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Baseline results from the EU28 EUROMOD (2011-2015)

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Baseline results from the EU28 EUROMOD (2011-2015)[1]

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with

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Abstract

This paper presents baseline results from the latest version of EUROMOD (version G3.0+), the tax-benefit microsimulation model for the EU-28. 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 2011 and 2015 (or 2014 in some cases). Finally, we provide estimates of marginal effective tax rates (METR) for all 28 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 EM18/2014.

JEL: C15; H24; H31; H55; I3

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

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[1] The results presented here are based on EUROMOD version G3.0+. EUROMOD is maintained, developed and managed by the Institute for Social and Economic Research (ISER) at the University of Essex, in collaboration with national teams from the EU member states. We are indebted to the many people who have contributed to the development of EUROMOD. This publication is supported by the European Union Programme for Employment and Social Innovation 'Easi' (2014-2020). The latest update to EUROMOD was supported by European Union Programme for Employment and Social Solidarity – PROGRESS (2007-2013). The information contained in this publication does not necessarily reflect the position or opinion of the European Commission.

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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.[2] 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**.[3] 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.euromod.ac.uk/.

This report presents baseline results from the latest public release of EUROMOD being constructed with support from DG-EMPL of the European Commission (EUROMOD version G3.0+).[4] It updates and extends the material reported in 2014 in a EUROMOD Working Paper.[5]

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 2011-2015 (or 2011-2014) policies, based mostly on micro-data from the EU-SILC. The calculations for 2011 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 (Year 3)

With the support of the 3-year long Progress funding, the EUROMODupdate2 project has updated and improved the new version of EUROMOD, covering all 28 EU member states, based on micro-data from the EU-SILC and simulating policies from recent policy years (such as 2015) as well as those corresponding to the income reference period in the SILC data (2011 in this release).

[2] For a comprehensive overview see: Sutherland H. and Figari F. (2013) 'EUROMOD: the European Union tax-benefit microsimulation model', *International Journal of Microsimulation* 6(1) 4-26.
[3] Subject to permission to access the input micro-data (EU-SILC).
[4] For more information on EUROMOD's updates, please contact us (euromod@essex.ac.uk).
[5] https://www.euromod.ac.uk/publications/baseline-results-eu27-euromod-2009-2013

The model has been built with the collaboration of national teams, which are listed in Appendix 1. In 22 EU countries policy systems have been updated to cover years 2011-2015; in 6 EU countries (Lithuania, Luxembourg, Hungary, Malta, Romania and Slovenia) policy systems have been updated to cover years 2011-2014.[6] In all countries apart from the UK input data have been updated from EU-SILC 2010 to EU-SILC 2012. In the UK input data have been updated from Family Resources Survey (FRS) 2009/10 to FRS 2012/13.[7] Four key tasks were undertaken: (1) updating the input database, (2) updating policy systems for 2014 and 2015, (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.[8] 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.

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. The results presented in this report are based on:

(a) FRS 2012/13 for the UK;
(b) SILC 2012 for all remaining countries.

- **Updating policy systems for 2014 and 2015**

Based on detailed descriptions of policies provided by national teams, 2014 policies have been modelled using the EUROMOD tax-benefit modelling "language" for all 28 EU countries and 2015 policies for 22 out of the 28 countries.[9] Together with updating factors, to bring 2011 incomes from EU-SILC 2012 data up to the level in each policy year (2012, 2013, 2014, 2015), it is now possible to simulate policies from each of these years for each of the 28 countries. These four alternative "baselines" also form the starting points for modelling possible reforms, making use of the EUROMOD language.

[6] The previous EUROMOD version was covering policy years up to 2013.
[7] See Appendix 2 for a list of micro-data sources used in each country.
[8] A network contract with Eurostat for this purpose has been established [EU-SILC/2009/17] and renewed [EU-SILC/2011/55].
[9] The six countries where this has not been the case are Lithuania, Luxembourg, Hungary, Malta, Romania and Slovenia.

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. 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.[10]

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 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

[10] It should be noted that external statistics are often available only with a time lag and macro-validation of 2015 policies typically cannot be finalised until late 2016 or 2017. Later Country Reports will report on this.

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.[11]

3. Poverty and inequality indicators

Table 1 shows selected poverty and inequality indicators for policy years 2011-2014/15 for all EU-28 countries. Risk of poverty rates for the whole population of each of the 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 presented: the Gini coefficient. The statistics are shown for each country and for the EU-28 as a whole, showing the 'weighted' value for the EU-28 population.[12] The table shows how policy changes and changes in market incomes (as well as interactions between these two factors) have affected poverty and inequality in the period 2011-2014/15, abstracting from changes in population characteristics. Figures for all years are based on the same input database. This is the 2012 SILC for all countries except from the UK (FRS 2012/13). 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 are updated from 2011 to following years based on indices for each income source separately as much as possible (e.g. earnings indices, pension indices etc.). While the construction of these indices has followed common guidelines, in this set of statistics for 2012 to 2014/2015 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 cases poverty thresholds increase between 2011 and 2012 by varying amounts. This is due to a combination of inflation, growth in market incomes, policy reforms and routine uprating of policy over this period. In the non-euro-zone countries poverty thresholds are also affected by fluctuations in the exchange rate. In Greece, Hungary, the Czech Republic, Portugal and, to a lesser extent, Poland, Spain, Romania and Ireland the poverty threshold decreases during this period. After 2012 EUROMOD estimates are showing nominal median incomes to continue to rise in 13 countries, they start rising in Spain, Poland, Portugal and Romania, start falling in Cyprus and fluctuate over time in Belgium, the Czech Republic, Denmark, Greece, France, Croatia, Hungary, Ireland, Slovenia and the UK. Fluctuations in

[11] The country reports are available at https://www.euromod.ac.uk/using-euromod/country-reports
[12] The EU-28 value is obtained by weighting national estimates according to the population of each member state.

non-euro zone countries such as the Czech Republic, Denmark, Croatia, Hungary, Poland and the UK are mainly due to exchange rate variations.

Over the period 2011-2015 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 Greece poverty is estimated to fall by 1.5 percentage points in 2014 and increase by almost 2 percentage points in 2015. This fluctuation is related to the provision of the social dividend, a lump-sum means-tested benefit only paid out in 2014. In Lithuania the headline risk of poverty increases by 2.3 percentage points in 2012. The increase is mainly related to differences in growth of market and non-market incomes (i.e. an increase in median income due to growth in market income above the rate at which pensions and benefits were increased on average) 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, increases in the poverty line produce considerable increases in the elderly risk of poverty, as pensioners cluster near the poverty threshold. This is particularly the case for 2014, when elderly poverty increases by 7 percentage points. The concentration of the elderly around the poverty line also explains fluctuations in poverty risk for this group in Bulgaria, Estonia, Cyprus, Romania and Sweden. The significant fall in elderly poverty in 2012 in Belgium is probably related to differences in growth of market incomes and pensions. The cut of the Christmas, Easter and vacations pension bonuses were mostly responsible for the increase in the risk of poverty for the elderly in Greece in 2013. 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 Hungary, poverty risk for the elderly fell significantly in 2012 mainly due to the increase in the threshold for means-testing of housing benefit, which made more people eligible for it.

Changes in poverty risk for those under 18 are smaller in most countries. The exceptions are Estonia (in 2015), Lithuania (in 2012), Hungary (in 2012) and Slovakia (in 2013). In Estonia, the significant child poverty reduction observed in 2015 can be mostly attributed to universal child allowances, which were substantially raised (from €19.18 to €45 per first and second child in a family and from €76.72 to €100 per third and each subsequent child) and to the means-tested family benefit, which was also increased from €9.59 to €45 per month. In Lithuania poverty risk for children increased significantly in 2012, mostly due to cuts in child benefits and social insurance benefits for families with small children. In Hungary the freezing of minimum pension, which is the base amount used for most social benefits, resulted in a significant increase in the child poverty risk. In Slovakia the increase in child poverty in 2013 is partly explained by the fact that the spouse tax allowance was restricted only to spouses who (a) take care of children up to 3 years old, (b) receive caring benefit, (c) are disabled or (d) are unemployed.

Inequality, as measured by the Gini coefficient, does not seem to change substantially in most countries. The countries with the biggest estimated decreases in the Gini (i.e. more than 2 percentage points) are France (in 2013), Cyprus (in 2014), Portugal (in 2012) and Greece (in 2014) whereas the countries with the biggest estimated increases in the Gini (i.e. more than 3.5 percentage points) are Denmark (in 2014), Hungary (in 2012 and 2013) and Romania (in 2014). The results for the EU as a whole show risk of poverty and inequality to be relatively stable over the period in question.

