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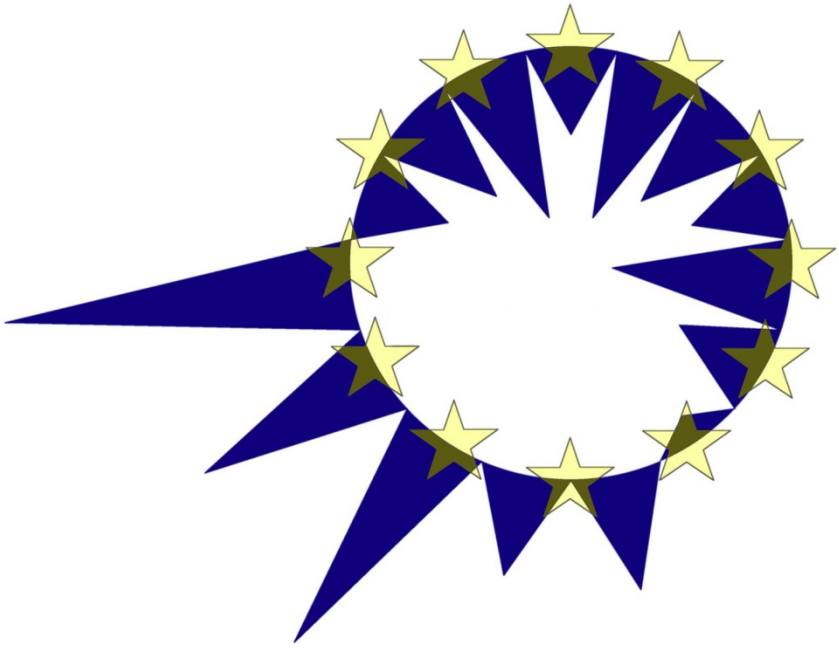

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Baseline results from the EU27 EUROMOD (2009-2012)

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Baseline results from the EU27 EUROMOD (2009-2012)[1]

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with

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Abstract

This paper presents baseline results from the latest version of EUROMOD (version F6.36+), 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 2012. 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 EM3/2013.

JEL: C15; H24; H31; H55; I3

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

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1. Introduction

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

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

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

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

The next section provides a brief description of the project and its mode of working. This is followed, in section 3, by a presentation of estimates of poverty and income inequality calculated using incomes simulated by EUROMOD for 2009 policies, based on micro-data from the EU-SILC. These calculations cover 27 countries and provide a "baseline" or starting point for any simulations of changes that EUROMOD users may carry out. The next section assesses the quality of the data and simulations behind these results and explains why they differ from estimates calculated using the EU-SILC data on household income directly. The comparison is restricted to countries using EU-SILC 2010 as input data in EUROMOD.[4] Section 5 shows how indicators of poverty and inequality differ under later policy regimes (up to 2012). Section 6 describes estimates of Marginal Effective Tax Rates using EUROMOD and section 7 concludes and presents the next steps for EUROMOD.

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

[3] https://www.iser.essex.ac.uk/publications/working-papers/euromod/em3-13

[4] Comparisons between indicators from EU-SILC 2008 and EUROMOD using 2007 policies and incomes can be found at: https://www.iser.essex.ac.uk/publications/working-papers/euromod/em3-13.pdf. Comparisons for a sub-set of 18 countries for 2006 policies and income data can be found at https://www.iser.essex.ac.uk/publications/working-papers/euromod/em1-12.pdf

2. The EUROMOD*update2* project

With the support of Progress funding the EUROMOD*update2* 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 2012) as well as those corresponding to the income reference period in the SILC data (2007 and 2009 in this release).

The results reported below are, with some exceptions, based on the EU-SILC of 2008 (2007 incomes) and EU-SILC 2010 (2009 incomes).[5] The model has been built with the collaboration of national teams, which are listed in Annex 1. In all 27 countries policy systems have been updated to cover years 2007-2012. In twelve countries (Belgium, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia and Spain) input data have been updated to EU-SILC 2010 and in the UK to FRS2009/10. There were 4 key tasks: (1) updating the input database, (2) updating policy systems for 2012 and 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.[6] However, the UDB does not contain all the information needed to inform tax-benefit calculations, in most countries. Where possible we have explored the possibility of merging variables from the underlying national data (often referred to as the "national SILC") into the EUROMOD input database that we create from the UDB. Eurostat has helpfully given us explicit permission to do this. However, whether NSIs agree to this, and for the merged data to be made available to EUROMOD users, is a matter for them and requires negotiation between us and them on a bilateral basis. As documented in Annex 2 in some cases this has been straightforward; in other cases the process is still ongoing.

In some countries it is possible to use the "national SILC" as an alternative (rather than a supplement) to the UDB. We have 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 is obviously imprecise and has implications for the results.

As part of the EUROMOD*update2* project, Belgium, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia and Spain have updated input databases to EU-SILC 2010. For the UK, the input data has been updated to the Family Resources Survey for 2009/10. The baseline results presented in this report are based on:

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

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

(a) SILC 2010 for Belgium, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia and Spain
(b) Family Resources Survey for 2009/10 for the UK
(c) SILC 2009 for Malta (these are the first micro-data to be available for Malta)
(d) SILC 2008 for the remaining countries.

- **Updating policy systems for 2011 and 2012**

Based on detailed descriptions of policies provided by national teams, 2011 and 2012 policies have been modelled using the EUROMOD tax-benefit modelling "language" for all 27 countries. Together with updating factors, to bring 2007 incomes from the 2008 EU-SILC data and 2009 incomes from 2010 EU-SILC data up to the level in each policy year (2008, 2009, 2010, 2011, 2012), it is now possible to simulate policies from each of these years for each of the 27 countries. These five alternative "baselines" also form the starting points for modelling possible reforms, making use of the EUROMOD language.

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

In some cases it is possible to part-simulate eligibility, using assumptions based on the information that is available. For example, in this project we are simulating entitlement to unemployment benefits using information in the EU-SILC about number of years in work and how much individuals worked in the previous 12 months. In some countries the user is offered the choice over whether to use the recorded or simulated values of unemployment benefits in 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.[7] 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".

[7] 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*. DOI: 10.1111/roiw.12035

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 and why the baseline results from EUROMOD do and do not correspond to other estimates.[8]

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 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 Annex 3 for a country-by-country description of the treatment of these issues.

- **Country Report**

Each national team has produced a country report conforming to common guidelines in terms of style and content. The intention is to provide comprehensive documentation for EUROMOD users and as a reference for developers and national teams in the future. [9]

3. Baseline poverty and inequality indicators

Table 1 presents selected poverty and inequality indicators for 2009 incomes and policies. Risk of poverty rates for the whole population of each of the 27 countries are shown for three poverty thresholds: 50%, 60% and 70% of national median equivalised household incomes (using the modified OECD equivalence scale). Risk of poverty for children (aged under 18) and older people (aged 65 or more) using the 60% threshold are also shown. A commonly used indicator of income inequality is also shown: the Gini coefficient. The statistics are also shown for the EU-27 combined, first showing the mean of the 27 country values

[8] It should be noted that external statistics are often available only with a time lag and macrovalidation of 2012 policies typically cannot be finalised until late 2013 or 2014. Later Country Reports will report on this.

