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Baseline results from the EU-27 EUROMOD (2009-2013)

H. Xavier Jara and Chrysa Leventi

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H. Xavier Jara[a] and Chrysa Leventi[a]

with

Silvia Avram[a], Paola De Agostini[a], Francesco Figari[b,a], Jekaterina Navicke[c,a], Alari Paulus[a], Olga Rastrigina[a], Iva Tasseva[a], Alberto Tumino[a] and Holly Sutherland[a]

[a] ISER - University of Essex
[b] University of Insubria
[c] Vilnius University

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Abstract

This paper presents baseline results from the latest version of EUROMOD (version G2.1), the tax-benefit microsimulation model for the EU. First, we briefly report the process of 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 2009 and 2013. 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. This paper updates the work reported in EUROMOD Working Paper EM13/2013.

JEL: C15; H24; H31; H55; I3

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

Corresponding author:

Chrysa Leventi

Email: cleventi@essex.ac.uk

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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. Furthermore, it can be used to explore the between- as well as within- country distributional implications of potential EU or eurozone social and fiscal policies.

EUROMOD is unusual in that it is **openly accessible**.[2] There are many 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 https://www.iser.essex.ac.uk/euromod/.

This report presents baseline results from the latest version of the EU27 version of EUROMOD being constructed with support from DG-EMPL of the European Commission.[3] It updates and extends the material reported in 2013 in a EUROMOD Working Paper.[4]

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 2009-2013 policies, based on micro-data from the EU-SILC. The calculations for 2009 provide a '*base year*' or starting point for any simulations of changes that EUROMOD users may carry out. Section 4 describes estimates of Marginal Effective Tax Rates (METRs) using EUROMOD. Section 5 assesses the quality of the data and simulations behind these results and explains why they may differ from estimates calculated using the EU-SILC data on household income directly. Section 6 concludes and presents the next steps for EUROMOD.

2. The EUROMODupdate2 project

With the support of Progress funding the EUROMODupdate2 project has updated and improved the 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 2013) as well as those corresponding to the income reference period in the SILC data (2009 in this release).

[2] Subject to permission to access the input micro-data (EU-SILC).
[3] The results presented in this report incorporate changes that took place after the model's latest public release (version G2.0+). For more information on EUROMOD's updates, please contact us (euromod@essex.ac.uk).
[4] https://www.iser.essex.ac.uk/publications/working-papers/euromod/em13-13

The results reported below are, with very few exceptions, based on EU-SILC 2010 (2009 incomes).[5] The model has been built with the collaboration of national teams, which are listed in Appendix 1. In all 27 countries policy systems have been updated to cover years 2009-2013.[6] In 13 countries input data have been updated from EU-SILC 2008 to EU-SILC 2010. There were 4 key tasks: (1) updating the input database, (2) updating policy systems for 2013, (3) validating the baseline outputs and (4) documenting the work in a Country Report. These are described briefly in turn.

- **Updating input databases**

The original aim was to build input databases for all countries from the EU-SILC UDB.[7] 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 Appendix 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 only 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; at-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 obviously involves approximations and has implications for the results.

As part of the EUROMODupdate2 project, Bulgaria, Czech Republic, Estonia, Ireland, Cyprus, Luxembourg, Malta, the Netherlands, Austria, Poland, Portugal, Finland and Sweden have updated input databases to EU-SILC 2010. The baseline results presented in this report are based on:

(a) Family Resources Survey (FRS) for 2009/10 for the UK;
(b) SILC 2008 for Denmark;
(c) SILC 2010 for all remaining countries.

- **Updating policy systems for 2013**

Based on detailed descriptions of policies provided by national teams, 2013 policies have been modelled using the EUROMOD tax-benefit modelling "language" for all 27 countries. Together with updating factors, to bring 2009 incomes from 2010 EU-SILC data up to the level in each policy year (2010, 2011, 2012, 2013), 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.

[5] See Appendix 2 for a list of micro-data sources used in each country.
[6] The previous EUROMOD version was covering policy years up to 2012.
[7] A network contract with Eurostat for this purpose has been established [EU-SILC/2009/17] and renewed [EU-SILC/2011/55].

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 their 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.[8] 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 a country component in EUROMOD was working satisfactorily, 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 the baseline results from EUROMOD correspond to other estimates and discuss reasons for differences.[9]

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. An example of 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

[8] For example, see Fernandez Salgado M., F. Figari, H. Sutherland and A. Tumino, 2013, "Welfare compensation for unemployment in the Great Recession", *Review of Income and Wealth*, 60(S1), 177-204.

[9] It should be noted that external statistics are often available only with a time lag and macro-validation of 2013 policies typically cannot be finalised until late 2014 or 2015. Later Country Reports will report on this.

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 key results with and without take-up and evasion approximations. See Appendix 3 for a country-by-country description of the treatment of these issues.

- **Country Reports**

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 serve as reference for developers and national teams in the future.[10]

3. Poverty and inequality indicators

Policy systems for years 2009 to 2013 are simulated for all 27 countries in EUROMOD allowing the analysis of the effect of policy changes on income redistribution. Table 1 shows selected poverty and inequality indicators for these policy years. 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 used indicator of income inequality is also shown: the Gini coefficient. The statistics are also shown for the EU-27 combined, showing the value for the EU-27 population ('weighted'). The table shows how policy changes and changes in the distribution of market income (as well as interactions of these two factors) have affected poverty and inequality in the period 2009-13, abstracting from changes in population characteristics. Figures for all years are based on the same input database. This is the 2010 SILC for all countries except from the UK (FRS 2009/10) and Denmark (2008 SILC). In each case we have calculated the indicators using the same methods in principle as Eurostat although, as explained in section 5 there are a number of reasons why the values may differ from those produced by Eurostat from the EU-SILC data directly.

Incomes that are not simulated (e.g. market incomes) are updated from 2009 to following years based on indices for each income source separately as much as possible (e.g. earnings indices for earnings). While the construction of these indices has followed common guidelines, in this set of statistics for 2010 to 2013 it is possible that some of the cross-country differences 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 1 shows how the poverty threshold shifts in nominal terms. In most euro-zone cases poverty thresholds increase between 2009 and 2010 but by varying amounts. This is due to a combination of inflation and growth in market 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. In

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

Estonia, Ireland, Greece, Spain, Latvia Lithuania and Hungary the poverty threshold decreases during this period. After 2010 EUROMOD estimates are showing nominal median incomes to continue to rise in the majority of countries, to fall consistently in Greece, Ireland and Portugal and to fluctuate over time in the Czech Republic, Spain, Cyprus and Slovenia. Fluctuations in non-euro zone countries such as Hungary, Poland and the UK are mainly due to exchange rate fluctuations.

Over the period 2009-2013 changes in poverty risk due to changes in tax-benefit policies and income levels tend to be relatively small in most countries, but with a few exceptions, as follows:

In Portugal the headline risk of poverty rate is estimated to rise by almost one percentage point in 2011 and then fall by 1.2 percentage points in 2012. The latter is caused by a decrease in household incomes due to austerity measures that affected mainly civil servants and people in retirement and lowered the median income. In Greece poverty is also estimated to fall in 2011-2013. It should however be noted that baseline EUROMOD results do not capture the deep effect of unemployment increase in both countries, thus the decrease in the risk of poverty may not be the case if changes in unemployment are taken into account. In Lithuania the headline risk of poverty increases by 1.5 percentage points in 2012. The increase is most probably related to differences in growth of market and non-market incomes together with an increase in median income due to growth in market income and the restoration of social security pensions to 2009 levels since 2012. This affected poverty levels mainly among the working age population and those with children.

In Latvia, changes in the poverty line produce considerable changes in the elderly risk of poverty, as pensioners cluster near the poverty threshold. In 2010 drop in employment income pushed median disposable income (and poverty threshold) down. As pensioners' income remained largely unchanged, elderly poverty rate dropped. In 2011 growth in employment income resumed and elderly poverty rate increased. The concentration of the elderly around the poverty line also explains fluctuations in poverty risk for this group in Estonia, Ireland, Greece and Sweden. The significant fall in elderly poverty in 2010 in Belgium and Spain is probably related to differences in growth of market incomes and pensions.

In Romania, pensions have been indexed in 2010 compared to 2009 while public wages have been cut, leading to a reduction in poverty risk among the elderly. Moreover, many recipients of the minimum pension who were clustered just below the poverty line in 2009, were lifted just above following an increase of the minimum pension in 2010. 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.

In Slovenia, poverty risk for the elderly has increased consistently between 2009 and 2012, mainly due to the fact that pension growth was negative over the period, while growth in employment and self-employment income was positive. In Hungary, poverty risk for the elderly increased until 2011 then fell in 2012, mainly due to the increase of in the threshold for means-testing of housing benefits in 2012, which makes more people eligible for it.

Changes in poverty risk for the under 18 are smaller in most countries. The exceptions are Ireland, Lithuania, Hungary and Portugal. In Lithuania poverty risk for children increased significantly in 2012, mostly due to cuts of child benefits and social insurance benefits for families with small children during the crisis. In Portugal this is mostly due to the 2011 austerity measures affecting social integration income. In Hungary the freezing of minimum pension, which is the base amount used for most social benefits, resulted in a significant increase in child poverty risk between 2011 and 2013.

Inequality as measured by the Gini coefficient stays the same or increases slightly in most countries. Exceptions are Denmark, where it increases more rapidly, especially in 2010 and 2012, Portugal where it falls, especially in 2012, Latvia where it falls in 2010 but returns to its original level in 2013 and Hungary where it rises, in particular in 2011. The results for the EU as a whole show risk of poverty and inequality to be relatively stable over the period.

It should be emphasised that these figures are not supposed to coincide with the value of social indicators produced by the EU-SILC 2011-2014 (2010-2013 incomes). The EUROMOD estimates show the implications for the movement in the indicators of policy changes over the period 2009-2013 relative to changes in average values of 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 increasing/declining poverty and inequality indicators in Table 1 is that the combined effect of policy changes with changes in the distribution of market income were having a mild negative/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.