It should be emphasised that these figures are not supposed to coincide with the value of social indicators produced by the EU-SILC 2013-2016 (2012-2015 incomes). The EUROMOD estimates show the implications for the movement in the indicators of policy changes over the period 2011-2015

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 market incomes 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: 2011-2014/15

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient
		50%	60%	70%	age <18	age>=65		
Belgium	2011	6.7	12.5	20.0	14.5	14.1	11,653	0.226
	2012	6.9	12.1	19.5	14.5	11.7	11,892	0.225
	2013	6.8	12.0	19.4	14.5	10.9	12,153	0.224
	2014	6.7	11.9	19.0	14.6	10.1	12,273	0.223
	2015	6.5	11.7	18.5	14.4	9.8	12,192	0.220
Bulgaria	2011	13.4	19.9	26.9	25.1	26.9	1,695	0.315
	2012	13.9	20.6	27.4	25.2	30.2	1,769	0.321
	2013	14.0	20.5	27.4	25.9	28.5	1,883	0.322
	2014	14.4	21.0	28.1	25.3	32.1	1,977	0.324
	2015	14.4	20.9	28.0	25.4	31.5	2,012	0.324
Czech Republic	2011	4.8	8.9	16.3	11.8	4.9	4,685	0.238
	2012	4.8	9.0	16.1	12.0	4.9	4,544	0.239
	2013	4.7	8.9	15.9	12.1	4.4	4,525	0.237
	2014	4.7	9.2	16.3	12.5	4.8	4,610	0.239
	2015	4.9	9.3	16.3	12.5	4.9	4,703	0.240
Denmark	2011	6.7	11.4	18.8	8.7	8.0	15,658	0.252
	2012	6.7	11.5	18.8	8.7	7.7	15,967	0.251
	2013	6.7	11.3	18.6	8.7	7.1	16,171	0.254
	2014	6.8	11.3	18.8	9.1	5.9	16,135	0.266
	2015	6.9	11.2	18.5	9.6	5.1	16,022	0.274
Germany	2011	6.0	13.4	22.1	13.3	13.8	11,789	0.260
	2012	6.1	13.4	22.1	13.4	13.6	11,960	0.261
	2013	6.2	13.4	22.2	13.4	13.9	12,166	0.262
	2014	6.3	13.6	22.2	13.7	14.1	12,401	0.262
	2015	6.6	13.8	22.7	13.6	15.3	12,625	0.263
Estonia	2011	10.6	18.2	26.7	17.0	19.4	3,633	0.315
	2012	10.7	18.2	26.9	17.1	19.6	3,796	0.317
	2013	11.0	19.1	27.3	17.6	22.9	4,056	0.319
	2014	10.8	18.9	27.1	17.2	22.4	4,276	0.318
	2015	9.7	18.7	26.8	15.1	24.3	4,584	0.314

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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	2011	6.5	15.8	24.9	20.2	1.8	11,763	0.275
	2012	6.5	16.0	24.8	20.4	2.3	11,755	0.275
	2013	6.5	15.8	24.6	20.5	2.5	11,455	0.278
	2014	6.5	15.9	24.4	20.2	3.6	11,294	0.279
	2015	7.0	16.1	25.0	20.4	4.2	11,432	0.281
Greece	2011	15.1	21.7	28.9	24.3	14.9	5,762	0.345
	2012	15.1	21.7	29.4	24.9	13.2	5,476	0.343
	2013	15.5	22.0	30.1	24.6	14.8	5,108	0.345
	2014	14.1	20.5	29.2	23.9	11.1	5,090	0.338
	2015	16.0	22.5	30.0	25.1	13.9	5,140	0.343
Spain	2011	14.3	21.7	29.0	28.1	16.7	7,369	0.322
	2012	14.4	21.7	27.9	28.2	16.1	7,353	0.319
	2013	14.3	21.7	27.9	28.2	15.5	7,357	0.318
	2014	14.4	21.8	27.9	28.4	15.4	7,357	0.318
	2015	14.5	21.8	28.1	28.2	16.1	7,474	0.319
France	2011	6.1	12.5	20.5	16.7	7.5	11,693	0.302
	2012	6.1	12.4	20.4	16.7	7.4	11,820	0.300
	2013	5.9	11.7	19.8	15.9	6.6	11,685	0.287
	2014	5.9	11.7	19.7	15.9	6.9	11,811	0.285
	2015	5.8	11.9	19.9	16.3	7.1	11,959	0.284
Croatia	2011	12.7	19.6	25.8	20.3	26.1	3,225	0.292
	2012	13.1	19.7	26.0	20.4	26.4	3,282	0.290
	2013	12.8	19.1	25.7	20.4	24.1	3,308	0.289
	2014	13.1	19.1	25.7	20.6	24.0	3,303	0.289
	2015	13.4	19.8	26.1	20.9	26.3	3,345	0.294
Italy	2011	11.4	19.0	26.5	25.2	15.8	9,437	0.330
	2012	11.4	18.5	26.3	24.7	14.8	9,449	0.328
	2013	11.2	18.1	26.0	24.0	14.2	9,604	0.326
	2014	11.2	18.1	25.9	23.6	14.9	9,740	0.323
	2015	11.3	18.1	25.9	23.3	15.5	9,845	0.321

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	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient
		50%	60%	70%	age <18	age>=65		
Cyprus	2011	6.5	13.8	22.2	12.1	31.2	10,333	0.296
	2012	6.8	13.5	22.4	11.6	28.9	10,350	0.295
	2013	6.6	13.2	21.8	11.9	25.9	10,145	0.291
	2014	5.5	12.0	20.7	12.3	20.7	9,891	0.285
	2015	5.1	11.7	20.3	12.6	17.9	9,605	0.285
Latvia	2011	11.2	17.9	27.2	22.5	10.2	2,515	0.339
	2012	11.6	18.4	28.2	22.5	13.2	2,650	0.346
	2013	12.3	18.9	28.2	22.6	16.3	2,766	0.354
	2014	12.7	20.2	28.3	21.9	23.3	2,980	0.357
	2015	13.0	20.9	28.8	21.3	27.0	3,138	0.361
Lithuania	2011	10.8	17.8	26.8	20.2	13.7	2,487	0.318
	2012	12.3	20.1	27.1	25.8	15.9	2,586	0.320
	2013	12.5	20.3	27.7	25.3	17.8	2,659	0.325
	2014	13.4	20.4	27.9	25.2	18.6	2,788	0.326
Luxembourg	2011	1.3	8.8	22.3	12.6	2.0	19,514	0.245
	2012	1.4	9.0	22.1	13.1	2.0	20,000	0.246
	2013	1.3	8.7	21.6	12.9	2.0	20,438	0.243
	2014	1.4	8.8	21.8	13.1	2.0	20,745	0.243
Hungary	2011	5.5	11.7	20.2	17.3	8.4	2,632	0.252
	2012	8.0	14.0	21.4	21.4	5.6	2,434	0.264
	2013	8.3	14.5	21.9	22.5	5.3	2,457	0.274
	2014	8.2	14.4	21.7	21.4	5.9	2,412	0.273
Malta	2011	9.3	16.8	25.9	24.1	16.5	6,905	0.275
	2012	9.6	17.2	25.9	24.4	16.9	7,135	0.276
	2013	9.5	17.1	26.0	24.2	17.2	7,229	0.278
	2014	9.5	17.2	26.0	24.3	17.1	7,355	0.279
Netherlands	2011	4.7	10.4	19.0	14.8	4.1	12,946	0.246
	2012	4.6	10.4	19.2	14.6	4.5	13,082	0.248
	2013	4.8	10.6	19.1	15.0	4.0	13,392	0.246
	2014	4.7	10.5	19.1	14.3	4.0	13,489	0.245
	2015	1.3	8.8	22.3	12.6	2.0	19,514	0.245

