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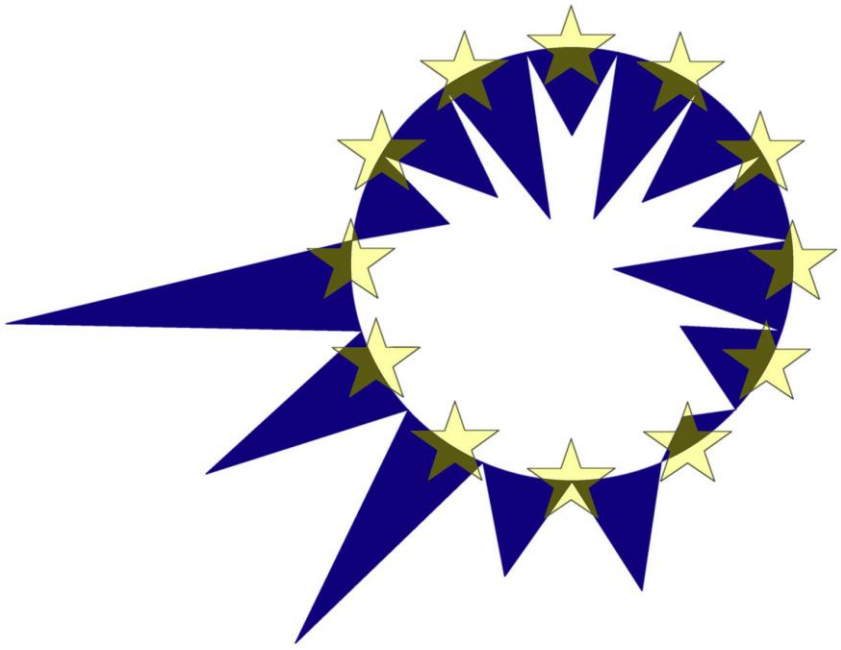

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BASELINE RESULTS FROM EUROMOD:
2006-2009 POLICIES

Silvia Avram and Holly Sutherland

February 2012

Baseline results from EUROMOD: 2006-2009 policies [1]

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with

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Abstract

The aim of the paper is to provide a description of the latest public release of EUROMOD (version F5.0), a microsimulation model of taxes and benefits in the EU. After giving a brief account of the process of constructing EUROMOD, we present headline indicators for income inequality and risk of poverty using EUROMOD and discuss explanations for differences between these and EU- SILC based indicators. We then compare EUROMOD indicators across countries and as policies evolve across time between 2006 and 2009. Throughout we highlight both the potential of EUROMOD as a tool for policy analysis and the caveats that should be borne in mind when using it and interpreting results.

JEL Classification: C15; H24; H55; I3

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

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1. Introduction

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

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

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

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

This short report presents results from a second release of the new, EU27 version of EUROMOD being constructed with support from DG-EMPL of the European Commission. 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 2006 policies, based on micro-data from the EU-SILC. These calculations cover 18 countries and provide a "baseline" or starting point for any simulations of changes that EUROMOD users may carry out. The next section assesses the quality of the data and simulations behind these results and explains why they differ from estimates calculated using the EU-SILC data on household income directly. Section 5 shows how indicators of poverty and inequality differ under later policy regimes (up to 2009). Section 6 concludes and presents the next steps for EUROMOD.

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

2. The EUROMOD*update* project

The EUROMOD*update* project is building a new version of EUROMOD, covering all 27 member states, based on micro-data from the EU-SILC and simulating policies from recent policy years as well as those corresponding to the income reference period in the SILC data (2006 in this paper). Nine countries are being constructed in each of the three project years, with updates the following year, where relevant. The current road map for publicly available releases of EUROMOD is shown in the table below.

EUROMOD road map

Release date	Early 2011	End 2011	Mid 2012
Countries	**Belgium, Czech Republic, Estonia, Greece, Spain, Hungary, Italy, Lithuania, UK**	Belgium, Czech Republic, Estonia, Greece, Spain, Hungary, Italy, Lithuania, UK, **Cyprus, Ireland, Latvia, Netherlands, Poland, Portugal, Slovenia, Slovakia, Sweden**	Belgium, Czech Republic, Estonia, Greece, Spain, Hungary, Italy, Lithuania, UK, Cyprus, Ireland, Latvia, Netherlands, Poland, Portugal, Slovenia, Slovakia, Sweden, **Bulgaria, Denmark, Germany, France, Luxembourg, Malta, Austria, Romania, Finland**
Latest SILC data year*	2006	2007	2008
Policy years	2005, 2006, 2007, 2008	2006, 2007, 2008, 2009	2007, 2008, 2009, 2010

* with some exceptions

The results reported below are from the publicly available version of the 2011 release of EUROMOD which covers 18 countries and is, with some exceptions, based on the EU-SILC of 2007 (2006 incomes).[3] The model has been built with the collaboration of national teams, which are listed in Annex 1. Nine countries updated the work done a year earlier (Belgium, Czech Republic, Estonia, Greece, Spain, Hungary, Italy, Lithuania and the UK) and nine countries were constructed from scratch (Cyprus, Ireland, Latvia, Netherlands, Poland, Portugal, Slovenia, Slovakia and Sweden). There were 4 key tasks: (1) building an input database, (2) building policy systems for 2006, 2007, 2008 and 2009, (3) validating the baseline outputs and (4) documenting the work in a Country Report. These are described briefly in turn.