Table 1 EUROMOD poverty and inequality statistics: 2009-2013

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient
		50%	60%	70%	age <18	age>=65		
Belgium	2009	5.6	11.7	19.6	14.9	15.2	11,346	0.227
	2010	5.5	11.3	18.9	14.8	13.0	11,377	0.226
	2011	5.4	11.1	18.7	14.6	12.6	11,642	0.226
	2012	5.4	11.1	18.7	14.9	11.7	11,993	0.225
	2013	6.2	11.7	19.0	15.6	11.1	12,298	0.229
Bulgaria	2009	12.7	19.2	26.7	24.7	29.5	1,715	0.319
	2010	12.3	19.0	26.5	24.6	28.8	1,836	0.317
	2011	12.8	19.0	26.7	23.9	30.8	1,934	0.326
	2012	13.5	19.7	26.8	25.1	31.0	2,056	0.326
	2013	13.6	19.7	26.8	25.0	31.5	2,096	0.327
Czech Republic	2009	4.0	8.0	14.6	11.8	6.2	4,313	0.236
	2010	4.0	8.1	14.6	11.7	6.4	4,404	0.236
	2011	4.2	8.3	14.7	12.9	5.0	4,739	0.236
	2012	4.3	8.2	14.6	12.8	4.9	4,593	0.238
	2013	4.2	8.0	14.4	12.6	4.7	4,580	0.237
Denmark	2009	4.5	11.2	20.2	7.7	18.0	15,844	0.232
	2010	4.5	10.8	19.9	8.0	14.4	16,552	0.241
	2011	4.5	10.9	20.2	7.7	16.0	16,903	0.236
	2012	4.5	10.6	19.3	8.2	13.4	17,071	0.246
	2013	4.7	10.3	19.0	8.1	11.8	17,299	0.251
Germany	2009	5.0	12.3	21.2	13.1	12.7	10,922	0.264
	2010	5.9	12.9	21.6	13.4	13.7	11,292	0.268
	2011	6.1	13.1	21.7	14.1	13.7	11,493	0.270
	2012	6.1	13.4	21.8	14.9	13.4	11,671	0.271
	2013	6.0	13.3	21.8	14.7	13.4	11,806	0.270
Estonia	2009	9.3	15.7	24.5	17.4	14.9	3,437	0.306
	2010	9.5	15.9	24.4	17.7	14.7	3,425	0.302
	2011	9.7	16.7	25.0	17.7	20.0	3,550	0.307
	2012	9.7	17.0	25.3	17.7	21.4	3,720	0.309
	2013	9.9	17.1	25.7	17.7	22.1	3,929	0.310

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	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient
		50%	60%	70%	age <18	age>=65		
Ireland	2009	3.8	12.1	22.7	16.5	2.0	12,258	0.268
	2010	4.1	14.2	23.8	19.3	2.0	11,886	0.272
	2011	4.4	14.7	23.6	20.1	1.6	11,545	0.270
	2012	4.5	14.7	23.9	20.3	1.6	11,535	0.271
	2013	5.9	15.0	23.9	20.3	5.5	10,847	0.277
Greece	2009	11.8	19.4	26.1	23.4	19.0	7,372	0.321
	2010	11.8	19.3	26.1	23.5	18.3	7,053	0.317
	2011	10.9	18.8	26.2	22.6	17.2	6,731	0.313
	2012	11.1	18.0	25.5	22.7	13.2	6,264	0.313
	2013	11.3	17.9	25.1	21.8	14.0	5,793	0.314
Spain	2009	15.3	21.3	28.1	29.2	19.5	8,044	0.314
	2010	14.2	20.4	27.5	28.7	15.6	8,026	0.311
	2011	14.1	20.5	27.5	29.0	15.8	8,126	0.311
	2012	13.9	20.0	27.0	28.4	15.2	8,088	0.306
	2013	13.9	20.1	26.9	28.6	15.1	8,148	0.306
France	2009	5.4	10.7	19.2	12.5	8.9	11,944	0.283
	2010	5.6	10.9	19.5	12.9	9.0	12,184	0.284
	2011	5.4	10.8	19.6	12.9	8.5	12,444	0.283
	2012	5.5	10.6	19.4	12.6	8.3	12,659	0.281
	2013	5.2	10.4	19.1	12.5	7.6	12,551	0.270
Italy	2009	11.2	17.8	26.1	23.4	14.3	9,044	0.307
	2010	11.1	17.6	25.8	23.1	14.2	9,074	0.307
	2011	11.0	17.5	25.8	22.7	14.3	9,173	0.308
	2012	11.0	17.4	25.8	22.5	14.3	9,232	0.307
	2013	10.7	17.3	25.7	22.9	13.3	9,401	0.306
Cyprus	2009	7.5	14.8	23.0	11.7	41.6	10,222	0.282
	2010	7.0	14.2	22.7	11.5	38.9	10,458	0.280
	2011	7.0	14.0	22.4	11.5	38.1	10,692	0.279
	2012	7.1	14.2	22.0	11.5	36.3	10,676	0.277
	2013	7.0	13.9	21.8	11.4	35.7	10,602	0.274

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	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient
		50%	60%	70%	age <18	age>=65		
Latvia	2009	14.0	20.8	28.7	27.7	13.2	2,690	0.349
	2010	12.8	19.4	27.5	26.2	7.7	2,468	0.332
	2011	13.3	19.8	28.8	26.4	11.0	2,674	0.339
	2012	13.6	20.2	28.8	27.2	11.8	2,769	0.343
	2013	13.7	20.1	28.8	26.7	12.3	2,841	0.349
Lithuania	2009	12.8	20.6	28.2	24.6	9.7	2,408	0.357
	2010	12.8	19.9	28.3	23.9	8.5	2,264	0.361
	2011	13.1	20.6	29.1	25.6	9.6	2,309	0.365
	2012	13.9	22.1	29.4	29.3	9.6	2,407	0.368
	2013	14.1	22.1	29.4	29.6	10.4	2,465	0.372
Luxembourg	2009	1.6	9.4	21.7	13.0	3.0	19,290	0.250
	2010	1.6	10.1	21.9	14.0	3.6	19,522	0.251
	2011	1.8	9.8	22.2	13.8	2.2	19,846	0.250
	2012	2.0	10.0	21.9	14.3	2.5	20,348	0.251
	2013	2.1	10.0	21.3	14.2	2.5	20,824	0.248
Hungary	2009	5.1	10.9	19.1	17.4	3.4	2,520	0.230
	2010	5.1	11.1	19.9	17.1	3.8	2,394	0.239
	2011	4.6	10.4	19.3	15.8	5.7	2,716	0.251
	2012	6.8	12.9	20.4	20.2	3.6	2,519	0.258
	2013	8.4	14.4	21.8	22.4	3.6	2,591	0.273
Malta	2009	8.1	15.8	24.9	19.5	18.0	6,272	0.283
	2010	8.2	15.4	24.6	19.1	17.8	6,419	0.282
	2011	8.2	15.9	24.7	19.3	19.5	6,619	0.284
	2012	8.3	15.9	24.8	19.3	19.5	6,811	0.284
	2013	8.3	15.9	24.9	19.5	19.4	7,010	0.285
Netherlands	2009	4.8	10.8	19.2	14.2	4.8	12,533	0.250
	2010	4.5	10.7	19.0	14.3	4.7	12,626	0.250
	2011	4.7	10.7	19.0	14.0	4.8	12,821	0.250
	2012	4.9	10.9	19.2	14.8	4.5	12,994	0.250
	2013	5.1	11.2	19.4	15.0	4.8	13,124	0.252

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	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient
		50%	60%	70%	age <18	age>=65		
Austria	2009	4.8	10.6	18.8	13.3	11.2	12,359	0.256
	2010	4.8	10.5	18.5	13.4	10.3	12,455	0.257
	2011	4.3	10.5	18.9	13.9	9.6	12,570	0.257
	2012	4.5	10.6	19.0	14.7	9.0	12,794	0.257
	2013	4.5	10.7	19.1	14.8	9.0	12,994	0.257
Poland	2009	11.0	17.5	25.6	22.0	14.1	2,544	0.311
	2010	10.6	17.3	25.2	21.6	13.2	2,828	0.308
	2011	10.9	17.5	25.4	22.0	13.3	3,078	0.310
	2012	11.3	17.8	25.5	22.8	12.9	2,979	0.312
	2013	10.9	18.0	25.6	22.9	13.3	3,082	0.311
Portugal	2009	9.6	16.7	24.9	20.4	19.2	5,443	0.322
	2010	9.6	16.6	25.0	20.4	19.1	5,534	0.320
	2011	10.5	17.6	25.6	22.5	19.1	5,520	0.317
	2012	9.9	16.3	24.8	21.4	17.8	5,454	0.308
	2013	9.7	16.4	24.8	21.7	17.6	5,432	0.306
Romania	2009	16.0	21.7	28.8	30.0	19.0	1,216	0.328
	2010	15.9	21.4	28.9	29.9	17.2	1,267	0.326
	2011	15.1	20.5	27.9	29.4	15.0	1,292	0.320
	2012	15.1	20.9	28.0	29.8	16.0	1,283	0.322
	2013	15.4	21.0	28.0	29.6	17.3	1,342	0.327
Slovenia	2009	7.2	12.8	20.3	12.4	19.3	6,857	0.240
	2010	7.3	13.2	20.3	12.3	20.1	7,026	0.240
	2011	7.6	13.2	20.3	12.4	21.0	7,160	0.239
	2012	7.1	12.9	20.1	10.6	23.7	7,163	0.238
	2013	7.0	12.9	20.1	10.6	23.6	7,131	0.239
Slovakia	2009	5.2	10.5	16.9	15.7	4.5	3,465	0.236
	2010	5.3	10.4	17.0	15.3	4.6	3,574	0.235
	2011	5.4	10.6	17.1	15.6	4.3	3,595	0.238
	2012	5.7	10.7	17.1	15.9	4.3	3,687	0.238
	2013	6.0	10.8	17.4	15.7	4.4	3,762	0.239