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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	2011	8.0	13.6	21.5	16.2	11.8	12,754	0.262
	2012	6.7	13.6	21.6	16.4	11.4	12,976	0.263
	2013	6.7	13.3	21.3	16.1	10.8	13,071	0.262
	2014	6.7	13.3	21.4	16.1	11.0	13,263	0.262
	2015	6.6	13.3	21.5	16.2	10.6	13,402	0.262
Poland	2011	10.5	17.2	24.8	21.4	13.4	3,091	0.308
	2012	11.0	17.4	25.0	22.2	13.3	3,021	0.311
	2013	10.9	17.5	25.2	22.1	13.1	3,067	0.309
	2014	11.0	17.7	25.3	22.6	13.1	3,310	0.310
	2015	11.1	17.8	25.4	22.5	13.4	3,395	0.311
Portugal	2011	10.9	17.6	25.0	21.5	15.0	5,275	0.329
	2012	10.5	16.9	23.8	20.9	14.7	5,175	0.322
	2013	10.6	17.0	24.2	20.7	14.9	5,196	0.318
	2014	10.7	17.1	24.3	20.7	15.2	5,206	0.318
	2015	10.7	17.2	24.4	20.8	15.3	5,246	0.322
Romania	2011	15.6	21.9	28.5	32.7	13.7	1,273	0.317
	2012	15.8	22.0	28.9	32.3	15.2	1,259	0.318
	2013	15.7	22.3	29.1	32.6	16.3	1,324	0.319
	2014	16.8	23.2	29.8	32.4	19.8	1,454	0.331
Slovenia	2011	7.4	13.7	21.1	12.7	18.4	7,033	0.240
	2012	6.8	13.3	20.5	11.8	18.9	7,099	0.238
	2013	6.7	13.3	20.6	11.7	18.7	7,076	0.237
	2014	6.1	13.2	20.6	11.7	18.8	7,116	0.236
Slovakia	2011	5.5	11.1	17.9	17.7	4.8	3,841	0.222
	2012	5.8	11.2	18.0	17.9	4.7	3,949	0.223
	2013	6.6	12.2	18.5	20.6	3.9	3,984	0.222
	2014	7.1	12.3	18.6	20.6	4.3	4,111	0.225
	2015	7.3	12.1	18.8	20.4	4.3	4,203	0.226
Finland	2011	5.2	12.1	20.8	11.3	14.7	13,268	0.249
	2012	4.8	11.6	20.4	10.8	13.8	13,765	0.248
	2013	4.5	11.4	20.2	10.9	12.9	13,920	0.244
	2014	4.3	11.1	19.8	10.8	12.4	14,013	0.244
	2015	4.2	10.9	19.4	10.9	11.9	14,070	0.243

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	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient
		50%	60%	70%	age <18	age>=65		
Sweden	2011	7.5	13.3	21.7	15.3	12.2	14,535	0.236
	2012	7.2	13.0	21.6	15.2	11.1	15,558	0.237
	2013	7.3	13.0	21.3	15.4	10.0	16,036	0.235
	2014	7.3	13.5	21.5	15.3	11.1	16,325	0.236
	2015	7.8	13.7	21.6	15.3	12.1	16,636	0.237
United Kingdom	2011	7.9	14.5	23.2	15.3	13.3	9,481	0.310
	2012	7.9	14.2	23.0	15.2	12.6	10,836	0.309
	2013	8.6	15.1	23.7	16.4	13.2	10,366	0.311
	2014	8.7	15.3	24.1	16.6	13.5	11,332	0.313
	2015	8.7	15.5	24.2	16.9	13.9	13,081	0.313
EU-28 (weighted)	2011	9.0	15.7	23.7	19.2	12.9	8,812	0.294
	2012	9.1	15.7	23.5	19.3	12.5	9,052	0.294
	2013	9.1	15.7	23.6	19.3	12.4	9,053	0.292
	2014	9.2	15.8	23.6	19.4	12.8	9,295	0.293

Source: EUROMOD version G3.0+.
Notes: EUROMOD figures for all countries are based on SILC 2012 (2011 incomes), except for UK which are based on FRS 2012/13.

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 2011 and 2015 (or 2014 for Lithuania, Luxembourg, Hungary, Malta, Romania and Slovenia). Note that for Tables 2 and 3 the poverty threshold is the same throughout, using 60% of median household disposable income in each respective year. Columns 3-7 show what happens to poverty and inequality if each component (means-tested benefits, non-means-tested benefits -excluding 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, by 17 percentage points on average. 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 incomes). The biggest effect is observed in Hungary, where the addition of pensions reduces poverty before taxes and benefits by approximately 23 percentage points.

The effect of means-tested benefits on poverty is much smaller in comparison with that of pensions (5 percentage points on average), except in Ireland and the UK, where it is significantly larger, reaching 17 and 16 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 5 percentage points on average) exceeds 10 percentage points in Luxembourg, Hungary (in 2011) and Ireland. 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, whereas those where the poverty-reducing effect of social insurance contributions is larger are the Netherlands, Greece (in 2015) and Poland (in 2015). The change in the effect due to tax policy changes or changes in social insurance contributions between 2011 and 2015 (or 2014) is small (i.e. up to one percentage point) in all countries.

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 approximately 45 percentage points. Deducting means-tested and non means-tested benefits increases the gap by 10 and 6 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 56 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 EU countries, with the

exception of Ireland, the Netherlands and the UK. In these countries occupational and other private pensions (included here in market incomes) 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. Means-tested benefit play a relatively large role compared with other countries in Ireland and the UK, non means-tested benefits in Hungary, Sweden, Denmark and Luxembourg, and direct taxes in Belgium, Ireland, Portugal and Luxembourg.

The role of policies in reducing inequalities has remained largely stable between 2011 and 2015. The few exceptions are Greece and Cyprus, where the inequality-reducing effect of means-tested benefits was reinforced, France, where the inequality-reducing effect of taxes was reinforced and Hungary, where the inequality-reducing effect of non means-tested benefits and taxes was weakened.

Table 2 Effects of tax-benefit components on poverty risk, 2011 and 2014/2015 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	2011	12.5	17.5	16.3	11.6	10.5	35.4	16.0
	2015	11.7	16.2	15.7	10.9	10.0	35.7	15.8
Bulgaria	2011	19.9	22.5	22.9	17.8	17.4	35.8	20.1
	2015	20.9	23.1	23.5	18.5	18.5	34.8	20.5
Czech Rep.	2011	8.9	11.9	13.4	8.8	6.3	34.0	12.0
	2015	9.3	12.1	12.9	9.0	6.6	33.5	11.8
Denmark	2011	11.4	17.0	20.0	5.9	9.8	30.2	12.7
	2015	11.2	16.9	18.3	5.8	9.5	29.7	12.4
Germany	2011	13.4	17.7	18.8	12.5	9.7	36.4	15.6
	2015	13.8	17.8	18.7	12.9	10.1	36.0	15.4
Estonia	2011	18.2	18.2	23.5	16.0	17.2	36.0	19.6
	2015	18.7	18.8	24.9	15.8	17.7	36.2	20.6
Ireland	2011	15.8	32.3	26.7	15.4	15.4	41.6	36.5
	2015	16.1	32.9	26.3	14.7	15.9	40.4	35.4
Greece	2011	21.7	22.8	23.7	20.2	17.1	40.2	18.4
	2015	22.5	25.7	23.9	20.4	17.0	41.4	19.1
Spain	2011	21.7	27.6	25.0	21.5	19.5	42.2	27.9
	2015	21.8	27.7	25.2	21.7	19.5	42.8	28.1
France	2011	12.5	19.2	18.6	8.6	8.9	35.2	16.1
	2015	11.9	18.7	17.8	8.1	8.4	34.6	15.5
Croatia	2011	19.6	22.0	21.4	19.1	15.8	38.1	19.4
	2015	19.8	22.5	21.9	19.7	16.0	38.3	19.5
Italy	2011	19.0	21.8	21.7	16.5	16.4	37.7	18.3
	2015	18.1	21.2	20.7	15.8	15.8	37.9	18.1
Cyprus	2011	13.8	16.8	18.9	13.3	11.7	31.6	19.5
	2015	11.7	17.2	15.4	11.4	9.7	31.9	18.3
Latvia	2011	17.9	18.5	22.6	15.6	15.6	36.7	17.6
	2015	20.9	21.0	25.5	18.5	19.0	36.0	20.6
Lithuania	2011	17.8	20.8	21.3	16.0	15.3	39.3	18.6
	2014	20.4	21.7	22.8	18.6	18.4	39.0	19.6
Luxembourg	2011	8.8	15.4	22.7	8.4	4.0	37.3	19.2
	2014	8.8	15.1	22.0	7.9	4.3	36.7	18.3
Hungary	2011	11.7	13.8	24.0	8.5	8.3	38.7	15.8
	2014	14.4	16.1	23.3	9.8	9.9	37.9	14.8
Malta	2011	16.8	21.5	17.1	15.9	13.0	30.6	17.6
	2014	17.2	21.8	17.6	16.1	13.3	30.5	17.7
Netherlands	2011	10.3	18.1	17.0	9.0	4.4	24.1	14.8
	2015	10.5	17.9	17.6	8.8	4.6	24.6	15.1
Austria	2011	13.6	17.0	21.2	12.9	10.7	35.8	17.3
	2015	13.3	16.7	20.9	12.5	10.5	35.4	16.7
Poland	2011	17.2	19.0	19.1	12.9	12.4	32.7	12.5
	2015	17.8	19.4	19.7	13.3	12.7	32.8	12.3
Portugal	2011	17.6	20.5	20.8	17.3	15.0	39.8	20.1
	2015	17.2	20.0	20.3	16.7	15.1	39.4	19.8
Romania	2011	21.9	25.3	24.2	18.9	19.8	41.1	21.6
	2014	23.2	25.8	25.3	20.0	21.0	39.7	21.8
Slovenia	2011	13.7	17.3	21.4	13.2	9.4	33.5	16.6
	2014	12.5	17.5	16.3	11.6	10.5	35.4	16.0