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

("unweighted") and secondly showing the value for the EU-27 population ("weighted"). In the remainder of this paper we provide weighted EU-27 statistics only.

Table 1 EUROMOD poverty and inequality statistics 2009 incomes and policies

	Poverty risk: all			Poverty risk (60%)		Gini coefficient (%)
	50%	60%	70%	age <18	age>=65	
Belgium	5.3	10.8	19.4	12.0	15.4	22.5
Bulgaria	12.3	18.2	27.0	23.9	21.8	32.8
Czech Republic	3.8	7.7	15.4	11.2	5.5	23.8
Denmark	4.5	10.9	20.0	7.5	17.1	23.0
Germany	6.0	12.7	21.1	12.7	12.8	26.4
Estonia	9.6	16.7	25.9	16.8	25.0	29.7
Ireland	5.0	13.4	23.9	17.1	17.1	25.0
Greece	11.8	19.4	26.1	23.4	19.0	32.1
Spain	14.3	20.4	27.3	26.8	19.6	30.8
France	5.3	10.5	19.1	12.1	9.1	28.3
Italy	11.2	17.7	26.1	23.3	14.1	30.7
Cyprus	7.1	14.6	22.5	11.8	47.7	26.9
Latvia	13.9	20.9	28.6	27.7	13.2	34.9
Lithuania	12.1	19.6	27.8	21.6	9.5	35.3
Luxembourg	1.3	7.7	17.0	10.0	1.9	24.4
Hungary	6.3	11.7	19.3	20.1	3.1	23.6
Netherlands	4.0	10.8	18.7	14.5	6.1	26.3
Malta	9.1	16.6	25.1	19.9	22.2	27.7
Austria	4.9	10.7	19.0	12.8	10.1	24.9
Poland	10.0	16.7	24.8	21.7	12.8	31.6
Portugal	11.2	18.9	27.6	21.3	26.7	34.7
Romania	16.1	21.9	28.9	30.2	18.9	32.8
Slovenia	7.2	12.9	20.3	12.4	19.3	24.0
Slovakia	5.0	9.9	16.3	15.6	4.5	23.4
Finland	5.3	12.3	21.5	13.0	17.5	24.9
Sweden	6.1	11.5	21.1	12.9	10.5	22.9
United Kingdom	8.8	15.6	24.6	17.9	14.2	32.4
EU-27 (unweighted)	8.1	14.5	22.8	17.4	15.4	28.0
EU-27 (weighted)	8.7	15.0	23.2	18.2	13.7	29.1

Source: EUROMOD version F6.36+.

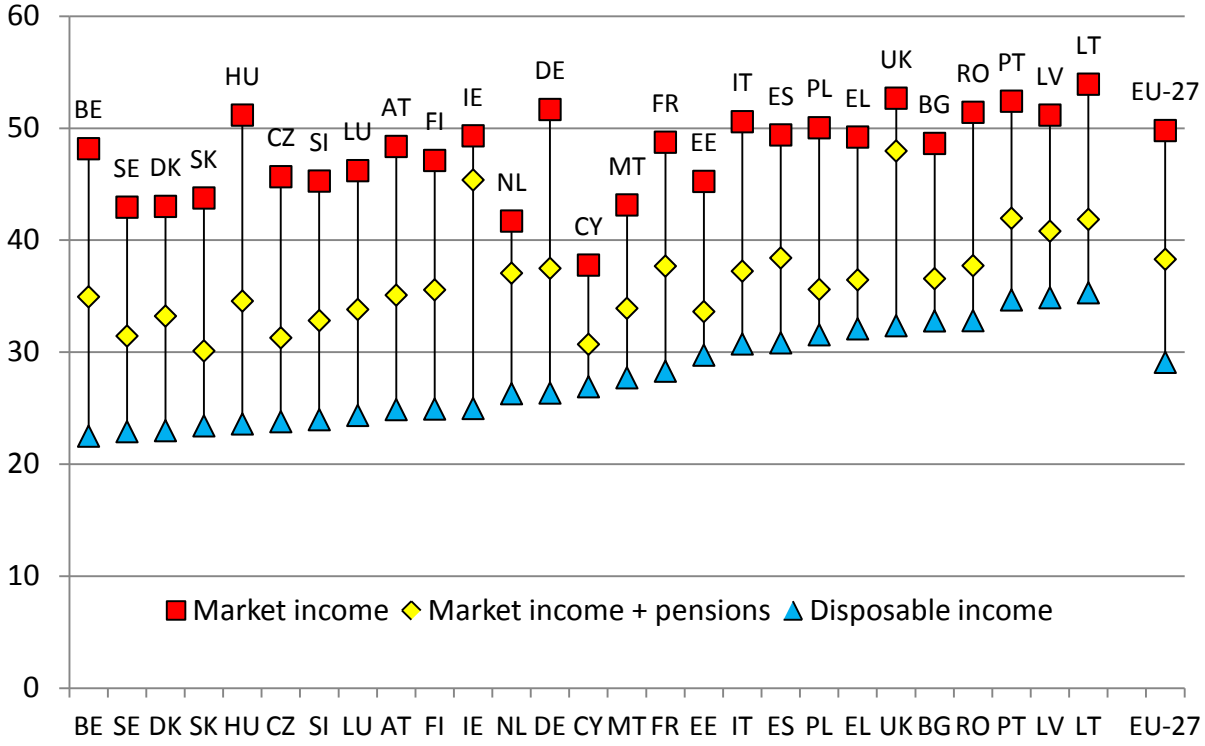
Notes: EUROMOD figures for Belgium, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia and Spain are based on SILC 2010 (2009 incomes), those for Malta are based on SILC 2009 (2008 incomes), updated, and those for UK are based on FRS2009/10. Figures for the remaining countries are based on SILC 2008 (2007 incomes), updated.

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

The EUROMOD baselines can be used in many different ways that complement analysis using the SILC directly. One example is illustrated in Figure 1. This shows the role of some components of household income in reducing income inequality. The Gini coefficient for disposable income (as in Table 1) is plotted using triangles, and countries have been ranked

according to the value of this indicator.[10] The country with the lowest disposable income inequality is Belgium and that with the highest is Lithuania. Considering inequality of market incomes, shown by the squares, Cyprus has the lowest inequality and Lithuania the highest. It is clear that taxes and benefits play a very varied role in reducing inequality with the largest absolute reduction in Hungary and Belgium and the smallest in Cyprus.

Figure 1 Income Inequality (Gini coefficient expressed as %) and the role of public pensions and non-pension benefits and taxes (2009 incomes and policies)



Source: EUROMOD F6.36+.

Notes: EUROMOD figures for Belgium, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia and Spain are based on SILC 2010 (2009 incomes), those for Malta are based on SILC 2009 (2008 incomes), updated, and those for UK are based on FRS2009/10. Figures for the remaining countries are based on SILC 2008 (2007 incomes), updated. Countries are ranked by the value of the Gini coefficient for disposable income.

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

[10] Note that the differences between countries are not necessarily statistically significant.

effectiveness in reducing income inequality across countries. They have a relatively large role compared with other countries in Ireland, the UK, Belgium, Hungary, Germany and the Netherlands and a relatively small role in Bulgaria, Cyprus, Estonia, Poland and Romania.