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	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient
		50%	60%	70%	age <18	age>=65		
Finland	2009	5.3	12.3	20.9	10.9	16.1	12,583	0.245
	2010	5.4	12.3	20.8	11.4	15.2	12,870	0.245
	2011	5.3	12.2	20.9	11.4	15.3	13,225	0.248
	2012	4.8	11.8	20.5	11.1	14.6	13,653	0.242
	2013	4.7	11.6	20.2	11.1	13.9	13,840	0.240
Sweden	2009	6.4	12.5	21.5	13.1	12.9	11,450	0.233
	2010	6.5	12.5	21.2	12.8	13.6	13,292	0.232
	2011	6.6	12.6	21.4	13.2	12.5	14,351	0.235
	2012	6.5	12.4	21.2	13.1	11.6	15,303	0.234
	2013	6.6	12.2	21.2	13.3	9.8	15,601	0.234
United Kingdom	2009	8.0	15.0	24.2	16.3	14.3	9,651	0.321
	2010	8.0	14.9	24.0	15.9	14.1	10,275	0.318
	2011	7.9	14.6	23.7	15.4	13.6	9,572	0.315
	2012	7.9	14.5	23.5	15.1	12.9	10,963	0.314
	2013	8.5	15.4	24.6	16.6	13.6	11,241	0.319
EU-27 (weighted)	2009	8.6	15.0	23.2	18.4	13.6	8,659	0.290
	2010	8.6	14.9	23.2	18.4	13.1	8,896	0.290
	2011	8.6	14.9	23.2	18.4	12.9	8,966	0.290
	2012	8.6	14.9	23.1	18.6	12.5	9,217	0.289
	2013	8.7	15.1	23.2	18.9	12.4	9,308	0.289

Source: EUROMOD version G2.1.
Notes: EUROMOD figures for all countries are based on SILC 2010 (2009 incomes), except for Denmark which are based on SILC 2008 (2007 incomes) and those for UK which are based on FRS 2009/10.

The role of taxes and benefits in reducing inequality and poverty risk is one area that EUROMOD is especially designed to address. Tables 2, 3 and 4 show the effects of various tax and benefit components on poverty risk, poverty gap and inequality (as measured by using the Gini coefficient) in 2009 and 2013. Note that for Tables 2 and 3 the poverty threshold is the same throughout, using 60% of median household disposable income. Columns 3-7 show what happens to poverty and inequality if each component (means-tested benefits, non-means-tested benefits -not including public pensions-, taxes and social insurance contributions) is added back (in the case of taxes) or deducted (in the case of benefits), in turn, from disposable income. Column 8 depicts poverty and inequality estimates on the basis of original income and column 9 presents what happens to these indices when public pensions are added to original income. The role of public pensions (in contrast with that of direct taxes and non-pension benefits, which are usually considered to be the main instruments of redistribution) is also graphically illustrated in Figures 1 (effects on poverty risk) and 2 (inequality effects).

Changes in original income only arise in this analysis because of the growth rate of average incomes 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 public pensions although this is of course also affected by policies for the updating of pensions. The effect of adding public 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%. The effect is notably smaller in Ireland and the UK (due to the prevalence of occupational and other private pensions which are included in original income). The biggest effect is observed in Hungary, where the addition of pensions reduces poverty before taxes and benefits by approximately 24 percentage points.

The change in the effect due to policy reforms and/or changes in the distribution of market income between 2009 and 2013 is generally small and positive. The exceptions are Estonia, where the poverty-reducing effect of pensions was weakened during that period by 2 percentage points, Bulgaria and Slovenia, where it was weakened by 1 percentage point.

The effect of means-tested benefits on poverty is much smaller in comparison with that of pensions (6 percentage points on average), except in Ireland and the UK, where it is significantly larger, reaching 19 and 15 percentage points respectively. In both countries means-tested benefits represent an important component of the social protection system. The poverty reducing effect of non means-tested benefits (also around 6 percentage points on average) exceeds 10 percentage points in Denmark, Ireland, Luxembourg, Hungary (in 2009) and Sweden (in 2009). Adding back taxes and social insurance contributions to disposable income has a smaller poverty-reducing effect, close to 2 and 3 percentage points respectively. The countries where the poverty-reducing effect of taxes is larger are Denmark, Sweden and Poland. The change in the effect due to tax policy changes between 2009 and 2013 is again small except in Ireland, where the poverty-reducing effect of taxes was increased by almost 4 percentage points, Greece and Hungary (increased by 2 percentage points). The change in the effect due to reforms related to social insurance contributions is close to zero, except in Romania, where policy changes in this field weakened the effect by more than 2 percentage points.

A similar picture is emerging when looking at the effects of tax and benefit components on poverty gap (Table 3). Adding public pensions to market income reduces the poverty gap by almost 41 percentage points. Deducting means-tested and non means-tested benefits increases the gap by 13 and 5 percentage points on average; the big outliers are again Ireland and the UK, where the deduction of means-tested benefits increases the poverty gap by almost 50 and 30 percentage points, respectively.

The poverty gap estimates are not significantly affected by the addition of taxes and social insurance contributions.

Table 4 and Figure 2 show the role of tax-benefit components of household income in reducing income inequality. Inequality of market income including public pensions (before tax) is everywhere lower than inequality of market income but higher than that of disposable income. Public pensions play the major role in reducing market income inequality in all of the countries shown, with the exception of Ireland, the Netherlands and the UK. In these countries occupational and other private pensions (included here in market income) make up a relatively large part of pension income. 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 Belgium (taxes), Ireland (both benefits and social insurance contributions), Denmark (non means-tested benefits), Hungary (non means-tested benefits), the Netherlands (means-tested benefits) and the UK (means-tested benefits).

The role of policies in reducing inequalities has remained largely stable between 2009 and 2013. The few exceptions are Hungary, where the inequality-reducing effect of taxes was considerably weakened, and Greece, France, Portugal and Romania, where the inequality-reducing effect of policies (more specifically, means-tested benefits for Greece and social insurance contributions for the other three countries) was reinforced.

Table 2 Effects of tax-benefit components on poverty risk, 2009 and 2013 policies

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Belgium	2009	11.7	16.6	16.0	11.3	10.1	34.9	15.8
	2013	11.7	16.4	14.9	11.3	10.1	34.7	15.0
Bulgaria	2009	19.2	21.6	21.6	17.7	16.8	34.7	19.3
	2013	19.7	21.7	22.0	17.9	17.2	34.0	19.6
Czech Rep.	2009	8.0	10.6	12.5	7.9	6.1	32.0	11.3
	2013	8.0	10.3	11.8	7.8	6.2	31.2	10.6
Denmark	2009	11.2	17.2	22.2	4.2	10.0	28.2	12.3
	2013	10.3	16.3	21.4	4.2	9.1	28.1	12.3
Germany	2009	12.3	17.1	19.1	11.3	8.7	36.7	16.1
	2013	13.3	17.3	19.3	12.2	9.6	36.5	16.1
Estonia	2009	15.7	15.7	23.2	13.9	14.9	36.2	19.1
	2013	17.1	17.1	24.3	15.1	16.3	34.8	19.7
Ireland	2009	12.1	31.0	28.1	11.5	11.6	42.8	37.9
	2013	15.0	32.5	28.3	10.5	14.2	40.3	35.8
Greece	2009	19.4	21.4	20.9	19.3	14.5	37.1	18.5
	2013	17.9	22.1	19.2	15.7	12.5	35.0	15.2
Spain	2009	21.3	25.0	25.7	21.0	19.1	41.3	26.0
	2013	20.1	24.5	24.3	19.6	17.8	40.3	25.0
France	2009	10.7	19.1	18.9	9.2	8.9	37.4	19.1
	2013	10.4	18.4	18.5	8.6	8.3	36.5	18.2
Italy	2009	17.8	21.1	20.6	15.4	15.5	37.3	17.4
	2013	17.3	20.5	20.1	14.5	14.9	36.6	16.6
Cyprus	2009	14.8	17.6	20.1	14.2	12.7	29.9	19.6
	2013	13.9	16.6	18.8	13.5	11.7	29.4	18.0
Latvia	2009	20.8	20.9	26.3	19.3	18.9	38.2	22.1
	2013	20.1	20.2	25.9	17.8	17.8	35.5	20.1
Lithuania	2009	20.6	23.9	25.9	18.2	17.7	42.0	23.5
	2013	22.1	24.0	26.3	19.9	19.2	40.2	22.4
Luxembourg	2009	9.4	15.3	23.5	9.4	3.9	37.7	19.6
	2013	10.0	14.8	22.6	8.9	4.4	36.1	17.7
Hungary	2009	10.9	13.2	23.3	9.2	6.9	40.0	16.0
	2013	14.4	16.4	22.7	10.6	9.0	38.7	14.4
Netherlands	2009	15.8	20.9	16.4	15.5	12.4	30.7	17.1
	2013	15.9	21.4	16.5	15.4	12.5	30.8	17.4
Malta	2009	10.8	18.3	18.3	9.7	5.2	23.0	13.9
	2013	11.2	19.1	18.4	9.5	4.6	22.5	13.6
Austria	2009	10.6	13.6	19.4	10.1	7.3	32.9	13.9
	2013	10.7	13.7	18.5	9.9	7.3	32.7	13.3
Poland	2009	17.5	20.2	19.6	13.1	12.8	33.7	13.3
	2013	18.0	20.6	19.9	12.9	12.4	33.9	12.9
Portugal	2009	16.7	21.4	20.7	16.2	13.9	37.6	21.0
	2013	16.4	19.8	20.4	15.7	14.2	36.5	20.0
Romania	2009	21.7	24.8	25.2	18.2	17.1	40.0	19.7
	2013	21.0	23.3	24.2	17.2	18.7	39.2	19.3
Slovenia	2009	12.8	16.2	19.6	12.3	9.5	31.7	15.1
	2013	12.9	16.7	19.2	12.4	9.9	31.7	16.1