- **Building an input database**

The original aim was to build input databases for all countries from the 2007 EU-SILC UDB.[4] 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

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

[4] A network contract with Eurostat for this purpose has been established [EU-SILC/2009/17].

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 to the UDB. We have followed this route in cases where these data are provided for research uses under reasonable contract conditions; where they contain the necessary detailed variables; and where they give rise to the same values as the UDB for some of the key social indicators (e.g. median household disposable equivalised income; risk of poverty rates).

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

- **Building policy systems for 2006, 2007, 2008 and 2009**

Based on detailed descriptions of policies provided by national teams, 2006 policies have been modelled using the EUROMOD tax-benefit modelling "language" for all 18 countries. Then, reforms to the structure of tax-benefit systems and parameter changes (e.g. inflation increases in the size of benefit amounts or tax thresholds) for the three subsequent policy years have also been included. Together with updating factors, to bring 2006 incomes from the 2007 EU-SILC data up to the level in each policy year (2007, 2008, 2009), it is now possible to simulate policies from each of these years for each of the 18 countries. These four alternative "baselines" also form the starting points for modelling possible reforms, making use of the EUROMOD language.

The aim has been to simulate as much as possible of the tax and benefit components of household disposable income. In practice, some parts of the tax or benefit system may be difficult to simulate and in that case the component is taken directly from the input database. This applies in the case of many contributory benefits and pensions (because of the need for 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 the need to know 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, no component 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 present in the EU-SILC about the total number of years spent in work and the number of months spent in work during the previous year. In some countries the user is offered the choice over whether to use the recorded or simulated values of unemployment benefits in any analysis. In these cases the default is to make use of recorded values in analysis of income distribution, but to use simulated values when calculating indicators such as replacement rates or welfare resilience indicators. Another example is that

of contributory parental benefits. In some countries it is possible to simulate these while in others it is not. In some cases (for example in Lithuania) it has been *necessary* to simulate parental benefits because this was part of the only feasible approach to identifying the components of the UDB SILC family benefit variable.

- **Validation**

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

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

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

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

The general approach to modelling non take-up or tax evasion is to, on the one hand, take the best available approach given the information available and, on the other, to make the treatment transparent and capable of being switched off or adapted by the user, depending on the analysis they wish to do. Generally Country Reports present 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. [5]

3. Baseline poverty and inequality indicators

Table 1 presents some poverty and inequality indicators for 2006 incomes and policies. Risk of poverty rates for the whole population in each of the 18 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. Two commonly used indicators of income inequality are also shown: the quintile share ratio and the Gini coefficient. 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.

[5] All 18 reports are being published on the EUROMOD web site. Each report covers the 2006, 2007, 2008 and 2009 policy systems and is between 60-100 pages in length. http://www.iser.essex.ac.uk/research/euromod/resources-for-euromod-users/country-reports

Table 1 EUROMOD poverty and inequality statistics 2006 incomes and policies

	Poverty risk: all			Poverty risk (60%)		Quintile share ratio	Gini coefficient (%)
	50%	60%	70%	age <18	age>=65		
Belgium	4.9	11.5	19.8	12.0	17.8	3.0	22.8
Czech Republic	4.2	9.1	16.5	14.5	5.1	3.2	24.2
Estonia	11.3	19.3	27.5	17.5	33.8	4.6	32.9
Ireland	8.5	17.9	27.7	19.7	31.4	4.0	28.9
Greece	12.8	19.7	27.2	21.6	23.8	5.7	34.2
Spain	12.6	19.4	27.0	23.4	27.4	5.1	30.8
Italy	10.9	18.7	27.3	24.4	19.4	5.2	31.4
Cyprus	8.0	14.6	21.8	10.5	51.0	4.0	28.8
Latvia	12.8	19.2	28.8	19.1	27.2	5.1	34.0
Lithuania	13.0	19.8	27.5	25.9	20.5	5.7	34.1
Hungary	8.3	14.0	21.1	21.3	4.0	4.1	25.9
Netherlands	3.7	10.4	20.0	14.1	9.1	3.8	27.0
Poland	10.4	16.9	24.4	23.2	8.2	5.4	31.3
Portugal	10.9	18.4	26.4	19.5	28.8	5.8	35.7
Slovenia	6.3	12.3	19.3	12.5	18.7	3.2	23.8
Slovakia	4.5	8.8	16.2	14.7	5.8	2.9	22.4