4. Assessing the results

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

- **Comparison with external aggregate statistics**

This is the process known as "macro-validation" and the comparisons for each country are documented in detail in the Country Reports. Comparisons are made between the weighted number of recipients/payers for each policy instrument in the EUROMOD baseline (simulated or not simulated) with equivalent numbers taken from national administrative statistics for the same period. Similarly the amount of annual expenditure or revenue is compared for EUROMOD and national administrative estimates. Comparisons are often not straightforward to carry out or are inconclusive for a number of reasons. First, the administrative statistics may refer to a different reference time period or unit of analysis than EUROMOD (this applies particularly to recipients/payers of an instrument). Secondly, the administrative statistics may not refer to the same distinct instruments or income components that are itemised in EUROMOD. They may refer to sub-instruments or to combinations of several income components. Thirdly, in some countries for some instruments the statistics may only be available at regional level. In some cases they are only available with a long time delay and in others they are not made publically available at all.

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

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

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

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

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

4) As indicated above non take-up of benefits, or the application of local discretion in the awarding of benefits, leads to EUROMOD over-simulating means-tested benefits in many instances (see also Annex 3). In many countries social assistance receipt is over-simulated by a factor 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 Annex 3.

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

Table 2 compares some indicators of poverty and inequality from 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, for those countries for which the results are based on EU-SILC 2010.[11] Given that EUROMOD uses 2010 SILC as its input data for the countries presented in Table 2 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 out of line, this may suggest some problem with the simulations or the input data. However, there are many reasons why the two sets of estimates should not be expected to be identical. These include:

- The release of EU-SILC: EUROMOD uses release 2 of EU-SILC 2008 and release 1 of EU-SILC 2010 in most countries: see Annex 2. Statistics provided by Eurostat use the most recent release, we assume. To the extent that the relevant data change between releases, we would expect differences in the indicators from the two sources.

- 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 2b below.

[11] Comparisons between indicators from EU-SILC 2008 (as provided by Eurostat on its web site and through New Cronos) and indicators from EUROMOD using 2007 policies and incomes can be found at: https://www.iser.essex.ac.uk/publications/working-papers/euromod/em3-13.pdf

- 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 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 unequal and, at least usually, risk of poverty rates less high than those calculated using the SILC directly, which itself may be subject to measurement errors. Adjustments have been made to account for non take-up in Belgium, Estonia, France, Greece, Ireland, Romania and the UK, and for tax evasion in Bulgaria, Greece and Italy.[14]

[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.

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

Table 2 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 (60%median) €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Belgium	Eurostat	7.9	14.6	23.8	18.3	19.4	11,678	26.6
	EUROMOD	5.3	10.8	19.4	12.0	15.4	11,372	22.5
Germany	Eurostat	9.2	15.6	23.2	17.5	14.1	11,278	29.3
	EUROMOD	6.0	12.7	21.1	12.7	12.8	10,835	26.4
Greece	Eurostat	12.4	20.1	27.2	23.0	21.3	7,178	32.9
	EUROMOD	11.8	19.4	26.1	23.4	19.0	7,372	32.1
Spain	Eurostat	14.4	20.7	28.1	26.2	21.7	7,818	33.9
	EUROMOD	14.3	20.4	27.3	26.8	19.6	8,178	30.8
France	Eurostat	7.5	13.3	21.6	17.9	10.6	12,035	29.8
	EUROMOD	5.3	10.5	19.1	12.1	9.1	11,992	28.3
Italy	Eurostat	11.6	18.2	26.0	24.7	16.6	9,562	31.2
	EUROMOD	11.2	17.7	26.1	23.3	14.1	9,010	30.7
Latvia	Eurostat	14.8	21.3	29.3	26.6	18.8	2,722	36.1
	EUROMOD	13.9	20.9	28.6	27.7	13.2	2,678	34.9
Lithuania	Eurostat	14.5	20.2	27.2	23.3	10.2	2,436	36.9
	EUROMOD	12.1	19.6	27.8	21.6	9.5	2,401	35.3
Hungary	Eurostat	6.0	12.3	19.8	20.3	4.1	2,544	24.1
	EUROMOD	6.3	11.7	19.3	20.1	3.1	2,463	23.6
Romania	Eurostat	15.0	21.1	27.6	31.3	16.7	1,222	33.3
	EUROMOD	16.1	21.9	28.9	30.2	18.9	1,216	32.8
Slovenia	Eurostat	7.3	12.7	19.7	12.6	20.2	7,042	23.8
	EUROMOD	7.2	12.9	20.3	12.4	19.3	6,857	24.0
Slovakia	Eurostat	7.8	12.0	19.0	18.8	7.7	3,670	25.9
	EUROMOD	5.0	9.9	16.3	15.6	4.5	3,500	23.4

Source: Eurostat web site and New Cronos (accessed07/04/2013); EUROMOD version F6.36+. Notes: Only countries for which EUROMOD figures are based on SILC 2010 (2009 incomes) are included.

The comparisons shown in Table 2 suggest that this is indeed the case. In most countries EUROMOD poverty rates for the populations (using three cut-offs: 50%, 60% and 70% of the median) are a little lower than those calculated by Eurostat using 2010 SILC. The exceptions are Belgium, France and Germany where they are consistently and substantially lower. They are also notably lower using EUROMOD for particular groups, such the elderly in Belgium, Latvia and Slovakia and children in Belgium, Germany and France. Inequality, as measured by the Gini coefficient, also tends to be lower using EUROMOD simulated incomes, particularly so in Belgium, Germany and Spain. 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) unemployment benefit II in Germany[16], which serves as a major social assistance for the working age poor, as well as old-age social assistance, leading to a low elderly poverty rate in EUROMOD relative to SILC (b) 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), (c) social assistance in Slovakia leading to underestimation of poverty rates in particular for the elderly, 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 (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).[17] Among those the difference is small in most cases and only more than 5% of the Eurostat estimate in Italy.
- Over-simulation of income taxes can lead to under-estimation of inequality and of median disposable income, and hence risk of poverty estimates. The main contributing factors are the existence of tax evasion, which is not typically captured, and the non-simulation of some tax deductions due to lack of necessary information.

    a) Tax evasion that is not yet accounted for in EUROMOD may mean that poverty thresholds are lower than they should be, leading to under-estimation of poverty particularly for groups who cannot or do not evade. This is 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

[15] It is worth noting that in some countries simulated means-tested benefits correspond very well to external statistics. As explained below, this is the case for example with unemployment benefit II in Germany. Higher poverty estimates in the SILC may also be due to under-reporting of benefits in the data.

[16] 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.

[17] 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.

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.

c) In order to provide an assessment of whether the lower median in EUROMOD calculations is sufficient to explain the lower risk-of poverty rates, Table 2a shows risk of poverty calculated using EUROMOD incomes but the Eurostat poverty thresholds. In Greece and Spain the Eurostat thresholds are in fact lower than those calculated by EUROMOD so the risk of poverty rates shown in Table 2a move further away from the Eurostat estimates than those shown in Table 2. In the remaining countries using the higher poverty threshold results in higher risk of poverty rates. In some the gap between EUROMOD and Eurostat estimates is narrowed but not removed completely (Belgium, Germany Latvia, Lithuania and Slovakia, as well as France to a small extent). In others the risk of poverty rate rises by too much, leading to over-estimates relative to Eurostat (Italy, Hungary, Romania and Slovenia).