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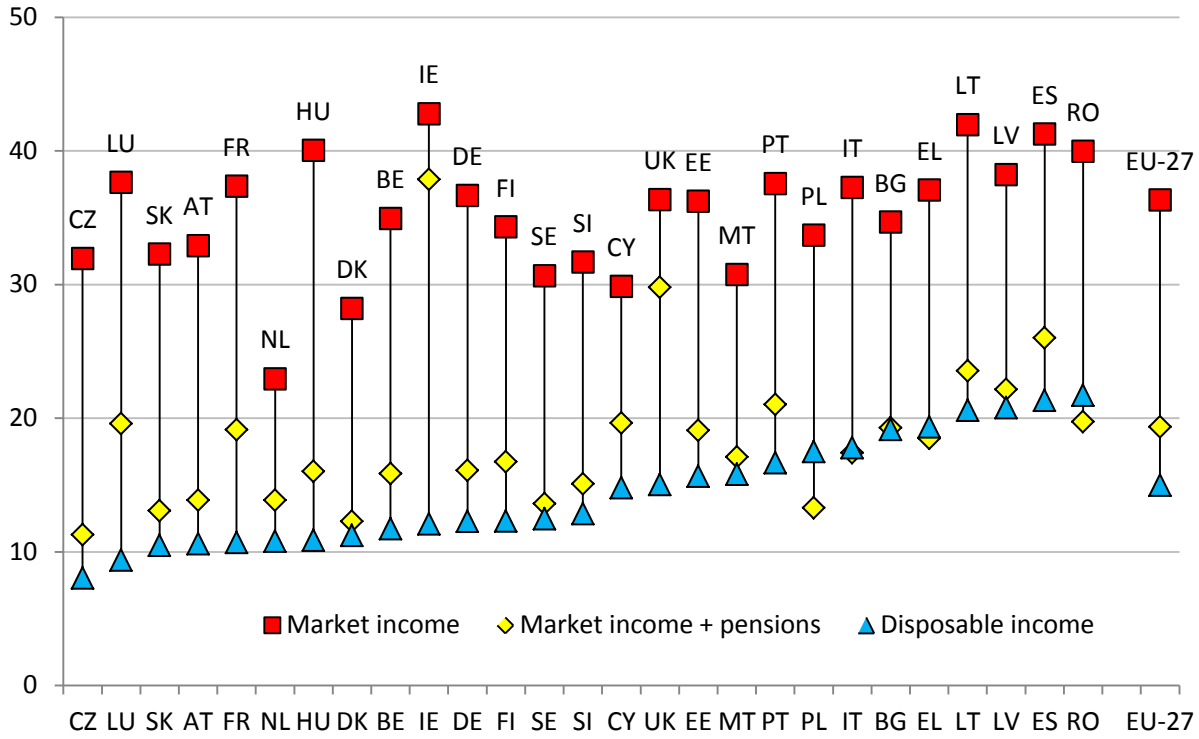
	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Slovakia	2009	10.5	12.2	15.3	10.2	7.2	32.3	13.1
	2013	10.8	12.2	15.8	10.2	7.7	31.3	12.3
Finland	2009	12.3	18.9	19.8	8.1	11.4	34.3	16.7
	2013	11.6	18.4	19.2	7.6	10.3	34.1	16.2
Sweden	2009	12.5	15.0	22.4	7.1	10.8	30.7	13.6
	2013	12.2	14.8	21.7	7.5	10.6	30.7	14.1
UK	2009	15.0	30.1	23.9	11.0	14.3	36.4	29.8
	2013	15.4	29.5	23.4	11.9	14.8	36.5	29.6
EU-27	2009	15.0	20.9	21.0	12.9	12.3	36.3	19.4
	2013	15.1	20.7	20.6	12.8	12.3	35.8	18.8

Source: EUROMOD version G2.1.

Notes: EUROMOD figures for all countries are based on SILC 2010 (2009 incomes), except for Denmark which are based on SILC 2008 (2007 incomes) and those for UK which are based on FRS 2009/10.

Figure 1 Poverty risk and the role of public pensions and non-pension benefits and taxes (2009 incomes and policies)



Note: Countries have been ranked according to the poverty estimates for disposable income.

Table 3 Effects of tax-benefit components on poverty gap, 2009 and 2013 policies

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Belgium	2009	15.0	25.3	27.5	17.4	17.6	97.1	45.9
	2013	18.2	27.2	29.2	19.7	19.8	95.7	49.0
Bulgaria	2009	25.3	31.5	25.7	24.2	25.1	66.6	31.2
	2013	26.3	31.6	27.0	26.2	26.3	70.0	31.9
Czech Rep.	2009	16.4	23.7	20.6	16.3	17.0	95.6	28.4
	2013	17.6	25.5	21.4	17.9	18.3	97.8	29.5
Denmark	2009	13.3	12.9	37.4	17.0	13.2	85.8	60.2
	2013	15.4	14.3	39.8	17.3	14.9	85.6	61.0
Germany	2009	13.3	34.7	21.1	13.4	14.1	93.1	49.7
	2013	14.4	36.2	20.5	15.0	15.4	93.3	49.9
Estonia	2009	22.2	22.2	30.5	24.5	22.9	82.6	31.6
	2013	21.0	21.0	28.1	22.5	21.5	86.6	29.4
Ireland	2009	10.4	59.8	24.6	10.8	10.4	83.3	83.3
	2013	12.5	61.6	25.1	9.7	12.1	89.0	88.5
Greece	2009	22.2	23.8	25.0	22.1	20.0	67.0	23.3
	2013	24.7	26.2	25.9	22.9	22.5	69.4	25.6
Spain	2009	29.2	38.6	33.0	29.7	29.2	79.4	43.8
	2013	29.6	38.2	33.5	30.3	29.8	81.0	43.7
France	2009	17.1	29.3	24.3	17.7	17.3	74.4	39.4
	2013	16.7	30.3	24.5	17.4	17.2	75.1	40.8
Italy	2009	24.3	26.9	26.5	27.1	23.8	88.6	32.7
	2013	23.6	26.6	26.8	26.9	23.4	94.1	33.0
Cyprus	2009	17.0	18.3	20.7	17.3	17.3	59.2	22.3
	2013	16.7	17.1	19.8	17.2	17.4	61.0	21.1
Latvia	2009	26.4	29.9	33.7	26.2	24.4	72.8	35.8
	2013	26.9	30.0	33.6	27.8	26.3	74.8	35.3
Lithuania	2009	25.1	36.0	27.5	26.4	25.6	74.2	35.8
	2013	25.5	35.7	29.5	25.7	24.6	74.7	34.5
Luxembourg	2009	7.5	19.7	20.4	8.0	8.5	61.3	28.9
	2013	7.5	20.2	20.0	8.3	9.5	65.3	29.1
Hungary	2009	14.8	18.1	31.7	15.1	15.0	86.3	36.2
	2013	21.2	22.9	33.5	22.3	21.2	88.6	36.6
Netherlands	2009	17.1	26.7	18.3	17.1	17.4	77.1	29.2
	2013	17.8	25.7	18.6	18.0	17.7	83.5	29.3
Malta	2009	14.8	28.1	24.9	15.2	17.1	59.9	57.6
	2013	14.7	27.5	24.8	15.1	17.9	59.9	57.4
Austria	2009	15.0	19.0	20.1	15.6	13.9	91.9	32.7
	2013	14.4	20.3	19.1	15.0	12.2	91.6	34.3
Poland	2009	23.2	27.6	24.7	23.3	20.1	78.8	27.1
	2013	22.9	28.7	23.5	21.9	19.9	79.3	27.2
Portugal	2009	20.5	26.2	22.1	20.5	19.0	83.8	28.7
	2013	22.1	26.1	23.5	21.8	22.6	85.9	29.0
Romania	2009	32.8	43.0	35.8	33.0	23.4	80.7	39.0
	2013	30.6	39.8	33.1	27.6	31.2	82.2	40.0
Slovenia	2009	18.6	25.9	22.9	18.8	18.1	88.0	30.4
	2013	18.6	27.3	22.7	18.3	18.8	88.4	30.6

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	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Slovakia	2009	16.6	30.5	19.7	16.5	17.7	93.7	32.1
	2013	18.9	29.7	22.2	18.9	19.3	97.0	33.4
Finland	2009	13.6	29.4	20.5	14.0	13.8	91.5	41.6
	2013	12.7	29.2	20.2	13.8	13.3	91.7	40.1
Sweden	2009	17.6	25.8	29.0	22.6	17.7	85.2	40.6
	2013	18.3	27.0	29.5	23.3	18.4	84.8	39.1
UK	2009	18.4	46.8	23.0	18.7	18.6	81.8	64.2
	2013	19.4	48.7	22.7	19.3	19.3	81.4	65.2
EU-27	2009	19.9	32.6	25.5	20.6	19.4	82.9	42.9
	2013	20.3	33.4	25.5	20.9	20.4	84.3	43.5

Source: EUROMOD version G2.1.

Notes: EUROMOD figures for all countries are based on SILC 2010 (2009 incomes), except for Denmark which are based on SILC 2008 (2007 incomes) and those for UK which are based on FRS 2009/10.

