and amounts are overestimated.

For **Germany** full take-up is assumed for the baseline. Results on the simulation of taxes and benefits seem to be very good compared to external figures. However, poverty and inequality estimates seem to be less accurate. Therefore, a non-take up correction is included in the model as an option and if switched on it is applied to some means-tested benefits including unemployment assistance, means-tested old-age assistance and general social assistance. It is assumed that this probability is homogenous across these benefits as well as across the entire population. As a result of this correction, the aggregated amount and number of recipients of the three benefits are under-simulated but poverty and inequality are well-estimated.

For **Estonia** non take-up is simulated for social assistance on the assumption that small entitlements (either in absolute or relative to other household income) are not claimed. Full take-up is assumed for all other simulated means-tested benefits.

For **France** non take-up correction of the main means-tested social assistance benefit (RMI/RSA)[15] is simulated to be random- proportions of non-take up -separately by active and inactive units (for RSA) taken from external data.

For **Ireland**, non take-up is simulated for Family Income Supplement, applying external estimates on the caseload. Full take-up is assumed for all other means-tested simulated benefits.

For **Greece** non take-up is simulated for social pension and unemployment assistance benefit for older workers applying external estimates on the caseload. Full take-up is assumed for all other means-tested simulated benefits.

For **Spain** full take up is assumed in the simulation of child benefit, birth and adoption benefit, regional child benefits. In general, the simulated number and amount of these benefits are not only consistent with official statistics but represent an improvement with respect to the EU-SILC data (where these benefits are underreported). However eligibility for non contributory old-age benefit and pension complements are, by default, made conditional on the benefit being reported in the input database due to significant differences between the number of recipients simulated by the model (assuming full take up) and reported in official statistics. Furthermore, the same approach is applied in the simulation of unemployment assistance benefits due to lack information to accurately simulate all the relevant criteria. Also in Spain

[15] RMI stands for Revenu minimum d'insertion and RSA for Revenu de solidarité active.

the number and amount of regional social assistance benefits simulated by EUROMOD are many times larger than the official statistics. This is because, in all but one region, access to the benefit is not only conditional on household/individual eligibility but also on the existence of public funds. Case-by-case comparisons show that just a few households that report social assistance in the EU-SILC are also eligible for social assistance according to the simulation. As a result, by default, EUROMOD baseline simulations ignore the simulated amount of social assistance and include the amounts reported in the EU-SILC.

For **Malta** full take-up is assumed; the main problem is the overestimation of old age pension. The number of recipients is overestimated by 40% and the expenditure by 50%. This is probably not entirely due to non-take up and difficulties in simulating the asset test at all precisely may also contribute.

For **Poland** full take up is assumed in the simulation of nursing supplement, nursing allowance, family allowance, family supplements, birth allowance, nursing benefit and permanent social assistance. In general, the simulated number and amount of benefits are consistent with official statistics. However, for housing benefit, due to significant differences between the number of recipients simulated by the model (assuming full take up) and reported in official statistics, eligibility is conditional on receipt being reported in the input database. Furthermore, due to lack of information on assets that are necessary for the means-test, the eligibility for temporary social assistance is simulated conditional on an estimated expected probability to be eligible. Moreover, by law the central government is obliged to pay just a share of the total benefit amount. The rest (or part of it) may be paid by the local government. In EUROMOD, we assume that only the central government pays its part.

For **Portugal** full take up is assumed in the simulation of family benefit, social pension and social insertion income (i.e., social assistance). In general, the simulated number and amount of family benefit is consistent with official statistics. Social pension is slightly under-estimated. Social assistance is overestimated. However, the number and amount of social solidarity supplement for the elderly simulated by EUROMOD are many times larger than the official statistics. Since this benefit has been introduced quite recently and its rules are rather complex, many potential recipients are likely to be unaware of the benefit or that they are eligible. As a result, by default, the baseline simulations ignore this benefit.

For **Romania** full take up is assumed. The minimum guaranteed income is overestimated by a factor of 4 but eliminating from eligibility families headed by a person aged 18-26 and families entitled to more generous means-tested benefits reduces the overestimation to 44%. Means-tested benefits for lone parents are underestimated by a factor of 2 due to a lack of lone parents in the data.

For **Slovakia** full take up is assumed for social assistance and all family benefits (the latter are universal). The simulated number of recipients and amounts for family benefits are very close to external figures (with the exception of the birth grant which is underestimated). The number of recipients of social assistance is close to the external benchmark.

For **Slovenia** full take-up is assumed for all benefits. Due to high non-take-up housing benefit is greatly overestimated by nearly a factor of 4.

For **Bulgaria**, **Denmark, Latvia**, **Lithuania**, **Luxembourg, Italy**, **Cyprus**, **Hungary, the Netherlands, Austria, Finland** and **Sweden** full take up is assumed for all simulated means-

tested benefits in the results reported in this paper. In some of these countries it is planned to introduce non take-up adjustments in the future.

Employment adjustments (alternative scenario)

Baseline EUROMOD results assume the same patterns of labour market activity as observed in the input data. In some countries employment fell and unemployment rose dramatically in the relevant period. For **Lithuania** and **Estonia**, where this was strongly the case, an alternative scenario with employment adjustments for the period 2009-2011 has been developed in order to account for labour market changes during the financial crisis. Adjustments are based on Eurostat LFS data showing relative decrease in employment by age, gender and level education in 2007 and the year in question. The new unemployed in EUROMOD dataset were chosen randomly within a corresponding cell of employed people aged 15-74 so that the same relative decrease in employment is reached. Transitions to inactivity or back to employment are not modelled. This adjustment makes a significant difference to estimates of poverty and inequality and to estimates of income tax liability and benefit entitlement in the later policy years simulated. For example, in Lithuania without the adjustment risk of poverty under 2010 policies is estimated as 17.8% whereas the estimate is 19.9% with the adjustment in place.