Table 2a EUROMOD output poverty statistics for 2009 using Eurostat poverty thresholds from the EU-SILC 2010 UDB

	Poverty risk: all			Poverty risk (60%)		Poverty threshold (Eurostat) €/year
	50%	60%	70%	age <18	age>=65	60% median
Belgium	5.8	12.0	21.1	13.2	17.8	11,678
Germany	6.9	14.8	23.4	15.5	14.7	11,278
Greece	10.9	18.3	24.9	22.0	17.7	7,178
Spain	13.2	18.2	24.9	24.3	15.6	7,818
France	5.4	10.7	19.4	12.2	9.3	12,035
Italy	13.1	20.7	29.5	27.0	17.6	9,562
Latvia	14.6	21.5	29.3	28.0	14.8	2,722
Lithuania	12.5	20.2	28.3	22.3	10.7	2,436
Hungary	7.2	12.9	21.2	21.5	3.5	2,544
Romania	16.3	22.0	29.0	30.2	19.1	1,222
Slovenia	8.0	13.9	21.7	13.6	20.6	7,042
Slovakia	6.0	11.3	19.2	17.5	6.6	3,670

Source: Eurostat web site and New Cronos (accessed07/04/2013); EUROMOD version F6.36+.

Notes: Only countries for which EUROMOD figures are based on SILC 2010 (2009 incomes) are included.

- 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 2b. 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 2b: 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	9.8	17.1	25.5	20.3	21.4	0.33
EUROMOD 2009 incomes	8.8	15.6	24.6	17.9	14.2	0.32
HBAI 2009 incomes	10	17	25	20	18	0.36

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

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

Policies systems for years 2007 to 2012 are simulated for all 27 countries in EUROMOD allowing the analysis of the effect of policy changes on income redistribution. Table 3 shows some of the same statistics for the 2009 policy year as in Table 1, but contrasting them with statistics for the 2010, 2011 and 2012 policy years. This shows how policy changes in the period 2009-12 have affected poverty and inequality, abstracting from changes in population characteristics. Both sets of figures are based on the same input database. As above, this is the 2010 SILC for Belgium, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia and Spain, 2009 SILC for Malta, FRS 2009/2010 for the UK and 2008 SILC for the remaining countries.

Incomes that are not simulated (e.g. market incomes) are updated from 2007 to 2009, 2010, 2011 and 2012 when SILC 2008 input data are used and from 2009 to 2010, 2011 and 2012 when SILC 2010 input data are used, based on indexes for each income source separately as much as possible (e.g. earnings indexes for earnings). While the construction of these indexes has followed common guidelines, in this set of statistics for 2009 to 2012 it is possible that some of the cross-country differences, or in the effects 2009-12, 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. This is a particularly big issue in Malta for market incomes from investment and property. Although we derive special updating factors for these income sources, they are quite large and it is likely that the distribution of these incomes has changed: something about which we have no further information to support a more refined adjustment

Table 3 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 non-simulated incomes and policy reforms and routine uprating of policy over this period. In the non euro-zone countries it is also affected by fluctuations in the exchange rate. In few cases such as Estonia, Ireland, Greece and Spain poverty threshold decreases during this period. After 2010 patterns are consistent in most cases, with EUROMOD estimates showing nominal median incomes continuing to rise in the majority of countries, to fall consistently in Greece and Ireland, to rise in 2010-2011 and fall in 2012 in Portugal and to fluctuate over time in Spain. Fluctuations in non-euro zone

countries such as Poland and the UK are mainly due to exchange rate fluctuations. The trajectories can be compared with Eurostat's estimates of median income from the SILC up to 2010 incomes (not shown here but available on Eurostat's web site) which also capture the effects of changes to employment status and other characteristics over the period. In most countries the trajectories are similar to those shown for the years 2009-2010 from EUROMOD in Table 3, but dampened to some extent. So where incomes are estimated to rise by EUROMOD, they rise by less in the Eurostat statistics (Czech Republic, Poland and Romania). Where they are estimated to fall, they fall by more in Eurostat statistics (Lithuania).The main exceptions are Bulgaria where EUROMOD indicates growth in nominal incomes 2009-10 and Eurostat statistics show a reduction, and Hungary where EUROMOD indicates a reduction and Eurostat indicates an increase. .

Over the period 2009-2012 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 one percentage point in 2011 and then fall by around 2 percentage points in 2012. The latter is caused by a strong decrease in household incomes due to austerity measures that affected mainly civil servants and people in retirement and lowered the median income. It should however be noted that baseline EUROMOD results do not capture the deep effect of unemployment increase in Portugal, 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 decreases slightly until 2011 then increases by around 2 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 Bulgaria, Estonia and Lithuania the reduction in poverty risk for elderly people in 2010 can be explained by the fact that pensions were increased while average market incomes fell significantly.

Table 3 Comparison of EUROMOD poverty and inequality statistics 2009, 2010, 2011 and 2012

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Belgium	2009	5.3	10.8	19.4	12.0	15.4	11,372	22.5
	2010	5.1	10.3	19.0	10.9	15.5	11,404	22.5
	2011	5.1	10.4	19.0	11.0	16.1	11,693	22.5
	2012	5.0	10.0	18.3	10.5	15.1	11,747	22.3
Bulgaria	2009	12.3	18.2	27.0	23.9	21.8	1,635	32.8
	2010	11.6	18.1	26.8	24.7	18.1	1,668	32.0
	2011	11.7	18.4	27.5	25.8	20.0	1,802	32.8
	2012	11.2	18.0	26.7	25.5	17.7	1,762	31.8
Czech Republic	2009	3.8	7.7	15.4	11.2	5.5	4,407	23.8
	2010	3.9	8.0	15.5	11.3	5.8	4,502	23.8
	2011	4.0	7.7	14.9	11.6	4.0	4,746	23.5
	2012	3.7	7.6	14.2	11.5	4.3	4,584	23.5
Denmark	2009	4.5	10.9	20.0	7.5	17.1	15,753	23.0
	2010	4.5	10.4	19.6	7.6	13.9	16,451	23.8
	2011	4.5	10.4	19.5	7.6	13.9	16,729	24.0
	2012	4.5	10.1	19.2	7.7	12.5	16,973	23.8
Germany	2009	6.0	12.7	21.1	12.7	12.8	10,835	26.4
	2010	6.3	13.4	21.4	12.9	14.1	11,247	26.5
	2011	6.5	13.8	21.6	13.6	13.9	11,450	26.7
	2012	6.4	13.6	21.6	13.6	13.7	11,579	26.8
Estonia	2009	9.6	16.7	25.9	16.8	25.0	3,723	29.7
	2010	9.6	16.7	25.8	17.0	24.2	3,698	29.4
	2011	10.0	17.6	26.4	16.9	29.5	3,845	29.8
	2012	10.2	18.4	26.8	17.2	32.7	4,020	30.1
Ireland	2009	5.0	13.4	23.9	17.1	17.1	13,913	25.0
	2010	4.9	13.0	24.2	17.3	10.7	13,418	25.3
	2011	5.3	12.6	24.0	17.5	4.6	13,003	25.2
	2012	5.9	12.8	24.3	17.9	4.8	13,023	25.3