Table 4 Effects of tax-benefit components on inequality (Gini coefficient), 2009 and 2013 policies

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Belgium	2009	0.227	0.251	0.254	0.296	0.250	0.482	0.349
	2013	0.229	0.255	0.253	0.298	0.250	0.481	0.348
Bulgaria	2009	0.319	0.337	0.325	0.326	0.326	0.465	0.355
	2013	0.327	0.342	0.333	0.334	0.333	0.466	0.360
Czech Rep.	2009	0.236	0.251	0.257	0.263	0.252	0.453	0.308
	2013	0.237	0.252	0.255	0.267	0.254	0.454	0.310
Denmark	2009	0.232	0.252	0.300	0.266	0.246	0.431	0.334
	2013	0.251	0.273	0.319	0.272	0.262	0.438	0.341
Germany	2009	0.264	0.301	0.289	0.318	0.275	0.517	0.375
	2013	0.270	0.304	0.293	0.324	0.281	0.517	0.376
Estonia	2009	0.306	0.309	0.334	0.332	0.307	0.482	0.358
	2013	0.310	0.313	0.337	0.336	0.313	0.480	0.363
Ireland	2009	0.268	0.387	0.325	0.328	0.302	0.550	0.521
	2013	0.277	0.400	0.331	0.342	0.307	0.550	0.520
Greece	2009	0.321	0.330	0.331	0.350	0.322	0.492	0.365
	2013	0.314	0.332	0.321	0.345	0.312	0.489	0.362
Spain	2009	0.314	0.337	0.336	0.351	0.313	0.501	0.392
	2013	0.306	0.331	0.327	0.348	0.306	0.499	0.390
France	2009	0.283	0.325	0.315	0.311	0.288	0.488	0.377
	2013	0.270	0.310	0.303	0.311	0.280	0.488	0.376
Italy	2009	0.307	0.321	0.315	0.352	0.315	0.506	0.373
	2013	0.306	0.320	0.314	0.350	0.314	0.509	0.371
Cyprus	2009	0.282	0.291	0.299	0.308	0.282	0.410	0.333
	2013	0.274	0.283	0.291	0.304	0.275	0.408	0.328
Latvia	2009	0.349	0.360	0.361	0.378	0.358	0.512	0.408
	2013	0.349	0.359	0.365	0.378	0.361	0.509	0.412
Lithuania	2009	0.357	0.381	0.372	0.378	0.364	0.539	0.419
	2013	0.372	0.389	0.386	0.392	0.378	0.538	0.423
Luxembourg	2009	0.250	0.272	0.294	0.298	0.257	0.480	0.357
	2013	0.248	0.270	0.289	0.302	0.257	0.480	0.357
Hungary	2009	0.230	0.239	0.290	0.277	0.249	0.512	0.346
	2013	0.273	0.282	0.316	0.288	0.290	0.513	0.341
Netherlands	2009	0.283	0.319	0.285	0.316	0.284	0.436	0.347
	2013	0.285	0.322	0.287	0.320	0.287	0.442	0.352
Malta	2009	0.250	0.296	0.288	0.307	0.246	0.400	0.355
	2013	0.252	0.299	0.289	0.307	0.247	0.400	0.355
Austria	2009	0.256	0.275	0.289	0.313	0.266	0.492	0.357
	2013	0.257	0.277	0.287	0.313	0.268	0.492	0.357
Poland	2009	0.311	0.326	0.319	0.326	0.313	0.482	0.344
	2013	0.311	0.328	0.318	0.325	0.311	0.483	0.343
Portugal	2009	0.322	0.351	0.337	0.366	0.329	0.522	0.409
	2013	0.306	0.326	0.321	0.365	0.319	0.518	0.405
Romania	2009	0.328	0.360	0.345	0.345	0.318	0.514	0.377
	2013	0.327	0.348	0.342	0.342	0.336	0.515	0.381
Slovenia	2009	0.240	0.262	0.265	0.277	0.263	0.453	0.328
	2013	0.239	0.267	0.262	0.275	0.264	0.453	0.333

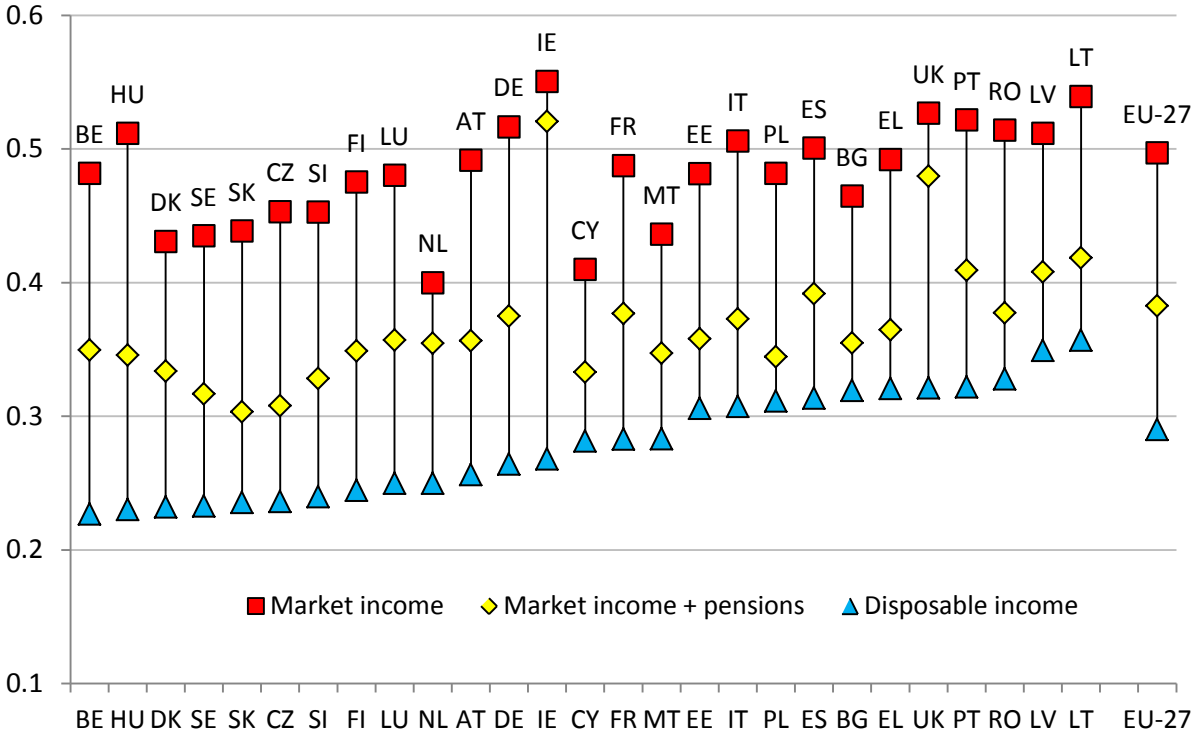
/continued

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Slovakia	2009	0.236	0.256	0.257	0.257	0.247	0.439	0.303
	2013	0.239	0.255	0.262	0.261	0.251	0.439	0.305
Finland	2009	0.245	0.287	0.275	0.287	0.253	0.475	0.349
	2013	0.240	0.283	0.271	0.285	0.251	0.475	0.348
Sweden	2009	0.233	0.248	0.282	0.269	0.237	0.435	0.317
	2013	0.234	0.250	0.283	0.272	0.239	0.436	0.320
UK	2009	0.321	0.409	0.356	0.359	0.337	0.527	0.480
	2013	0.319	0.404	0.350	0.362	0.334	0.526	0.478
EU-27	2009	0.290	0.325	0.315	0.328	0.297	0.497	0.383
	2013	0.289	0.323	0.312	0.330	0.298	0.497	0.382

Source: EUROMOD version G2.1.

Notes: EUROMOD figures for all countries are based on SILC 2010 (2009 incomes), except for Denmark which are based on SILC 2008 (2007 incomes) and those for UK which are based on FRS 2009/10.

Figure 2 Income inequality (Gini coefficient) and the role of public pensions and non-pension benefits and taxes (2009 incomes and policies)



Note: Countries have been ranked according to the value of the Gini coefficient for disposable income.

4. Work incentives: estimates of 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 five policy systems. EUROMOD calculates METR for all individuals with earned income, taking account of the effect of earning 3% more such income (in gross terms) on their household disposable income. Following Jara and Tumino (2013), here we present METR results for individuals of working age (15-64) who have more than 1 unit of national currency of monthly earnings. We further exclude from our calculations the top percentile of the METR distribution if the value is above 150% and the lowest percentile if the value of METR is negative. The latter exclusions are made in order to avoid average METR calculations to be biased by "outliers", although such values are in principle plausible. Table 5 shows the mean and median METR for each of the five policy systems.

Table 5 Mean and median Marginal effective tax rates: 2009-2013

		2009	2010	2011	2012	2013
Belgium	mean	52.3	52.7	52.6	52.3	52.5
	median	55.1	55.1	55.0	55.0	55.0
Bulgaria	mean	21.5	20.9	21.4	21.3	21.3
	median	21.7	20.9	21.6	21.6	21.6
Czech Republic	mean	27.7	27.8	28.3	28.1	29.0
	median	31.1	31.1	31.1	31.1	31.1
Denmark	mean	48.2	44.8	44.7	44.8	44.5
	median	42.8	41.6	41.7	41.7	41.8
Germany	mean	52.5	43.8	44.1	44.0	43.2
	median	48.4	44.6	45.0	45.0	45.1
Estonia	mean	21.7	22.7	23.2	23.4	22.8
	median	22.6	23.2	23.2	23.2	22.6
Ireland	mean	43.7	43.7	46.8	47.0	47.3
	median	42.6	41.5	49.5	50.0	50.6
Greece	mean	23.9	23.2	27.4	26.6	27.8
	median	25.0	20.3	27.5	28.0	26.0
Spain	mean	22.2	23.9	23.9	25.0	25.2
	median	28.8	28.8	28.8	29.5	29.5
France	mean	35.5	35.4	35.4	36.0	37.6
	median	31.6	31.6	31.6	31.7	32.5
Italy	mean	37.5	37.8	38.2	38.7	38.9
	median	38.6	38.9	39.4	39.7	39.8
Cyprus	mean	17.8	18.3	18.9	19.3	20.8
	median	12.6	12.6	12.6	12.6	12.6
Latvia	mean	28.0	33.9	33.7	33.9	32.2
	median	29.9	32.7	33.3	33.3	32.4
Lithuania	mean	27.7	27.7	27.6	27.3	27.4
	median	27.0	27.0	27.0	27.0	27.0
Luxembourg	mean	41.4	41.1	42.9	42.3	43.6
	median	40.1	40.1	42.5	42.0	44.0
Hungary	mean	43.2	39.4	37.9	38.7	36.3
	median	44.6	38.6	37.8	34.5	34.5
Malta	mean	24.2	24.5	25.8	26.3	26.2
	median	23.3	23.3	25.0	25.0	26.7
Netherlands	mean	39.5	39.7	39.9	40.4	40.0
	median	42.0	42.6	43.3	45.0	42.8
Austria	mean	39.5	39.0	39.7	40.3	40.7
	median	44.3	44.3	44.3	44.3	44.4
Poland	mean	27.0	27.0	27.1	27.2	27.7
	median	30.3	30.3	30.3	30.3	30.3
Portugal	mean	26.4	27.2	28.8	27.8	32.5
	median	24.0	24.6	25.0	25.0	25.8