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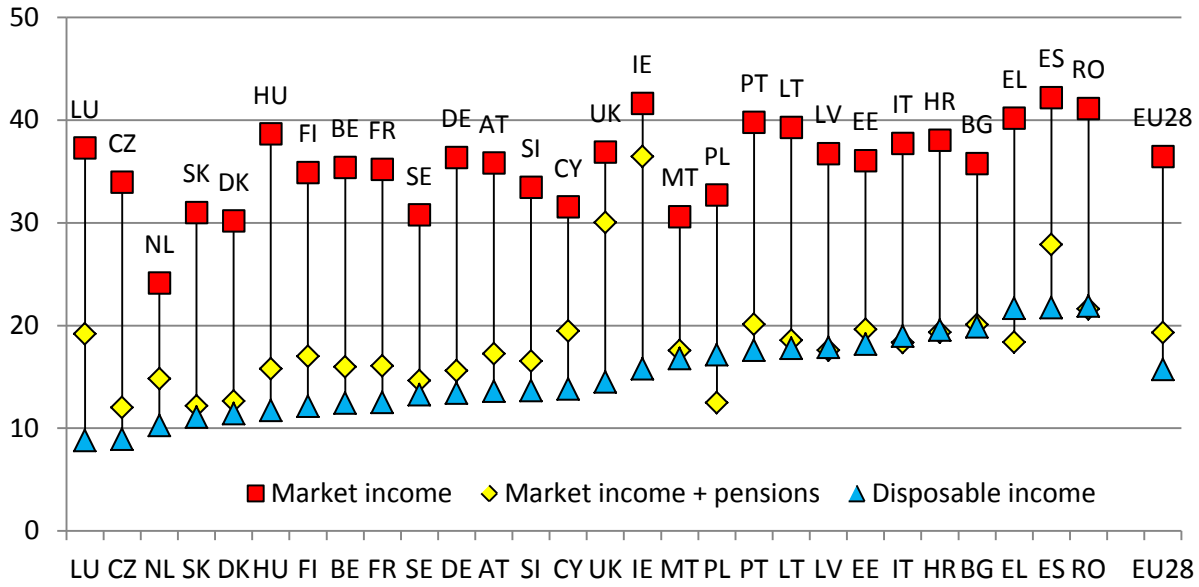
	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Slovakia	2011	11.1	12.9	14.9	10.6	7.2	31.0	12.2
	2015	12.1	13.8	16.3	11.4	7.7	30.4	11.6
Finland	2011	12.1	18.4	18.9	8.4	11.2	34.9	17.0
	2015	10.9	18.0	18.1	7.3	9.9	34.5	16.5
Sweden	2011	13.3	15.8	23.1	8.3	11.6	30.8	14.6
	2015	13.7	15.6	23.0	8.4	12.0	30.9	14.4
UK	2011	14.5	30.2	22.7	10.7	13.9	36.9	30.0
	2015	15.5	29.7	23.3	12.1	14.8	37.3	30.1
EU-28	2011	15.7	21.4	20.8	13.4	12.8	36.4	19.3
	2014	15.8	21.4	20.6	13.4	12.9	36.3	19.1

Source: EUROMOD version G3.0+.

Notes: EUROMOD figures for all countries are based on SILC 2012 (2011 incomes), except for those for the UK which are based on FRS 2012/13.

Figure 1 Poverty risk (%) and the role of public pensions and non-pension benefits and taxes (2011 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, 2011 and 2014/15 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	2011	19.1	24.3	28.7	21.2	21.0	98.9	49.5
	2015	19.6	25.4	31.6	21.8	19.9	98.3	50.0
Bulgaria	2011	26.9	32.4	28.0	26.4	26.1	76.0	34.7
	2015	26.6	32.3	27.9	27.0	26.1	76.7	34.5
Czech Rep.	2011	18.7	22.8	21.9	18.3	18.3	98.3	27.2
	2015	19.0	25.0	22.0	18.3	19.1	99.4	28.1
Denmark	2011	21.9	28.1	33.5	30.0	22.5	83.9	72.1
	2015	21.7	35.8	35.9	28.6	21.7	84.6	75.0
Germany	2011	14.7	32.3	21.0	15.2	16.6	93.2	45.3
	2015	15.6	32.9	21.2	16.2	16.8	94.0	46.2
Estonia	2011	22.9	22.9	29.0	24.6	23.4	89.9	29.1
	2015	18.0	21.0	27.3	20.4	18.8	88.7	28.4
Ireland	2011	13.3	69.9	24.1	13.4	13.3	85.1	87.9
	2015	14.4	70.7	23.7	12.8	13.6	87.5	89.8
Greece	2011	30.6	30.6	33.8	31.2	27.4	95.4	31.8
	2015	30.6	33.4	33.5	29.6	28.1	91.7	32.4
Spain	2011	29.6	39.9	33.5	30.0	29.2	92.2	43.5
	2015	29.2	39.6	33.9	29.5	29.7	92.1	42.9
France	2011	16.3	27.0	22.9	18.7	17.5	76.3	34.9
	2015	16.2	27.1	22.2	17.3	16.8	77.6	35.0
Croatia	2011	25.3	31.2	27.1	25.7	25.7	100.0	33.3
	2015	25.9	31.0	28.3	26.0	26.3	100.0	33.1
Italy	2011	23.3	27.3	26.1	26.8	24.3	83.4	33.9
	2015	24.5	27.6	26.5	27.8	25.3	86.9	34.1
Cyprus	2011	15.3	18.8	19.6	16.0	15.9	63.7	22.0
	2015	15.0	18.6	16.1	14.8	13.6	63.2	21.3
Latvia	2011	22.0	29.8	28.9	21.1	20.8	87.7	36.9
	2015	23.8	26.2	29.6	24.7	24.4	88.7	33.8
Lithuania	2011	21.7	33.4	23.3	22.9	22.1	89.1	39.5
	2014	24.7	32.3	27.9	25.2	23.6	90.0	38.4
Luxembourg	2011	7.1	23.4	22.1	7.9	7.6	61.8	34.2
	2014	7.6	23.7	21.9	8.5	8.4	62.5	35.2
Hungary	2011	15.4	18.6	33.3	14.5	13.7	89.6	40.1
	2014	19.7	23.4	36.1	19.5	18.8	90.2	41.4
Malta	2011	18.9	25.7	19.5	19.1	17.5	77.6	25.9
	2014	18.7	25.5	19.1	19.3	17.7	76.9	25.6
Netherlands	2011	14.4	31.1	28.1	14.9	16.8	60.1	59.1
	2015	14.9	32.3	25.2	14.1	15.8	60.5	59.5
Austria	2011	17.4	26.7	22.4	17.4	15.4	91.5	38.9
	2015	16.5	27.5	22.3	16.7	13.5	91.7	38.6
Poland	2011	23.0	27.5	24.4	23.0	20.6	78.7	25.4
	2015	22.9	28.0	24.7	22.8	20.8	79.9	26.1
Portugal	2011	23.2	29.4	27.5	23.0	22.6	90.3	31.8
	2015	24.0	28.9	28.2	23.6	24.3	90.4	31.4
Romania	2011	27.1	36.0	32.3	27.3	28.7	81.5	42.3
	2014	29.4	36.0	33.0	29.5	31.0	84.3	42.9
Slovenia	2011	18.9	25.1	22.7	18.9	20.0	88.2	29.9
	2014	15.6	25.8	19.5	15.6	17.7	87.4	30.2

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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	2011	16.5	25.0	21.3	16.8	17.9	96.1	29.4
	2015	21.2	26.1	24.5	20.8	21.4	98.2	31.5
Finland	2011	13.9	27.1	21.8	14.9	14.6	90.4	35.4
	2015	12.5	27.0	21.3	13.0	12.7	90.9	36.3
Sweden	2011	20.2	27.7	31.4	23.7	20.3	84.6	44.6
	2015	19.4	28.4	30.5	24.8	19.7	85.2	46.1
UK	2011	19.1	49.7	21.9	20.9	19.5	79.4	63.5
	2015	20.1	50.4	22.4	20.9	20.5	79.5	64.0
EU-28	2011	20.3	32.8	25.6	21.6	20.8	84.8	42.4
	2014	21.0	33.4	26.0	22.0	21.3	85.8	43.0

Source: EUROMOD version G3.0+.