/continued

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty Threshold €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Greece	2009	11.8	19.4	26.1	23.4	19.0	7,372	32.1
	2010	11.8	19.3	26.0	23.5	18.0	7,042	31.7
	2011	11.1	18.7	26.2	22.3	16.5	6,663	31.3
	2012	10.9	18.2	25.3	23.1	13.1	6,186	31.0
Spain	2009	14.3	20.4	27.3	26.8	19.6	8,178	30.8
	2010	13.9	19.5	26.9	26.1	16.4	8,137	30.5
	2011	13.0	19.6	26.8	26.3	16.7	8,223	30.6
	2012	12.9	19.4	26.5	26.2	16.2	8,128	30.1
France	2009	5.3	10.5	19.1	12.1	9.1	11,992	28.3
	2010	5.4	10.8	19.4	12.5	9.3	12,237	28.4
	2011	5.3	10.7	19.4	12.3	9.1	12,466	28.3
	2012	5.3	10.6	19.3	12.4	9.1	12,685	28.1
Italy	2009	11.2	17.7	26.1	23.3	14.1	9,010	30.7
	2010	11.1	17.7	25.9	23.1	14.1	9,057	30.7
	2011	11.0	17.5	25.9	22.7	14.1	9,135	30.8
	2012	10.9	17.3	25.8	22.4	14.0	9,182	30.6
Cyprus	2009	7.1	14.6	22.5	11.8	47.7	10,952	26.9
	2010	6.6	14.2	22.4	11.7	46.3	11,243	26.8
	2011	6.3	14.2	22.6	11.7	45.5	11,480	26.8
	2012	5.6	13.1	21.8	10.2	41.7	11,327	26.2
Latvia	2009	13.9	20.9	28.6	27.7	13.2	2,678	34.9
	2010	12.9	19.7	27.5	26.8	7.8	2,480	33.2
	2011	13.3	20.1	28.4	26.7	11.1	2,683	33.9
	2012	13.5	20.2	28.4	26.8	11.4	2,719	34.2
Lithuania	2009	12.1	19.6	27.8	21.6	9.5	2,401	35.3
	2010	11.8	19.3	27.6	22.2	8.6	2,253	35.6
	2011	12.1	19.1	27.3	21.4	9.4	2,288	36.1
	2012	13.4	21.4	28.6	28.2	9.3	2,364	36.6
Luxembourg	2009	1.3	7.7	17.0	10.0	1.9	19,534	24.4
	2010	1.5	8.2	17.1	10.9	2.5	19,807	24.5
	2011	2.2	8.0	17.6	10.5	1.9	20,157	24.5
	2012	2.2	8.2	17.5	11.0	1.9	20,673	24.5

/continued

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Hungary	2009	6.3	11.7	19.3	20.1	3.1	2,463	23.6
	2010	6.4	12.0	19.7	19.4	3.5	2,358	24.3
	2011	6.4	12.1	20.9	18.4	7.7	2,597	26.7
	2012	6.9	12.3	20.2	18.8	4.8	2,326	26.2
Netherlands	2009	4.0	10.8	18.7	14.5	6.1	12,373	26.3
	2010	3.9	10.6	18.6	14.4	5.7	12,458	26.3
	2011	3.9	10.5	18.7	13.9	6.2	12,666	26.3
	2012	4.1	10.5	18.7	14.4	5.4	12,814	26.3
Malta	2009	9.1	16.6	25.1	19.9	22.2	6,008	27.7
	2010	8.8	16.0	25.0	18.8	20.5	6,152	27.4
	2011	8.5	15.8	24.2	18.9	19.6	6,288	27.2
	2012	8.6	16.0	24.7	19.4	19.8	6,483	27.2
Austria	2009	4.9	10.7	19.0	12.8	10.1	12,092	24.9
	2010	4.9	11.0	18.7	13.4	9.9	12,192	24.9
	2011	4.8	11.0	19.4	13.8	9.2	12,415	25.0
	2012	4.6	10.9	19.1	13.7	8.7	12,604	25.0
Poland	2009	10.0	16.7	24.8	21.7	12.8	2,544	31.6
	2010	9.6	16.2	24.2	21.0	11.6	2,827	31.2
	2011	10.1	16.7	24.6	22.0	11.8	3,070	31.5
	2012	10.3	17.0	24.8	22.6	11.2	3,165	31.6
Portugal	2009	11.2	18.9	27.6	21.3	26.7	5,402	34.7
	2010	11.0	18.9	27.6	21.3	26.5	5,472	34.4
	2011	12.3	20.0	28.2	23.8	27.0	5,487	34.0
	2012	11.2	18.3	26.9	22.0	24.3	5,374	32.9
Romania	2009	16.1	21.9	28.9	30.2	18.9	1,216	32.8
	2010	15.2	21.3	28.1	30.0	15.5	1,220	32.2
	2011	15.1	20.6	28.0	29.3	15.0	1,290	32.0
	2012	15.1	20.7	27.8	29.6	15.1	1,297	32.1

/continued

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Slovenia	2009	7.2	12.9	20.3	12.4	19.3	6,857	24.0
	2010	7.3	13.2	20.4	12.3	19.9	7,030	24.0
	2011	7.6	13.1	20.2	12.4	20.5	7,188	23.9
	2012	7.1	12.9	20.0	10.7	23.0	7,205	23.6
Slovakia	2009	5.0	9.9	16.3	15.6	4.5	3,500	23.4
	2010	5.0	10.1	16.3	15.8	4.5	3,606	23.4
	2011	5.1	10.0	16.5	15.8	4.1	3,637	23.6
	2012	5.3	10.0	16.5	15.9	4.0	3,733	23.6
Finland	2009	5.3	12.3	21.5	13.0	17.5	12,583	24.9
	2010	5.1	12.1	21.2	13.0	16.8	12,809	25.0
	2011	5.3	12.3	21.3	12.9	17.9	13,137	25.3
	2012	4.8	11.8	21.0	12.4	17.3	13,625	24.9
Sweden	2009	6.1	11.5	21.1	12.9	10.5	11,232	22.9
	2010	6.2	11.8	21.1	13.0	12.1	13,107	23.1
	2011	6.2	11.8	21.1	13.2	10.6	14,141	23.4
	2012	6.2	11.8	21.2	13.0	10.7	15,274	23.2
United Kingdom	2009	8.8	15.6	24.6	17.9	14.2	9,642	32.4
	2010	8.8	15.4	24.3	17.6	13.9	10,252	32.0
	2011	8.7	15.2	24.1	17.2	13.5	9,558	31.7
	2012	8.7	15.1	24.0	16.9	13.0	10,934	31.6
EU-27	2009	8.7	15.0	23.2	18.2	13.7	8,653	29.1
	2010	8.6	14.9	23.1	18.1	13.2	8,891	29.0
	2011	8.5	14.9	23.2	18.2	13.1	8,952	29.1
	2012	8.5	14.8	23.0	18.2	12.6	9,194	28.9

Source: EUROMOD version F6.36+.

Notes: EUROMOD figures for Belgium, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia and Spain are based on SILC 2010 (2009 incomes), those for Malta are based on SILC 2009 (2008 incomes), updated, and those for UK are based on FRS2009/10. Figures for the remaining countries are based on SILC 2008 (2007 incomes), updated.