		2009	2010	2011	2012	2013
Romania	mean	35.5	36.1	34.0	33.5	33.2
	median	31.9	31.9	31.9	31.9	31.9
Slovenia	mean	32.6	32.8	32.7	34.9	34.1
	median	32.7	33.3	32.9	33.5	32.8
Slovakia	mean	28.3	28.5	28.3	28.1	28.2
	median	29.9	29.9	29.9	29.9	29.9
Finland	mean	41.3	41.6	41.4	41.9	42.6
	median	42.0	42.5	42.9	43.8	44.2
Sweden	mean	35.6	35.3	35.4	35.4	35.4
	median	29.8	29.6	31.7	31.9	32.0
United Kingdom	mean	39.4	39.7	40.0	40.0	39.4
	median	33.4	33.5	34.3	34.3	34.3

Source: EUROMOD version G2.1.

Notes: EUROMOD figures for all countries are based on SILC 2010 (2009 incomes), except for Denmark which are based on SILC 2008 (2007 incomes) and those for UK which are based on FRS 2009/10.

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 relates to the treatment of benefit non take-up and tax evasion for the calculation of METRs. The results presented bellow assume full take-up of benefits in all countries. In Bulgaria, Greece and Italy, where tax evasion has been modelled and used to obtain baseline statistics, full compliance has been assumed for the calculation of METRs. 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, these differences should be borne in mind when interpreting these results. Second, 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. Third, the METRs focus on the components of disposable income and hence exclude employer SIC. Therefore, these calculations do not reflect the overall tax wedge.

Countries with low mean marginal rates (below 25%) in 2009 include Cyprus, Bulgaria, Estonia, Spain, Greece and Malta, and those with high mean rates (over 40%) include Germany, Belgium, Denmark, Ireland, Hungary, Luxembourg and Finland. Belgium and Germany have mean METRs in excess of 50%.

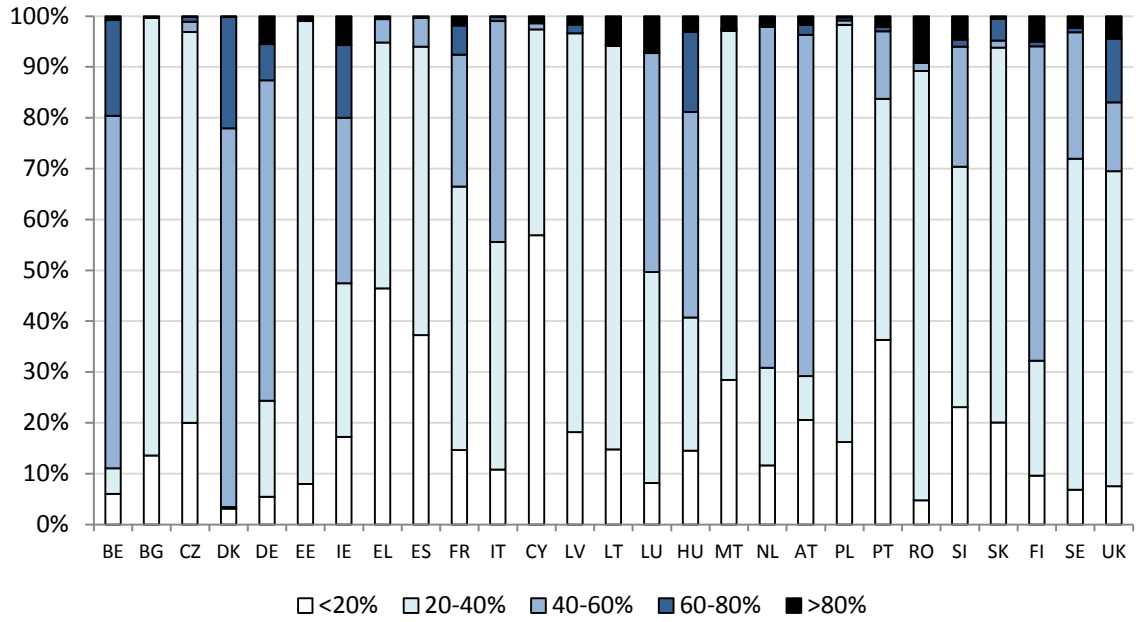
Over the period 2009 to 2013 mean METRs decline slightly in some countries (e.g. Romania, Denmark and especially Germany and Hungary,) and rise slightly in others (e.g. Cyprus, Spain, Ireland, Greece and especially Latvia and Portugal), due to changes in earnings relative to tax thresholds in this period in some countries, combined with changes in policy.

As well as averages, the distribution of METRs is of interest. Figure 3 shows, for the 2009 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.

Marginal rates below 40% predominate in many countries. There are exceptions where higher rates are the norm (Belgium, Denmark, Germany, Netherlands, Austria, Finland) as well as cases where there are large shares of the population in paid work both with relatively low and relatively high marginal rates (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. For example in Romania there are a number of means-tested benefits where income below a threshold brings entitlement to the full amount while income above the threshold results in zero entitlement. The share of working people with such high METRs is 5% or more in Germany, Ireland Lithuania, Luxembourg, Romania and Finland.

Figure 3 Marginal effective tax rates 2009: share of population in paid work (%) by range of METR



Source: EUROMOD version G2.1.

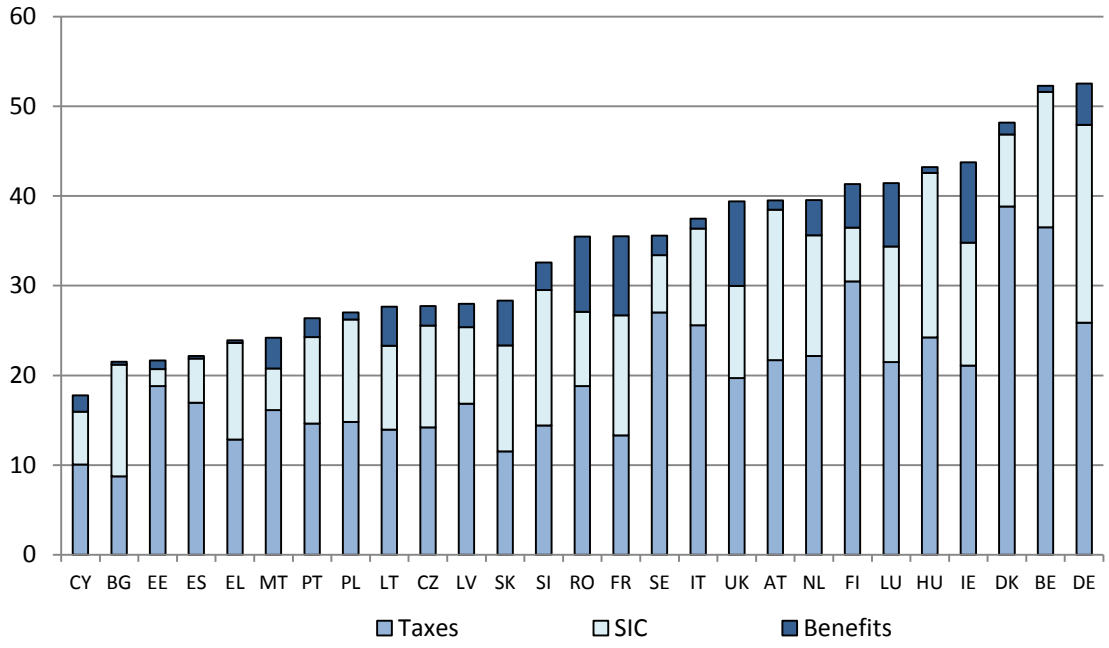
Notes: EUROMOD figures for all countries are based on SILC 2010 (2009 incomes), except for Denmark which are based on SILC 2008 (2007 incomes, and those for UK which are based on FRS 2009/10.

Finally, Figure 4 presents the decomposition by components of mean METR for each country in policy year 2009. Mean METRs have been decomposed into three main components: taxes, representing the average increase in taxes paid at the household level as a proportion of the increase in individual gross earnings; social insurance contributions, including changes in both employee and self-employed social insurance contributions; and benefits, representing the average reduction in benefits and pensions paid at the household level as a proportion of the increase in earnings.

Despite a wide variation across countries, the graph shows that the tax component is usually the most important, the size of it varying significantly across countries and ranging from relatively low values in Bulgaria, Cyprus, Slovakia and Greece to relatively high values in Belgium and Denmark. Social insurance contributions are the second most important component of the mean METR, ranging from just below 2% in Estonia to above 18% in Hungary and Germany. It should be noted that social insurance contributions paid by the employer are not included in the calculation since they do not represent a source of variation of household disposable income (at least in the short-run). Finally, the benefit withdrawal component is the smallest, with sizable effect mainly in Romania, France, Ireland and UK, countries characterised by important means-tested benefits.

The METR estimates presented here show a very small selection of indicators that may be of interest. Breakdowns by gender, family status, employment status and analysis of METRS across the income distribution are examples of analysis that can be carried out in the future.

Figure 4 Marginal effective tax rates (%) by income component, 2009



Source: EUROMOD version G2.1.

Notes: EUROMOD figures for all countries are based on SILC 2010 (2009 incomes), except for Denmark which are based on SILC 2008 (2007 incomes) and those for UK which are based on FRS 2009/10.