Notes: EUROMOD figures for all countries are based on SILC 2012 (2011 incomes), except for UK which are based on FRS 2012/13.

Table 4 Effects of tax-benefit components on inequality (Gini coefficient), 2011 and 2014/15 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	2011	0.226	0.252	0.253	0.297	0.250	0.492	0.352
	2015	0.220	0.245	0.248	0.292	0.243	0.491	0.346
Bulgaria	2011	0.315	0.337	0.323	0.323	0.322	0.467	0.357
	2015	0.324	0.343	0.332	0.331	0.331	0.467	0.362
Czech Rep.	2011	0.238	0.254	0.256	0.266	0.252	0.463	0.307
	2015	0.240	0.257	0.255	0.269	0.253	0.463	0.309
Denmark	2011	0.252	0.286	0.298	0.286	0.266	0.457	0.348
	2015	0.274	0.314	0.315	0.300	0.284	0.468	0.360
Germany	2011	0.260	0.294	0.278	0.311	0.268	0.503	0.357
	2015	0.263	0.296	0.279	0.317	0.272	0.503	0.360
Estonia	2011	0.315	0.320	0.331	0.342	0.319	0.485	0.362
	2015	0.314	0.321	0.333	0.340	0.317	0.485	0.363
Ireland	2011	0.275	0.397	0.316	0.343	0.294	0.536	0.505
	2015	0.281	0.405	0.321	0.348	0.301	0.535	0.506
Greece	2011	0.345	0.350	0.356	0.381	0.345	0.544	0.390
	2015	0.343	0.360	0.351	0.377	0.341	0.544	0.393
Spain	2011	0.322	0.356	0.339	0.361	0.322	0.524	0.408
	2015	0.319	0.353	0.336	0.359	0.319	0.525	0.406
France	2011	0.302	0.336	0.325	0.329	0.305	0.494	0.376
	2015	0.284	0.319	0.307	0.324	0.294	0.494	0.374
Croatia	2011	0.292	0.315	0.301	0.319	0.313	0.508	0.365
	2015	0.294	0.316	0.303	0.319	0.314	0.508	0.363
Italy	2011	0.330	0.343	0.336	0.371	0.336	0.520	0.389
	2015	0.321	0.335	0.327	0.366	0.329	0.521	0.385
Cyprus	2011	0.296	0.308	0.309	0.326	0.296	0.434	0.351
	2015	0.285	0.307	0.292	0.315	0.285	0.433	0.346
Latvia	2011	0.339	0.355	0.352	0.374	0.353	0.531	0.409
	2015	0.361	0.369	0.376	0.392	0.373	0.530	0.421
Lithuania	2011	0.318	0.339	0.328	0.341	0.328	0.519	0.376
	2014	0.326	0.343	0.336	0.349	0.336	0.519	0.380
Luxembourg	2011	0.245	0.272	0.289	0.304	0.253	0.486	0.365
	2014	0.243	0.270	0.286	0.304	0.253	0.486	0.364
Hungary	2011	0.252	0.262	0.312	0.277	0.276	0.511	0.349
	2014	0.273	0.282	0.322	0.284	0.295	0.510	0.348
Malta	2011	0.275	0.307	0.277	0.311	0.276	0.433	0.338
	2014	0.279	0.310	0.281	0.312	0.280	0.433	0.339
Netherlands	2011	0.246	0.297	0.285	0.300	0.243	0.401	0.353
	2015	0.245	0.294	0.283	0.296	0.245	0.402	0.353
Austria	2011	0.262	0.288	0.293	0.316	0.275	0.498	0.367
	2015	0.262	0.289	0.292	0.315	0.275	0.498	0.367
Poland	2011	0.308	0.320	0.316	0.324	0.310	0.477	0.339
	2015	0.311	0.323	0.318	0.325	0.311	0.480	0.340
Portugal	2011	0.329	0.352	0.344	0.382	0.336	0.544	0.421
	2015	0.322	0.341	0.337	0.382	0.334	0.544	0.421
Romania	2011	0.317	0.343	0.328	0.338	0.328	0.515	0.380
	2014	0.331	0.354	0.340	0.353	0.343	0.518	0.391
Slovenia	2011	0.240	0.263	0.270	0.277	0.262	0.462	0.332
	2014	0.236	0.265	0.265	0.271	0.260	0.463	0.333

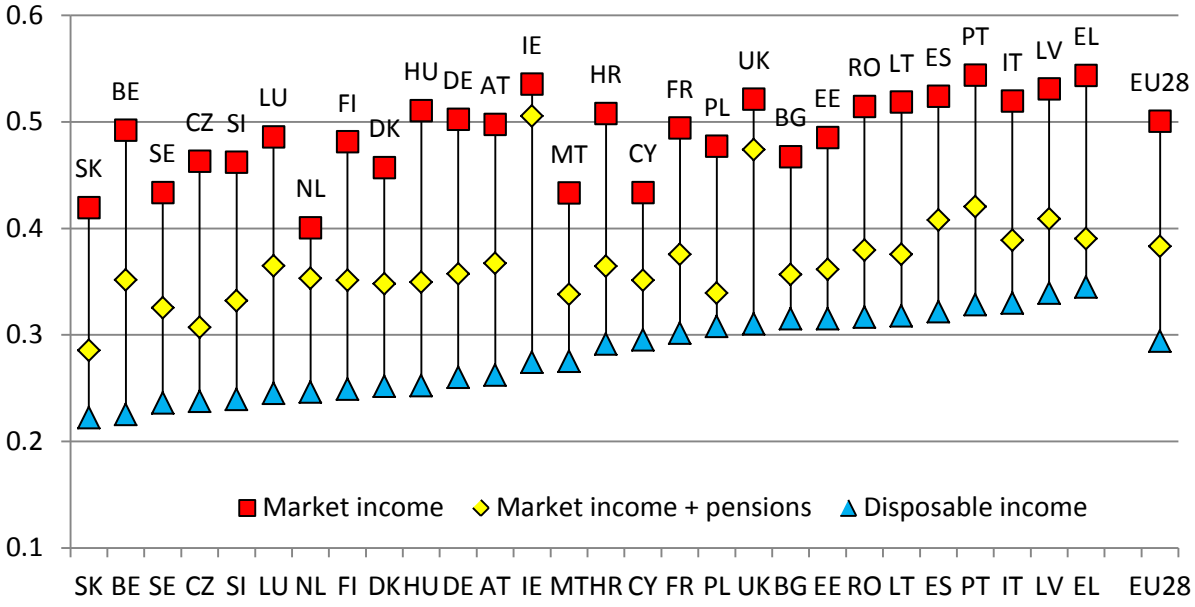
/continued

	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	2011	0.222	0.241	0.240	0.244	0.235	0.420	0.286
	2015	0.226	0.241	0.245	0.246	0.240	0.420	0.286
Finland	2011	0.249	0.288	0.280	0.292	0.259	0.481	0.351
	2015	0.243	0.285	0.275	0.290	0.255	0.482	0.352
Sweden	2011	0.236	0.253	0.286	0.275	0.240	0.434	0.325
	2015	0.237	0.253	0.285	0.276	0.240	0.434	0.324
UK	2011	0.310	0.401	0.343	0.351	0.327	0.521	0.474
	2015	0.313	0.398	0.345	0.354	0.329	0.522	0.473
EU-28	2011	0.294	0.329	0.315	0.332	0.302	0.501	0.383
	2014	0.293	0.327	0.312	0.333	0.302	0.501	0.383

Source: EUROMOD version G3.0+.