A similar explanation for falling relative risk of poverty also applies in Latvia and Ireland where pensions were frozen but other incomes were falling. 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 shifted 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.

In Romania, pensions have been indexed in 2010 compared to 2009 while public wages have been cut, leading to the dramatic reduction in poverty risk among the elderly shown in Table 3. 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 small in all countries. The only exception is Lithuania, where poverty risk for children increased significantly in 2012, probably due to cuts of child benefits and social insurance benefits for families with small children during the crisis.

Inequality as measured by the Gini coefficient stays the same or falls a little in most countries. Exceptions are Portugal where it falls more rapidly, especially towards the end of the period, Latvia where it falls in 2010 but returns almost to its original level in 2012 and Hungary where it rises, in particular in 2011.

It should be emphasised that these figures for 2010 are unlikely to coincide with the value of social indicators that will be produced by the EU-SILC 2011 (2010 incomes). The EUROMOD estimates show the implications for the movement in the indicators of policy changes over the period 2007-2010 relative to average changes in other incomes. For example, if benefits and tax thresholds were uprated in line with increases in (median) incomes generally we would expect to see no changes in these indicators. To the extent that they are not or that there is differential change across income sources or structural policy reform, differences can be observed in the indicators. The policy conclusion that one might draw from the general picture of declining poverty and inequality indicators in Table 3 is that policy changes were having a mild positive effect. This is informative if, for example, poverty and inequality are generally growing or predicted to do so (meaning that things would be worse without the policy effect) or if poverty and inequality are falling fast (meaning that policy effects are not the sole explanation). It is useful to know the direction and relative size of the policy effect since it is this that policy makers can influence directly.[18]

[18] The analysis presented here goes part way towards doing this, by stripping out the effects of changes in population characteristics and behaviour. To focus solely on the effects of policy changes the analysis would

On this basis the results for the EU as a whole show risk of poverty and inequality declining slightly over the period.

The role of taxes and benefits in reducing poverty risk is one area that EUROMOD is especially designed to address. Table 4 shows risk of poverty measured before taxes and benefits (i.e. for market income) so this can be compared with poverty risk after taxes and benefits (as in Table 3). The "before" measure is shown in two versions: one excluding public pensions from market incomes and another including these incomes as part of "before". Note that, the poverty threshold is the same throughout, using 60% of median household disposable income.[19]

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

The change in the effect due to policy changes between 2009 and 2012 is generally small and positive with some exceptions. In Greece, where pensions were actually cut during this period but less compared to the decrease in other incomes (i.e. earnings) leading to increase in effect.. In Bulgaria, Poland and Romania the increase in effect is due to an increase in pensions in the period.

In a few countries the poverty reduction effect of pensions fell over the period, and by at least 0.5 percentage points in Latvia, Slovenia, Sweden and Estonia.

The effect of non-pension benefits and taxes on all incomes is much smaller in comparison with that of pensions, except in Ireland and the UK, where it is much larger and can be attributed to the prevalence of means-testing in these two countries. In some countries the effect is negative (the taxes being paid by people on low incomes being greater than the non-pension benefits they receive). This is the case for policies in both 2009 and 2012 in Bulgaria, Greece, Italy, Poland, and Romania and for policies in 2012 in Estonia and Latvia. The change in the effect due to policy changes between 2009 and 2012 is again small and generally negative except in Belgium, Denmark, Ireland, Malta, the Netherlands, Romania, Slovenia, Sweden and the UK where it is positive. The reduction in the effect is the largest in Lithuania mainly due to cuts on unemployment benefits since 2010, social assistance reforms in 2012, as well as cuts on child benefits and contributory family benefits within the period.

require a "neutral" counterfactual scenario to be defined for the movement of policy parameters (such as tax thresholds) relative to the movement in the level and distribution of market incomes.

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

Table 4: EUROMOD estimates of poverty risk before and after taxes and benefits, 2009 and 2012 policies

	Policy year	Poverty risk before taxes & benefits: market incomes		Poverty risk after taxes & benefits	Reduction due to (ppts)		
		excluding pensions	including pensions		pensions	taxes & non pension benefits	total taxes & benefits
Belgium	2009	34.9	15.9	10.8	19.1	5.0	24.1
	2012	34.6	15.4	10.0	19.2	5.4	24.6
Bulgaria	2009	34.6	17.2	18.2	17.4	-0.9	16.5
	2012	37.1	16.5	18.0	20.5	-1.4	19.1
Czech Republic	2009	32.2	11.8	7.7	20.4	4.1	24.5
	2012	32.2	11.6	7.6	20.7	4.0	24.6
Denmark	2009	28.3	12.4	10.9	16.0	1.4	17.4
	2012	28.4	12.3	10.1	16.0	2.2	18.2
Germany	2009	36.6	15.9	12.7	20.7	3.2	23.9
	2012	36.5	16.0	13.6	20.5	2.4	23.0
Estonia	2009	32.4	17.2	16.7	15.2	0.4	15.6
	2012	31.1	18.2	18.4	12.9	-0.2	12.7
Ireland	2009	37.4	32.2	13.4	5.2	18.8	24.0
	2012	36.9	31.8	12.8	5.1	19.0	24.1
Greece	2009	37.1	18.5	19.4	18.6	-0.9	17.7
	2012	35.6	14.9	18.2	20.7	-3.4	17.3
Spain	2009	40.0	24.9	20.4	15.2	4.5	19.6
	2012	39.4	24.2	19.4	15.3	4.7	20.0
France	2009	37.4	19.2	10.5	18.2	8.7	26.9
	2012	37.3	19.0	10.6	18.2	8.4	26.6
Italy	2009	37.2	17.3	17.7	19.9	-0.5	19.5
	2012	36.3	16.3	17.3	20.0	-1.0	19.0
Cyprus	2009	26.1	17.4	14.6	8.6	2.9	11.5
	2012	25.2	15.7	13.1	9.5	2.6	12.1
Latvia	2009	38.1	22.0	20.9	16.1	1.1	17.2
	2012	35.3	19.7	20.2	15.6	-0.5	15.1
Lithuania	2009	41.9	23.5	19.6	18.5	3.9	22.3
	2012	40.4	22.2	21.4	18.2	0.8	19.0
Luxembourg	2009	33.5	15.5	7.7	18.0	7.8	25.8
	2012	32.4	14.7	8.2	17.8	6.5	24.2
Hungary	2009	39.7	15.6	11.7	24.0	4.0	28.0
	2012	39.1	15.1	12.3	24.0	2.8	26.8
Netherlands	2009	22.7	13.5	10.8	9.2	2.7	11.9
	2012	22.5	13.3	10.5	9.2	2.8	12.0
Malta	2009	31.7	18.2	16.6	13.5	1.5	15.1
	2012	31.7	18.6	16.0	13.1	2.6	15.7
Austria	2009	33.8	15.0	10.7	18.8	4.3	23.1
	2012	33.2	14.4	10.9	18.8	3.5	22.3
Poland	2009	34.7	13.8	16.7	20.9	-3.0	17.9
	2012	34.9	13.4	17.0	21.5	-3.6	18.0
Portugal	2009	35.7	19.4	18.9	16.3	0.5	16.8
	2012	35.2	18.8	18.3	16.5	0.4	16.9
Romania	2009	40.0	19.7	21.9	20.2	-2.1	18.1
	2012	40.4	19.9	20.7	20.5	-0.7	19.7
Slovenia	2009	31.7	15.1	12.9	16.6	2.2	18.8
	2012	31.4	15.8	12.9	15.7	2.9	18.6