5. Assessing the results

In this section we assess the poverty and inequality baseline results from EUROMOD. The results from the baseline can be assessed 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).[11] But we cannot (usually) *validate* (ex ante) estimates of the effects of policy changes because no independent measures usually exist.

5.1 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

[11] For a review of some recent applications based on EUROMOD see Sutherland, H., Figari, F. (2013) "EUROMOD: the European Union tax-benefit microsimulation model". *International Journal of Microsimulation* (2013) 6(1) pp. 4-26.

recipients/payers for each policy instrument in the EUROMOD baseline (simulated or not simulated) with 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 also 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 be 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 issues 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. Their quality also depends on the level of complexity of national tax and benefit systems.

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 Appendix 3). In many countries social assistance receipt is over-simulated by a factor of 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 well 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 Appendix 3.

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

Table 7 compares some indicators of poverty and inequality from EU-SILC 2010 (as provided by Eurostat on its web site and through New Cronos) with broadly equivalent estimates from EUROMOD using 2009 policies and incomes. Given that EUROMOD uses 2010 SILC as its input data, one would expect the estimates for 2009 incomes (using 2010 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 different, 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 1 of EU-SILC 2010 in most countries: see Appendix 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.
- The UK uses a different data source in this version of EUROMOD: the Family Resources Survey for 2009/10. It is unlikely that two independent surveys with different questionnaires will produce the same results. Comparisons of EUROMOD results with both EU-SILC and national statistics for the UK are presented in Table 7b below.
- The standard definition of household disposable income produced by EUROMOD and used here is slightly different from the definition of the UDB variable (HX090) used for the official indicator calculations. In EUROMOD we do not include any non-cash employment income (value of company car).[12] This is likely to have some effect on the income distribution for example by reducing the median and the poverty threshold in countries with significant non-cash employment income in this form.
- 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 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 equivalised disposable income.
- 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.[13] 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

[12] In a definitive reconciliation of the two sources the income measures could in principle be adjusted to include precisely the same components.
[13] We have followed Eurostat document LC-ILC/39/09/EN.

unequal and, at least usually, risk of poverty rates smaller 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, France, Greece, Ireland, Romania, Finland and the UK, and for tax evasion in Bulgaria, Greece and Italy.[14]

The comparisons shown in Table 7 suggest that SILC and EUROMOD estimates can indeed differ. 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 2010 SILC. The exceptions are Belgium, Germany, Ireland, France and Luxembourg where they are consistently and substantially lower. They are also notably lower using EUROMOD for particular groups, such the elderly in Belgium, Ireland, Latvia, Austria and Slovakia and children in Belgium, Germany, France and Lithuania. Inequality, as measured by the Gini coefficient, also tends to be lower using EUROMOD simulated incomes, particularly so in Belgium, Germany, Ireland, Spain 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 appears to explain some of the low EUROMOD poverty rates. 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, and non take-up.[15] For example (a) the main social assistance benefit for families in France due to the introduction of an income disregard in June 2009 (simulated in EUROMOD for the whole year), (b) social assistance in Slovakia leading to underestimation of poverty rates in particular for the elderly, (c) Jobseekers Allowance in Ireland leading to underestimation of poverty rates, and (d) income support in Belgium due to the difficulty of fully capturing the means-test in the simulations, which leads to low poverty rates.

- 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 lower in EUROMOD than in the SILC in Latvia and Ireland (the threshold is also lower in EUROMOD). Comparisons of the threshold itself are only straightforward for the euro-zone countries (or for those with long term fixed exchange rates).[16] Among those the difference is small in most cases and only more than 5% of the Eurostat estimate in Italy and Slovakia.

- Over-simulation of income taxes can lead to under-estimation of inequality and of median disposable income, and hence the 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

[14] Also, non take-up of paternity benefits is simulated in Latvia.

[15] It is worth noting that in some countries simulated means-tested benefits correspond very well to external statistics; higher poverty estimates in the SILC may also be due to under-reporting of benefits in the data. For example, unemployment benefit II in Germany has been oversimulated in comparison to EU-SILC input data. However, macrovalidation results show that the benefit is accurately simulated when compared to official statistics. These results clearly point out to issues in the EU-SILC input data. e.g. underreporting of the benefit.

[16] 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 2009.

particularly for groups who cannot or do not evade. This is thought to be a likely explanation in Latvia using 2008 data where we have evidence that there was a high rate of evasion of taxes. However, this is not supported for simulations based on SILC 2010. This suggests that the extent of tax evasion considerably reduced during the crisis (especially since the collapse of the construction sector).

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.

Table 7 Comparison of EUROMOD output poverty and inequality statistics for 2009 with Eurostat estimates from the EU-SILC 2010 UDB

		Poverty Risk: all			Poverty risk (60%)		Poverty threshold	Gini coefficient
		50%	60%	70%	age <18	age>=65	(60% median) €/year	
Belgium	Eurostat	7.9	14.6	23.8	18.3	19.4	11,678	0.266
	EUROMOD	5.6	11.7	19.6	14.9	15.2	11,346	0.227
Bulgaria	Eurostat	15.2	20.7	28.2	26.7	32.2	1,810	0.332
	EUROMOD	12.7	19.2	26.7	24.7	29.5	1,715	0.319
Czech Republic	Eurostat	5.2	9.0	15.5	14.3	6.8	4,235	0.249
	EUROMOD	4.0	8.0	14.6	11.8	6.2	4,313	0.236
Denmark	Eurostat	7.9	13.3	21.5	10.9	17.7	15,401	0.269
	EUROMOD	4.5	11.2	20.2	7.7	18.0	15,844	0.232
Germany	Eurostat	9.2	15.6	23.2	17.5	14.1	11,278	0.293
	EUROMOD	5.0	12.3	21.2	13.1	12.7	10,922	0.264
Estonia	Eurostat	9.4	15.8	25.0	17.3	15.1	3,436	0.313
	EUROMOD	9.3	15.7	24.5	17.4	14.9	3,437	0.306
Ireland	Eurostat	7.1	15.2	25.0	18.9	9.9	12,307	0.307
	EUROMOD	3.8	12.1	22.7	16.5	2.0	12,258	0.268
Greece	Eurostat	12.4	20.1	27.2	23.0	21.3	7,178	0.329
	EUROMOD	11.8	19.4	26.1	23.4	19.0	7,372	0.321
Spain	Eurostat	15.1	21.4	28.5	29.2	20.5	7,600	0.344
	EUROMOD	15.3	21.3	28.1	29.2	19.5	8,044	0.314
France	Eurostat	7.5	13.3	21.6	17.9	10.6	11,976	0.298
	EUROMOD	5.4	10.7	19.2	12.5	8.9	11,944	0.283
Italy	Eurostat	11.6	18.2	26.0	24.7	16.6	9,562	0.312
	EUROMOD	11.2	17.8	26.1	23.4	14.3	9,044	0.307
Cyprus	Eurostat	8.4	15.6	23.3	12.6	39.9	9,708	0.301
	EUROMOD	7.5	14.8	23.0	11.7	41.6	10,222	0.282
Latvia	Eurostat	14.8	21.3	29.3	26.6	18.8	2,682	0.361
	EUROMOD	14.0	20.8	28.7	27.7	13.2	2,690	0.349
Lithuania	Eurostat	14.5	20.2	27.2	23.3	10.2	2,418	0.369
	EUROMOD	12.8	20.6	28.2	24.6	9.7	2,408	0.357

/continued

		Poverty Risk: all			Poverty risk (60%)		Poverty threshold	Gini coefficient
		50%	60%	70%	age <18	age>=65	(60% median) €/year	
Luxembourg	Eurostat	8.0	14.5	24.1	21.4	5.9	19,400	0.279
	EUROMOD	1.6	9.4	21.7	13.0	3.0	19,290	0.250
Hungary	Eurostat	6.0	12.3	19.8	20.3	4.1	2,544	0.241
	EUROMOD	5.1	10.9	19.1	17.4	3.4	2,520	0.230
Malta	Eurostat	7.7	15.0	23.4	19.9	18.0	6,261	0.284
	EUROMOD	8.1	15.8	24.9	19.5	18.0	6,272	0.283
Netherlands	Eurostat	4.9	10.3	18.8	13.7	5.9	12,175	0.255
	EUROMOD	4.8	10.8	19.2	14.2	4.8	12,533	0.250
Austria	Eurostat	6.2	12.1	20.1	14.3	15.2	12,371	0.261
	EUROMOD	4.8	10.6	18.8	13.3	11.2	12,359	0.256
Poland	Eurostat	10.5	17.6	25.5	22.5	14.2	2,643	0.311
	EUROMOD	11.0	17.5	25.6	22.0	14.1	2,544	0.311
Portugal	Eurostat	11.3	17.9	26.0	22.4	21.0	5,207	0.337
	EUROMOD	9.6	16.7	24.9	20.4	19.2	5,443	0.322
Romania	Eurostat	15.0	21.1	27.6	31.3	16.7	1,222	0.333
	EUROMOD	16.0	21.7	28.8	30.0	19.0	1,216	0.328
Slovenia	Eurostat	7.3	12.7	19.7	12.6	20.2	7,042	0.238
	EUROMOD	7.2	12.8	20.3	12.4	19.3	6,857	0.240
Slovakia	Eurostat	7.8	12.0	19.0	18.8	7.7	3,670	0.259
	EUROMOD	5.2	10.5	16.9	15.7	4.5	3,465	0.236
Finland	Eurostat	5.5	13.1	21.4	11.4	18.3	12,809	0.254
	EUROMOD	5.3	12.3	20.9	10.9	16.1	12,583	0.245
Sweden	Eurostat	7.0	12.9	21.2	13.1	15.5	11,825	0.241
	EUROMOD	6.4	12.5	21.5	13.1	12.9	11,450	0.233
United Kingdom	Eurostat	9.9	17.1	25.5	20.4	21.3	10,263	0.329
	EUROMOD	8.0	15.0	24.2	16.3	14.3	9,651	0.321

Source: Eurostat web site and New Cronos (accessed 13/09/2014); EUROMOD version G2.1.
Notes: EUROMOD figures for all countries are based on SILC 2010 (2009 incomes), except for Denmark which are based on SILC 2008 (2007 incomes), updated, and those for UK which are based on FRS2009/10.