Notes: EUROMOD figures for all countries are based on SILC 2012 (2011 incomes), except for those for the UK which are based on FRS 2012/13.

Figure 2 Income inequality (Gini coefficient) and the role of public pensions and non-pension benefits and taxes (2011 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 too much influenced by "outliers", although such values are in principle plausible. Table 5 shows the mean and median METR for each of the five (or four) policy systems.

Table 5 Mean and median Marginal effective tax rates: 2011-2014/15

		2011	2012	2013	2014	2015
Belgium	mean	52.2	52.0	52.2	52.1	53.0
	median	55.0	54.8	54.8	54.8	56.9
Bulgaria	mean	22.4	22.3	22.3	22.0	22.1
	median	21.6	21.6	21.6	21.6	21.6
Czech Republic	mean	27.3	27.4	28.2	27.5	27.5
	median	31.1	31.1	31.1	31.1	31.1
Denmark	mean	44.2	44.5	44.2	43.5	43.5
	median	41.7	41.7	42.1	41.8	42.0
Germany	mean	51.6	45.2	44.1	44.3	49.8
	median	44.8	44.7	44.5	44.6	45.1
Estonia	mean	23.5	23.9	23.4	23.8	22.4
	median	24.0	24.8	24.2	24.2	22.9
Ireland	mean	41.9	42.3	42.5	41.8	41.8
	median	49.2	51.0	50.0	50.0	49.8
Greece	mean	28.8	27.4	29.6	29.7	28.6
	median	29.0	28.0	27.0	27.0	26.7
Spain	mean	23.9	24.9	24.8	24.7	23.7
	median	28.8	29.5	29.5	29.5	29.3
France	mean	32.5	33.1	36.8	37.6	38.1
	median	30.2	30.4	32.2	33.4	37.0
Croatia	mean	27.7	28.5	28.6	28.6	27.0
	median	30.2	30.2	30.2	30.8	30.2
Italy	mean	38.1	38.4	38.5	40.2	41.0
	median	39.8	40.0	39.9	42.7	42.9
Cyprus	mean	18.1	18.5	18.4	23.0	23.3
	median	8.2	8.5	8.5	14.6	14.6
Latvia	mean	34.5	34.4	32.6	31.2	30.3
	median	33.3	33.3	32.4	32.0	31.1
Lithuania	mean	28.0	27.4	27.3	26.9	n/a
	median	27.0	27.0	27.0	27.9	n/a
Luxembourg	mean	43.1	42.5	43.8	43.9	n/a
	median	42.7	42.3	44.5	45.0	n/a
Hungary	mean	38.7	39.0	36.4	35.9	n/a
	median	37.8	34.5	34.5	34.5	n/a
Malta	mean	25.7	25.9	26.0	25.2	n/a
	median	25.0	25.0	25.0	25.0	n/a
Netherlands	mean	39.3	39.7	39.4	39.0	38.5
	median	42.6	45.0	42.0	44.0	44.3
Austria	mean	39.8	40.2	40.7	40.9	41.3
	median	44.3	44.3	44.3	44.4	44.4
Poland	mean	27.2	27.3	27.6	27.6	27.8
	median	30.3	30.3	30.3	30.3	30.3

Portugal	mean	29.1	27.6	32.6	32.8	31.2
	median	25.0	25.0	25.5	25.5	25.5
Romania	mean	33.8	33.3	33.0	33.8	n/a
	median	31.9	31.9	31.9	31.9	n/a
Slovenia	mean	33.7	35.5	34.7	36.3	n/a
	median	33.6	34.2	33.4	34.6	n/a
Slovakia	mean	28.9	28.8	31.0	30.8	31.2
	median	29.9	29.9	29.9	29.9	29.9
Finland	mean	41.5	42.1	42.6	43.3	43.9
	median	43.4	44.0	44.2	45.0	45.2
Sweden	mean	35.9	35.9	35.9	35.2	35.5
	median	31.8	31.9	32.0	28.6	28.7
United Kingdom	mean	40.2	39.8	38.6	38.3	38.2
	median	33.8	33.6	33.5	33.5	33.5

Source: EUROMOD version G3.0+.

Notes: EUROMOD figures for all countries are based on SILC 2012 (2011 incomes), except for those for the UK which are based on FRS 2012/13.

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 in this section assume full take-up of benefits in all countries. In Bulgaria, Greece, Italy and Romania, 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 2011 include Cyprus, Bulgaria, Estonia and Spain, and those with high mean rates (over 40%) include Belgium, Germany, Denmark, Luxembourg, Ireland, Finland and the UK. Belgium and Germany have mean METRs in excess of 50%.[13]

Over the period 2011 to 2015 (or 2014) mean METRs do not change considerably in most EU countries. The biggest decline is estimated in Latvia and Hungary and the biggest increase in France and Cyprus. In the case of Latvia this evolution is mostly related to the gradual decrease of the income tax which was previously raised as part of the austerity package.

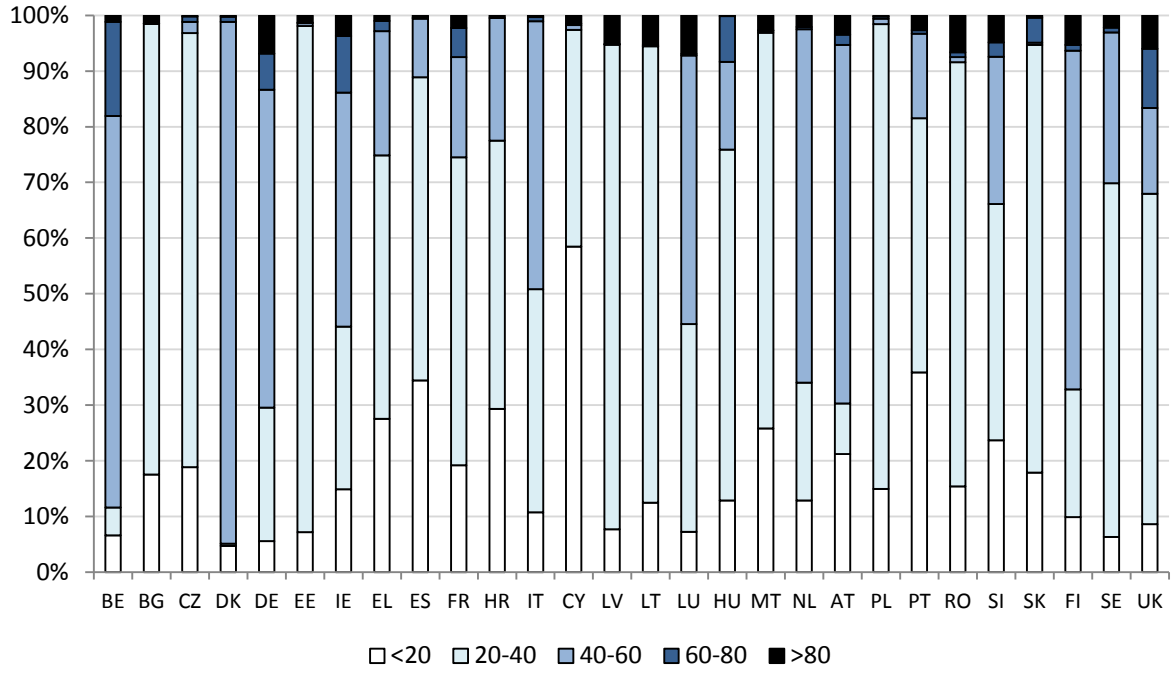
As well as averages, the distribution of METRs is also of interest. Figure 3 shows, for the 2011 policy systems, the shares of the populations in paid work who face METRs in certain ranges: under 20%, 20% to under 40%, 40% to under 60%, 60% to under 80% and 80% and above.

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

[13] Note that these rates are affected by the way statutory social insurance contributions are split between employees and employers; the latter are not part of this analysis.

there are large shares of the population in paid work both with relatively low and relatively high marginal rates (Ireland, Italy, Luxembourg. Slovenia). 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 higher in Luxembourg, Germany, Romania, the UK, Lithuania, Finland and Latvia.

Figure 3 Marginal effective tax rates 2011: share of population in paid work (%) by range of METR



Source: EUROMOD version G3.0+.