/continued

	Policy year	Poverty risk before taxes & benefits: market incomes		Poverty risk after taxes & benefits	Reduction due to (ppts)		
		excluding pensions	including pensions		pensions	taxes & non pension benefits	total taxes & benefits
Slovakia	2009	32.5	12.9	9.9	19.6	3.0	22.5
	2012	31.8	12.3	10.0	19.6	2.3	21.9
Finland	2009	32.6	17.1	12.3	15.6	4.7	20.3
	2012	32.5	17.3	11.8	15.2	5.5	20.7
Sweden	2009	30.3	13.7	11.5	16.5	2.2	18.8
	2012	30.3	14.3	11.8	16.0	2.5	18.5
United Kingdom	2009	36.3	29.8	15.6	6.6	14.1	20.7
	2012	36.5	29.6	15.1	6.9	14.5	21.4
EU-27	2009	36.1	19.1	15.0	17.0	4.2	21.2
	2012	35.9	18.7	14.8	17.2	3.9	21.1

Source: EUROMOD version F6.36+.

Notes: EUROMOD figures for Belgium, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia and Spain are based on SILC 2010 (2009 incomes), those for Malta are based on SILC 2009 (2008 incomes), updated, and those for UK are based on FRS2009/10. Figures for the remaining countries are based on SILC 2008 (2007 incomes), updated. The poverty threshold is 60% of median equivalised disposable household income. Columns may not add due to rounding.

Taking both types of payment together (last column of Table 4) over the period 2009-2012, the poverty-reducing impact of tax and benefit systems becomes smaller in Germany, Estonia, Italy, Latvia, Lithuania, Luxembourg, Hungary, Austria and Slovakia, and to a lesser extent in Greece, France, Slovenia and Sweden. It decreases by more than 2 percentage points in Estonia due to a smaller poverty-reducing effect of public pensions which were frozen in 2010-2011 and increased in 2012, while average earnings grew steadily throughout this period; in Latvia most probably due to the introduction of austerity measures in 2010-11; and in Lithuania due to cuts in social benefits during 2010-2012. In Bulgaria, the total poverty-reducing impact of taxes and benefits increased by around 3 percentage points, mainly due to uprating of public pensions during the period. Looking at the EU overall, the poverty-reducing effect of both pensions and other benefits and taxes has remained the same.

6. Marginal Effective Tax Rates

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

Table 5: Marginal effective tax rates for policy systems in 2009, 2010, 2011 and 2012

		2009	2010	2011	2012
Belgium	mean	54.5	54.9	54.7	55.2
	median	54.9	54.9	54.9	54.9
Bulgaria	mean	23.2	21.7	24.0	23.2
	median	21.7	20.9	21.6	21.6
Czech Republic	mean	30.3	29.9	30.4	30.8
	median	31.1	31.1	31.1	31.1
Denmark	mean	47.1	44.0	43.8	44.0
	median	42.1	40.9	41.2	41.6
Germany	mean	53.8	45.9	48.1	45.9
	median	48.0	44.6	45.0	45.0
Estonia	mean	21.7	22.6	23.0	23.4
	median	22.6	23.2	24.0	24.6
Ireland	mean	45.3	44.4	46.2	46.5
	median	41.0	40.0	46.8	48.0
Greece	mean	23.7	23.3	27.0	26.3
	median	25.0	20.3	27.5	28.0
Spain	mean	23.2	25.4	24.9	26.3
	median	28.8	28.8	28.8	29.5
France	mean	35.6	35.4	35.2	35.7
	median	31.6	31.6	31.6	31.6
Italy	mean	38.2	38.3	39.0	39.7
	median	38.8	39.1	39.6	40.0
Cyprus	mean	19.7	20.5	21.0	23.5
	median	20.0	20.2	23.4	20.8
Latvia	mean	28.4	34.3	33.7	35.7
	median	29.9	32.7	33.3	33.3
Lithuania	mean	28.4	29.4	29.5	29.0
	median	27.0	27.0	27.0	27.0
Luxembourg	mean	40.1	40.1	42.3	41.9
	median	39.6	39.7	42.0	41.8
Hungary	mean	43.6	39.6	33.2	34.6
	median	44.6	38.6	37.8	34.5
Netherlands	mean	38.8	39.2	39.1	39.2
	median	43.3	43.3	43.3	45.0
Malta	mean	24.0	25.3	25.3	25.9
	median	23.2	23.3	23.3	23.3
Austria	mean	40.8	42.0	42.2	40.9
	median	43.4	43.4	43.4	43.4
Poland	mean	27.2	27.2	27.2	26.7
	median	30.3	30.3	30.3	30.3
Portugal	mean	27.0	28.1	28.9	29.1
	median	24.0	24.6	25.0	25.0
Romania	mean	35.4	36.2	35.3	35.2
	median	31.9	31.9	31.9	31.9
Slovenia	mean	33.0	33.6	34.2	35.6
	median	32.2	32.5	32.4	32.9
Slovakia	mean	27.9	27.0	27.6	27.8
	median	29.9	29.9	29.9	29.9
Finland	mean	40.6	40.5	40.4	41.2
	median	43.3	43.8	43.9	44.7
Sweden	mean	34.8	34.3	34.4	33.4
	median	29.8	28.9	29.7	29.6
United Kingdom	mean	36.0	36.3	36.7	36.7
	median	31.8	31.9	32.6	32.5

Source: EUROMOD version F6.36+. All EUROMOD figures are preliminary and should not be cited. Notes: EUROMOD figures for Belgium, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia and Spain are based on SILC 2010 (2009 incomes), those for Malta are based on SILC 2009 (2008 incomes), updated, and those for UK are based on FRS2009/10. Figures for the remaining countries are based on SILC 2008 (2007 incomes), updated.

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, except Greece and Estonia where partial take-up for some benefits is considered in the calculations. In Bulgaria and Greece, where tax evasion has been modelled and used to obtain baseline statistics, full compliance has been assumed for the calculation of METRs. In the other country where tax evasion is modelled – Italy – it is assumed that the marginal earnings arise partly in the black economy according to the proportion estimated for existing earnings. In the remaining countries, all of the marginal earnings are assumed to be earned in the official economy and are subject to taxes, contributions and benefit withdrawal, assuming full compliance. Two issues arise from this. First, this lack of comparability should be borne in mind when interpreting these results. Secondly, whether or not to take evasion into account at all when measuring work incentives is clearly an issue to consider. This depends very much on whether the METRs are to be considered as indicators of the effects of the design of the tax-benefit system on marginal earnings that are retained; or whether they are to be interpreted as calculations of the marginal return to additional work in practice, taking into account opportunities to evade.

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

Over the period 2009 to 2012 mean METRs decline slightly in some countries (e.g. Denmark, Poland and especially Germany and Hungary,) and rise slightly in others (e.g. Cyprus, Estonia, Greece, Spain Slovenia and especially Latvia), due to changes in earnings relative to tax thresholds in this period in some countries, combined with changes in policy.