- In Denmark the comparison in Table 7 are for 2009 incomes and 2010 characteristics (Eurostat) with EUROMOD estimates using 2007 incomes updated to 2009. It is also worth comparing the EUROMOD statistics for 2007 with those from Eurostat for 2008 (2007 incomes), shown in Table 7a. In this case the estimates are much closer than those shown in Table 7, except for the elderly.

Table 7a Comparison of EUROMOD output poverty and inequality statistics for 2007 for Denmark with Eurostat estimates from the EU-SILC 2008 UDB

	Poverty Risk: all			Poverty risk (60%)		Poverty threshold	Gini coefficient
	50%	60%	70%	age <18	age>=65	(60% median) €/year	
Eurostat	6.2	11.8	19.7	9.1	18.1	14,497	0.251
EUROMOD	4.6	10.7	19.1	7.8	15.4	14,451	0.248

Source: Eurostat web site and New Cronos (accessed07/04/2013); EUROMOD version G2.1.
Notes: EUROMOD figures for Denmark are based on SILC 2008 (2007 incomes).

- In the UK the comparisons are made not only with respect to 2010 SILC (2009 incomes) but also with respect to national statistics using the same underlying data (FRS2009/10) as shown below in Table 7b. EUROMOD poverty rates are lower than both SILC and national statistics. They are notably lower for people aged 65 and over. EUROMOD inequality estimates are also lower compared to SILC and national statistics The higher Gini reported by the HBAI statistics is at least partly due to the adjustment they make for missing high incomes. It is documented that FRS underreports some benefits due to non-reporting by recipients, misreporting by recipients or differential non-response by recipients. Underreporting applies particularly to Attendance allowance (39%), Carer's allowance (25%), Income support and Pension Credit (over 30%), Housing Benefit and WTC (around 20%) and CTB (around 10%). Underreporting of benefits, some of which are simulated in EUROMOD, is one of the explanations why the EUROMOD poverty risk is lower than that measured by FRS/HBAI.

Table 7b UK comparisons of poverty risk for 2009 incomes

	Poverty risk: all			Poverty risk (60%)		Gini coefficient
	50%	60%	70%	age <18	age>=65	
Eurostat 2010 SILC	9.9	17.1	25.5	20.4	21.3	0.329
EUROMOD 2009 incomes	8.0	15.0	24.2	16.3	14.3	0.321
HBAI 2009 incomes	10.0	17.0	25.0	20.0	18.0	0.360

Source: Households Below Average Income (HBAI) 1994/95 - 2010/11, Department for Work and Pensions (2012), UK.

6. Conclusions and next steps

The results from EUROMOD shown above are both limited to some key statistical indicators of the baselines for 2009-13 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 not just intended to generate baseline statistics for a particular policy year; its main purpose it to be used 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 model 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 2010 (and later) policies can also take account of the effects of the economic downturn (and recovery). Research performed on 13 EU countries suggests that in countries like Greece, Latvia, Lithuania and Spain, where there have been significant changes such adjustments can make a considerable difference to estimates of poverty and inequality and the effects of policies.[17]

- Also, we will continue to 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 as a supplement or in place of the UDB, in order to overcome approximations resulting from imputing the components of UDB income aggregations.

[17] Leventi, C., Navicke, J., O. Rastrigina and H. Sutherland, 2014, *Nowcasting risk of poverty and income distribution in the EU in 2013,* EUROMOD Working Paper EM 11/14.

Appendix 1 National teams contributing to EUROMOD G2.1

Country	National team – team leader
Belgium	University of Antwerp – Gerlinde Verbist K.U.Leuven – André Decoster
Bulgaria	University of National and World Economy (UNSS), Sofia – Ekaterina Tosheva
Czech Republic	CERGE-EI – Daniel Münich
Denmark	Bent Greve (Roskilde University)
Germany	DIW Berlin (Deutsches Institut für Wirtschaftsforschung) – Peter Haan
Estonia	PRAXIS Center for Policy Studies – Andres Võrk
Ireland	Maastricht University/Teagasc - Cathal O'Donoghue
Greece	Athens University of Economics and Business (AUEB) – Manos Matsaganis
Spain	Instituto de Estudios Fiscales (IEF) – María Milagros Paniagua San Martin
France	Université de la Méditerranée, Marseille – Laurence Bouvard
Italy	Bocconi University/Centre for Industrial Studies (CSIL) – Carlo Fiorio
Cyprus	University of Cyprus – Panos Pashardes
Latvia	Baltic International Centre for Economic Policy Studies (BICEPS) – Alf Vanags
Lithuania	Institute for Social Research, Lithuania – Romas Lazutka
Luxembourg	CEPS/INSTEAD – Philippe Liégeois
Hungary	TÁRKI Social Research Institute – Péter Szivós
Malta	Ministry of Finance, the Economy and Investment - Godwin Mifsud
Netherlands	CentERdata, Tilburg University – Klaas de Vos
Austria	European Centre for Social Welfare Policy and Research, Vienna – Michael Fuchs
Poland	Center for Economic Analysis (CenEA) – Michal Myck
Portugal	Centro de Investigação sobre Economia Portuguesa (CISEP) - Carlos Farinha Rodrigues
Romania	National Research Institute for Labour and Social Protection - Eva Militaru
Slovenia	Inštitut za Ekonomska Raziskovanja (IER) – Boris Majcen and Nataša Kump
Slovakia	Ministry of Finance of the Slovak Republic - Eduard Hagara
Finland	Research Department of the Social Insurance Institution of Finland (KELA) – Pertti Honkanen
Sweden	Ministry of Health and Social Affairs – Tom Nilstierna and Joakim Hussénius
United Kingdom	Institute for Social and Economic Research (ISER) - Paola De Agostini

Appendix 2 EUROMOD input datasets used in the analysis in this paper

Country	Input data
Belgium	EU-SILC version 2010-1
Bulgaria	EU-SILC version 2010-1
Czech Republic	EU-SILC version 2010-1
Denmark	EU-SILC version 2008-2
Germany	EU-SILC version 2010-1
Estonia	EU-SILC (UDB 2010-1) & national SILC variables
Ireland	EU-SILC version 2010-4
Greece	EU-SILC (UDB 2010-1) & national SILC variables
Spain	National SILC 2010 (release date 04/10/13)
France	EU-SILC version 2010-1
Italy	National SILC 2010-1
Cyprus	EU-SILC version 2010-3
Latvia	EU-SILC version 2010-1
Lithuania	EU-SILC (UDB 2010-1) & national SILC variables
Luxembourg	EU-SILC (UDB 2010-1) & national SILC variables
Hungary	EU-SILC version 2010-1
Malta	EU-SILC version 20010-3
Netherlands	EU-SILC version 2010-1
Austria	National SILC 2010-1
Poland	EU-SILC (UDB 2010-1) & national SILC variables
Portugal	EU-SILC version 2010-1
Romania	EU-SILC version 2010-1
Slovenia	EU-SILC version 2010-1
Slovakia	National SILC (release date 19/03/12)
Finland	EU-SILC version 2010-1
Sweden	EU-SILC version 2010-2
United Kingdom	Family Resources Survey 2009/10

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 Estonian version of the EU-SILC (ESU) made available by Statistics Estonia, 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 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 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.

Appendix 3 Country notes: tax evasion and benefit non take up

- **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 improve the quality of the simulation of personal income taxation have been made based on information from external data on the frequency and the amount of tax allowances and tax deductions actually applied by tax payers. This information has been imputed into the EU-SILC micro data and used in the EUROMOD simulation of personal income taxation, as a kind of proxy for the allowances and deductions that are not observed in the sample of individuals in EU-SILC.

For **Greece** tax evasion adjustments have been made on the basis of external estimates for the extent of average income underreporting by income source (earnings, self-employment income from farming and non-farm business). Assuming that net incomes reported in SILC reflect true incomes, two sets of gross incomes have been derived – one under the assumption of full compliance and the other assuming that everyone have underreported a given income source to the tax authority by the same proportion. A user can choose which assumption is utilised for calculating disposable incomes, and the model automatically draws on the relevant set of gross incomes. Adjustments for tax evasion are used by default for the baseline scenarios.

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 in 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. This assumption leads to an overestimation of personal income tax payers, but it does not lead to an overestimation of the aggregate tax amount.

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 in the UK, some of this effect is captured.

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)[18] 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 correction is simulated for unemployment assistance benefit for older workers. Full take-up is assumed for all other simulated means-tested 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 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

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

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 all means-tested benefits. However, given the inability of simulating all eligibility conditions for the social solidarity supplement for the elderly, the simulation of this benefit overestimates the number of recipients and aggregate amounts. Thus, the beneficiaries were calibrated to guarantee consistency with the official statistics.

due to the 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.

For **Romania** non take-up is simulated for the minimum guaranteed income, which under full take-up is overestimated by a factor of 4. The calibration is based on the assumption that households headed by a person under 25 do not claim. Means-tested benefits for lone parents are underestimated by a factor of 2 due to a lack of lone parents in the data.

For **Latvia** non take-up is simulated for paternity benefit based on the benefit observed in the data. The adjustment is only for data based on SILC 2010.

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 relatively close to external figures (with the exception of the birth grant which is underestimated). The number of recipients and amounts of social assistance are over-simulated by around 40%.

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.

In Finland eligibility for income support is assessed at the family level (rather than at the household level). For example, adult children can apply separately from their parents. In practice, however, this happens rarely. Therefore, in the model we account for non take-up by simulating income test at the

household level. Also, the households where the head is self-employed are excluded from eligibility (as they rarely apply for income support).

For **Bulgaria**, **Denmark, Lithuania**, **Luxembourg, Italy**, **Cyprus**, **Hungary, the Netherlands, Austria,** 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.