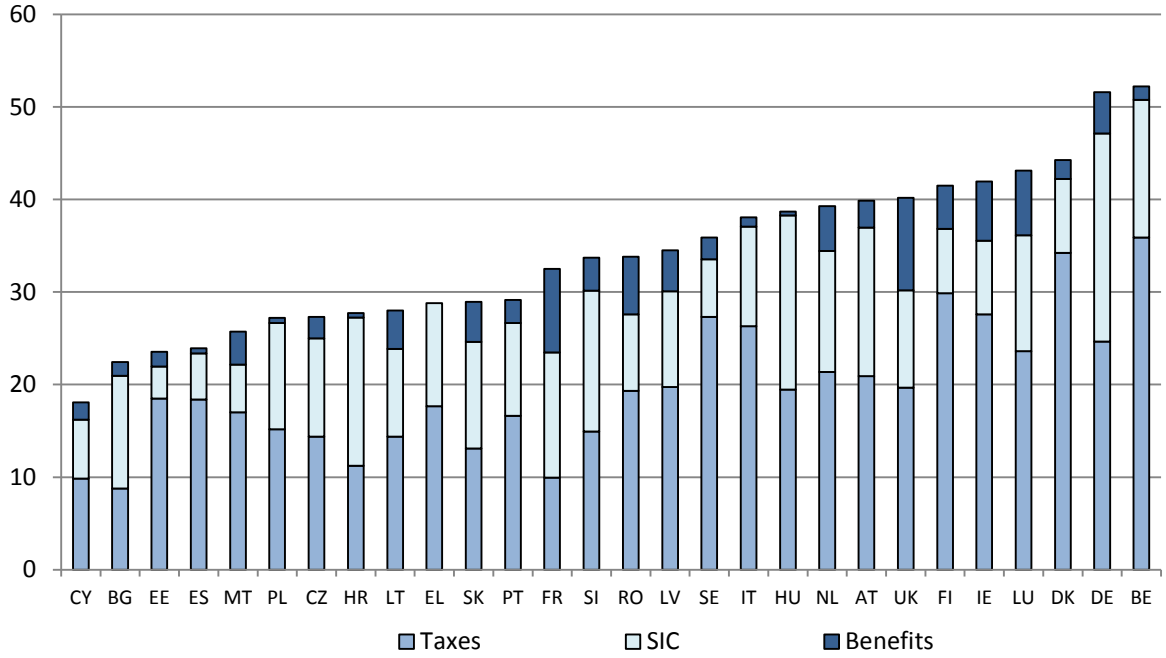
Notes: EUROMOD figures for all countries are based on SILC 2012 (2011 incomes), except for those for the UK which are based on FRS 2012/13.

Finally, Figure 4 presents the decomposition by components of mean METR for each country in policy year 2011. 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, France and Croatia to relatively high values (i.e. above 30%) in Belgium and Denmark. Social insurance contributions are the second most important component of the mean METR, ranging from 3.4% in Estonia to above 18% in Germany and Hungary. 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 benefits withdrawal component is the smallest, with sizable effect (i.e. more than 5%) only in the UK, France, Luxembourg, Romania and Ireland, countries characterised by important means-tested benefits.

Figure 4 Marginal effective tax rates (%) by income component, 2011



Source: EUROMOD version G3.0+.

Notes: EUROMOD figures for all countries are based on SILC 2012 (2011 incomes), except for those for the UK which are based on FRS 2012/13.

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).[14] But we cannot (usually) *validate* (ex ante) estimates of the effects of policy changes because no independent measures usually exist.

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

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 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 can be 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).[15] 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 (as in Portugal). It may also be under- or over- estimated because of under- or over-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, might lead to EUROMOD over-simulating means-tested benefits in some instances (for more detailed information see the EUROMOD Country Reports). 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 (see Appendix 3). 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

[15] Note that EUROMOD simulates policies as in 30th June of each year.

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.

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 2012 (as provided by Eurostat on its website) with broadly equivalent estimates from EUROMOD using 2011 policies and incomes. Given that EUROMOD uses 2012 SILC as its input data, one would expect the estimates for 2011 incomes (using 2012 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 2012 in most countries: see Appendix 2; statistics provided by Eurostat use the most recent release. 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 2012/13. 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 7a 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).[16] 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.
- In constructing the input information used in the calculation of tax liabilities and benefit entitlements it is important that the two 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.[17] We have not top- or bottom- coded the EUROMOD household

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

disposable income variable. It is not clear whether Eurostat does this in their calculations of inequality indexes.

- Finally, as mentioned above our use of simulated values for benefits and taxes without allowing for non take-up of benefits nor tax evasion will tend to make the income distribution appear less unequal and, at least usually, risk of poverty rates smaller than those calculated using the SILC directly, which itself may be subject to measurement errors. Adjustments have been made to account for benefit non take-up in a number of countries (see Appendix 3).

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 2012 SILC. The exceptions are Luxembourg, Belgium, Germany and Hungary where they are substantially lower (i.e. more than 2 percentage points). They are also notably lower using EUROMOD for particular groups, such as the elderly in Ireland, Denmark, Sweden, Belgium and Lithuania and children in Luxembourg, Slovakia and Hungary (i.e. more than 5 percentage points). Inequality, as measured by the Gini coefficient, also tends to be lower using EUROMOD simulated incomes, particularly so in Belgium, Luxembourg and Slovakia. In understanding these discrepancies among the factors to be taken into account are the following:

- Over-simulation of some particular means-tested benefits can 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.[18] For example (a) social assistance in Slovakia leading to underestimation of poverty rates, and (b) 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 Ireland. This discrepancy is also driven by the oversimulation of pensions in EUROMOD. Comparisons of the threshold itself are only straightforward for the euro-zone countries.[19] Among those the difference is small in most cases and only more than 5% of the Eurostat estimate in Spain, Portugal and France. In the case of Spain this difference is partly due to the backward revisions in SILC that are not part of the EUROMOD input data.

- 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.

[18] 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.

[19] 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 2011.

- In Luxembourg differences between the two estimates are mostly due to the exclusion of households with at least one international civil servant from the EUROMOD input dataset.

Table 6 Comparison of EUROMOD output poverty and inequality statistics for 2011 with Eurostat estimates from the EU-SILC 2012 UDB

		Poverty Risk: all			Poverty risk (60%)		Poverty threshold	Gini coefficient
		50%	60%	70%	age <18	age>=65	(60% median) €/year	
Belgium	Eurostat	8.3	15.3	24.3	17.3	19.4	12,168	26.5
	EUROMOD	6.7	12.5	20.0	14.5	14.1	11,653	22.6
Bulgaria	Eurostat	15.1	21.2	28.3	28.2	28.2	1,715	33.6
	EUROMOD	13.4	19.9	26.9	25.1	26.9	1,695	31.5
Czech Republic	Eurostat	5.1	9.6	16.6	13.9	6.0	4,675	24.9
	EUROMOD	4.8	8.9	16.3	11.8	4.9	4,685	23.8
Denmark	Eurostat	7.7	13.1	21.4	10.2	14.1	15,948	28.1
	EUROMOD	6.7	11.4	18.8	8.7	8.0	15,658	25.2
Germany	Eurostat	9.6	16.1	23.6	15.2	15.0	11,755	28.3
	EUROMOD	6.0	13.4	22.1	13.3	13.8	11,789	26.0
Estonia	Eurostat	10.9	17.5	26.7	17.0	17.2	3,591	32.5
	EUROMOD	10.6	18.2	26.7	17.0	19.4	3,633	31.5
Ireland	Eurostat	8.8	15.7	23.6	18.0	12.2	11,447	29.9
	EUROMOD	6.5	15.8	24.9	20.2	1.8	11,763	27.5
Greece	Eurostat	16.0	23.1	30.4	26.9	17.2	5,676	34.3
	EUROMOD	15.1	21.7	28.9	24.3	14.9	5,762	34.5
Spain	Eurostat	14.4	20.8	28.9	27.9	14.8	8,318	34.2
	EUROMOD	14.3	21.7	29.0	28.1	16.7	7,369	32.2
France	Eurostat	6.9	14.1	21.6	19.0	9.4	12,363	30.5
	EUROMOD	6.1	12.5	20.5	16.7	7.5	11,693	30.2
Croatia	Eurostat	14.1	20.4	27.5	23.3	25.6	3,226	30.9
	EUROMOD	12.7	19.6	25.8	20.3	26.1	3,225	29.2
Italy	Eurostat	12.2	19.4	26.8	26.0	16.3	9,617	31.9
	EUROMOD	11.4	19.0	26.5	25.2	15.8	9,437	33.0
Cyprus	Eurostat	8.0	14.7	23.9	13.9	29.3	10,156	31.0
	EUROMOD	6.5	13.8	22.2	12.1	31.2	10,333	29.6
Latvia	Eurostat	13.5	19.2	28.2	24.4	13.9	2,675	35.7
	EUROMOD	11.2	17.9	27.2	22.5	10.2	2,515	33.9
Lithuania	Eurostat	11.3	18.6	27.0	20.8	18.7	2,602	32.0
	EUROMOD	10.8	17.8	26.8	20.2	13.7	2,487	31.8