As well as averages, the distribution of METRs is of interest. Figure 2 shows, for the 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) as well as cases where a wide range of rates is faced by large proportions of the population in paid work (Ireland, Italy, Luxembourg. Slovenia, Finland). In almost all countries there is a minority facing very high rates (i.e. over 80%) which typically occurs because of the interaction of tax and contributions with benefit withdrawal, or because of discontinuities in entitlement to benefits or tax concessions. 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 with such high METRs is 5% or more in Belgium, Germany, Ireland Lithuania, Luxembourg, Slovenia and Romania.

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

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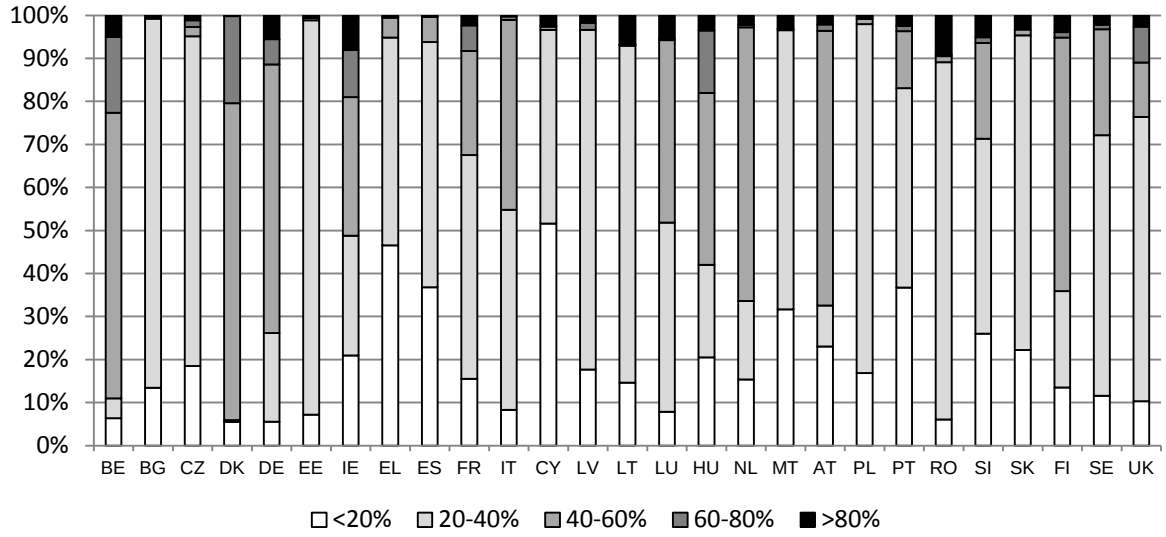
Figure 2: Marginal effective tax rates 2009: share of population in paid work (%) by range of METR



Source: EUROMOD version F6.36+.

Notes: EUROMOD figures for Belgium, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Slovenia and Spain are based on SILC 2010 (2009 incomes), those for Malta are based on SILC 2009 (2008 incomes), updated, and those for UK are based on FRS2009/10. Figures for the remaining countries are based on SILC 2008 (2007 incomes), updated.

7. Conclusions and next steps

The results from EUROMOD shown above are both limited to some simple analysis of the baselines for 2009-12 policies. On the one hand improvements and refinements are possible that will improve the quality, comparability and applicability of the baseline results. On the other hand, EUROMOD is mainly intended not simply to generate baseline statistics for a particular policy year, but also as a tool to explore alternative scenarios in terms of both policies and the characteristics of the populations on which they have impact. Next steps in the development will include:

- Consideration of adjustments to improve the baseline in relation to external statistics while at the same time maintaining transparency in the model and its responsiveness to the effects of simulated policy changes. Adjustments for non take-up of benefits and evasion of taxes are one important area for future work. Another is improving understanding of when and how EUROMOD simulations better capture the situations of households than variables that may be under- or mis- reported in surveys.
- Another important development concerns adjustments for changes in labour markets (or demographics) so that simulations of 2010 (and later) policies can also take account of the effects of the economic downturn (and recovery). Some preliminary work on Estonia, Greece, Latvia, Lithuania and Spain suggests that in countries like these where there have been dramatic changes such adjustments can make a

considerable difference to estimates of poverty and inequality and the effects of policies.[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 the imprecision resulting from imputing the components of UDB income aggregations.

[20] Navicke, J., O. Rastrigina and H. Sutherland, 2013, *Using EUROMOD to nowcast poverty risk in the European Union*, Eurostat Methodologies and Working Papers, Luxembourg: Eurostat.

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Annex 2 EUROMOD input datasets used in the analysis in this paper[21]

Country	Input data
Belgium	EU-SILC version 2010-1
Bulgaria	EU-SILC version 2008-2
Czech Republic	EU-SILC version 2008-2 (+ additional national variables)
Denmark	EU-SILC version 2008-1
Germany	EU-SILC version 2010-1
Estonia	EU-SILC version 2008-2
Ireland	EU-SILC version 2008-2
Greece	EU-SILC version 2010-1 (+ additional national variables)
Spain	National SILC 2010
France	EU-SILC version 2010-1
Italy	National SILC 2010
Cyprus	EU-SILC version 2008-2
Latvia	EU-SILC version 2010-1
Lithuania	EU-SILC version 2010-1 (+ additional national variables)
Luxembourg	EU SILC version 2008-2 (+ additional national variables)
Hungary	EU-SILC version 2010-1
Malta	EU-SILC version 2009-1
Netherlands	EU-SILC version 2008-2
Austria	National SILC 2008
Poland	EU-SILC version 2008-2 (+ additional national variables)
Portugal	EU-SILC version 2008-2
Romania	EU-SILC version 2010-1
Slovenia	EU-SILC version 2010-1
Slovakia	National SILC 2010
Finland	EU-SILC version 2008-2
Sweden	EU-SILC version 2008-2
United Kingdom	National non-SILC data (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 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.

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

Annex 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. The amount of income tax is overestimated. However, detailed results show that this is not due to tax evasion but to the non simulation of some tax credits (In particular, education, health and private insurances tax credits are not simulated due to lack of data such expenditures).

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

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

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

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

Benefit non take-up

For **Belgium** and the **UK** we employ a simple non take-up correction of the main means-tested benefits by applying the take-up proportions estimated on a caseload basis (own calculations in case of Belgium; using statistics from the Department of Work and Pensions and HM Revenue and Customs in case of the UK). Take-up probabilities are applied at the

household level (so that people entitled to the same benefits within a household exhibit the same take-up behaviour), for each benefit separately. In general we assume that take-up behaviour is not affected by changes in the size of benefit or tax credit entitlements. However, by applying differential take-up probabilities according to type of claimant 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)[22] 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** full take-up is assumed for all means-tested simulated benefits using the 2010 dataset.

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 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

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

according to the simulation. As a result, by default, EUROMOD baseline simulations ignore the simulated amount of social assistance and include the amounts reported in the EU-SILC.

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

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

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

For **Romania** 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.

For **Bulgaria**, **Denmark, Latvia**, **Lithuania**, **Luxembourg, Italy**, **Cyprus**, **Hungary, the Netherlands, Austria, Finland** and **Sweden** full take up is assumed for all simulated means-tested benefits in the results reported in this paper. In some of these countries it is planned to introduce non take-up adjustments in the future.