/continued

		Poverty Risk: all			Poverty risk (60%)		Poverty threshold	Gini coefficient
		50%	60%	70%	age <18	age>=65	(60% median) €/year	
Luxembourg	Eurostat	7.1	15.1	24.7	22.6	6.1	19,667	28.0
	EUROMOD	1.3	8.8	22.3	12.6	2.0	19,514	24.5
Hungary	Eurostat	8.2	14.0	21.5	22.6	6.0	2,852	26.9
	EUROMOD	5.5	11.7	20.2	17.3	8.4	2,632	25.2
Malta	Eurostat	7.4	15.1	24.5	23.1	17.3	6,869	27.1
	EUROMOD	9.3	16.8	25.9	24.1	16.5	6,905	27.5
Netherlands	Eurostat	5.2	10.1	17.9	13.2	5.5	12,337	25.4
	EUROMOD	4.5	10.3	18.7	14.2	4.4	12,781	24.6
Austria	Eurostat	8.4	14.4	21.6	17.5	15.1	13,084	27.6
	EUROMOD	8.0	13.6	21.5	16.2	11.8	12,754	26.2
Poland	Eurostat	10.5	17.1	24.9	21.5	14.0	3,034	30.9
	EUROMOD	10.5	17.2	24.8	21.4	13.4	3,091	30.8
Portugal	Eurostat	11.4	17.9	24.9	21.8	17.4	4,994	34.5
	EUROMOD	10.9	17.6	25.0	21.5	15.0	5,275	32.9
Romania	Eurostat	16.5	22.6	29.5	34.6	15.4	1,270	33.2
	EUROMOD	15.6	21.9	28.5	32.7	13.7	1,273	31.7
Slovenia	Eurostat	7.4	13.5	20.7	13.5	19.6	7,273	23.7
	EUROMOD	7.4	13.7	21.1	12.7	18.4	7,033	24.0
Slovakia	Eurostat	7.8	13.2	20.4	21.9	7.8	4,156	25.3
	EUROMOD	5.5	11.1	17.9	17.7	4.8	3,841	22.2
Finland	Eurostat	6.0	13.2	21.8	11.1	18.4	13,619	25.9
	EUROMOD	5.2	12.1	20.8	11.3	14.7	13,268	24.9
Sweden	Eurostat	7.8	14.1	21.9	14.6	17.7	14,783	24.8
	EUROMOD	7.5	13.3	21.7	15.3	12.2	14,535	23.6
United Kingdom	Eurostat	9.2	16.0	24.6	18.0	16.4	11,501	31.3
	EUROMOD	7.9	14.5	23.2	15.3	13.3	9,481	31.0

Source: Eurostat website (accessed 15/10/2015); EUROMOD version G3.0+.
Notes: EUROMOD figures for all countries are based on SILC 2012 (2011 incomes), except for those for the UK which are based on FRS2012/13. In the case of Spain the backward revisions in SILC (depicted in the Eurostat estimates) are not part of the EUROMOD input data.

- In the UK the comparisons are made not only with respect to SILC 2012 but also with respect to HBAI 2012/13 as shown below in Table 7a. 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 Eurostat/HBAI.

Table 6a UK comparisons of poverty risk for 2011 incomes

	Poverty risk: all			Poverty risk (60%)		Gini coefficient
	50%	60%	70%	age <18	age>=65	
Eurostat SILC 2012	9.2	16.0	24.6	18.0	16.4	31.3
HBAI 2011 incomes	9.0	16.0	25.0	17.0	16.0	34.0
EUROMOD 2011 incomes	7.9	14.5	23.2	15.3	13.3	31.0

Source: Eurostat website (accessed 15/10/2015); EUROMOD version G3.0+

6. Conclusions and next steps

The results from EUROMOD shown above are both limited to some key statistical indicators of the baselines for 2011-2014/15 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 2012 (and later) policies can also take account of the effects of the economic downturn and recovery. Research performed on 25 EU countries suggests that in countries where there have been significant changes such adjustments can

make a considerable difference to estimates of poverty and inequality and the effects of policies.[20]

- 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, as well as the use of the disaggregated benefit variables included in SILC 2014 onwards for a selection of EU countries.

[20] Rastrigina O., Leventi C., Vujackov S. and Sutherland H. *(*2016) *Nowcasting: estimating developments in the risk of poverty and income distribution in 2014 and 2015,* Social Situation Monitor Research Note 1/2015 (forthcoming).

Appendix 1 National teams contributing to EUROMOD G3.0+

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) – Marta Ana Adiego Estella
France	Université de la Méditerranée, Marseille – Laurence Bouvard
Croatia	Institute of Public Finance – Ivica Urban
Italy	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	Lithuanian Social Research Centre, Lithuania – Viginta Ivaškaitė-Tamošiūnė
Luxembourg	LISER – 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	Lisboa School of Economics & Management - 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 Statistics Sweden - Klas Lindström
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 2012-3
Bulgaria	EU-SILC version 2012-1
Czech Republic	EU-SILC version 2012-1
Denmark	EU-SILC version 2012-2
Germany	EU-SILC version 2012-1
Estonia	EU-SILC (UDB 2012-1) & national SILC variables
Ireland	EU-SILC version 2012-2
Greece	National SILC 2012 (UDB & PDB versions)
Spain	National SILC 2012 (release date 30/10/2013)
France	National SILC (SRCV 2012-lil-0901)
Croatia	EU-SILC version 2012-1
Italy	National SILC 2012-1
Cyprus	EU-SILC version 2012-1
Latvia	EU-SILC version 2012-1
Lithuania	EU-SILC (UDB 2012-1) & national SILC variables
Luxembourg	EU-SILC (UDB 2012-2) & national SILC variables
Hungary	EU-SILC version 2012-1
Malta	EU-SILC version 2012-1
Netherlands	EU-SILC version 2012-1
Austria	National SILC 2012-1
Poland	EU-SILC (UDB 2012-1) & national SILC variables
Portugal	EU-SILC version 2012-1
Romania	EU-SILC version 2012-1
Slovenia	EU-SILC version 2012-1 & national SILC variables
Slovakia	National SILC 2012 (release date 20/01/14)
Finland	EU-SILC version 2012-1
Sweden	EU-SILC version 2012-1
United Kingdom	Family Resources Survey 2012/13

We are grateful for access to micro-data from the EU Statistics on Incomes and Living Conditions (EU-SILC) made available by Eurostat under contract 59/2013-EU-SILC-LFS, the Estonian version of the EU-SILC made available by Statistics Estonia, the Greek UDB and PDB versions of SILC made available by the Greek Statistical Office, the Spanish version of SILC made available by the National Statistics Institute of Spain, the French version of SILC made available by Reseau Quetelet, the Italian version of the EU-SILC made available by ISTAT, the Lithuanian version of the EU-SILC made available by the Lithuanian Department of Statistics, the Luxembourgish version of SILC made available by the Luxembourg Statistical Office, the Austrian version of the EU-SILC made available by Statistics Austria, the Polish version of SILC made available by the Polish Statistical Office, the Slovakian version of SILC made available by the Slovakian 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 **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 **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 **Romania** all self-employed in agriculture living in rural areas and with a self-employment income below the average wage are assumed to evade taxes.

Full compliance is assumed for both income taxes and social insurance contributions for the rest of the countries.

- **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 **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)[21] 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** a random non take-up correction is simulated for unemployment assistance benefit for long-term unemployed. The receipt of social dividend (a lump-sum benefit only provided in 2014) was restricted to the amount of the primary budget surplus that was allocated to the benefit, i.e. approximately €450 million. 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. 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 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 **Latvia** non take up is simulated for paternity benefit based on the benefit receipt observed in the data.

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

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

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.

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.

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).

Full take-up is assumed for all simulated means-tested benefits for the remaining EU countries.