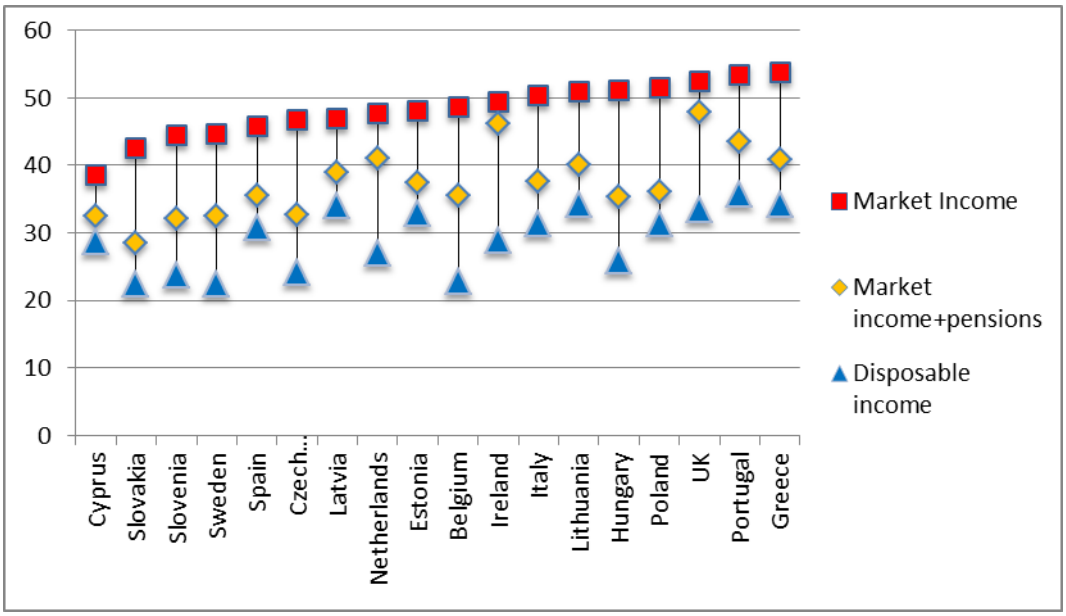
	Poverty risk: all			Poverty risk (60%)		Quintile share ratio	Gini coefficient (%)
	50%	60%	70%	age <18	age>=65		
Sweden	5.4	10.5	18.0	11.9	8.0	3.0	22.4
United Kingdom	9.7	17.2	26.2	21.5	17.7	6.2	33.4

Source: EUROMOD version F5.0+.

Notes: EUROMOD figures for Lithuania are based on SILC 2006, updated, and those for UK are based on FRS2008/9, backdated.

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. The country with the lowest income inequality is Sweden and that with the highest is Portugal. In the Figure, countries are ranked according to inequality of market income, shown by the squares. Using this measure Cyprus has the lowest inequality and Greece the highest. It is clear that taxes and benefits play a very varied role in reducing inequality with the largest absolute reduction in Belgium and the smallest in Cyprus. However, the main purpose of the Figure is to illustrate the role of public pension incomes, in contrast with that of direct taxes and non-pension benefits which are usually considered to be the main instruments of redistribution. (Such a comparison would not be possible using the EU-SILC data directly because pension incomes are aggregated with other payments received by older people.) Inequality of market income including public pensions (before tax), shown by the diamond shape in Figure 1 is everywhere lower than inequality of market income but higher than that of disposable income. Public pensions play the major role in reducing the gap between market income inequality and disposable income inequality in all of the countries shown, with the exception of Ireland and the UK. In both of these countries private pensions (included here in market income) make up a large part of pension income. In addition, however, non pension benefits and taxes (income taxes and social contributions) vary in their effectiveness in reducing income inequality across countries. They have a relatively large role compared with other countries in Ireland, the UK and Belgium and a relatively small role in Cyprus, Estonia, Latvia, and Poland.

Figure 1 Income Inequality (Gini coefficient) and the role of public pensions and non-pension benefits and taxes



Source: EUROMOD F5.0+

4. Assessing the results

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

- **Comparison with external aggregate statistics**

This is the process known as "macro-validation" and the comparisons for each country are documented in detail in the Country Reports. Where possible, 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 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 – and it is less important that it does so – than if it is an important component of household incomes.

4) As indicated above non take-up of benefits, or the application of local discretion in the awarding of benefits, leads to EUROMOD over-simulating means-tested benefits in many instances (see also Annex 3). In many countries social assistance receipt is over-simulated by a factor or 2 or 3. The size of this effect (e.g. on poverty risk) varies with the emphasis on this type of benefit in each national system. Adjustments to approximate non take-up behaviour can be applied as described above. However, 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 good baseline estimates but is not appropriate when modelling policy changes or "what if" scenarios involving new benefit entitlements or swapping policies across countries. Examples of the treatment of non take-up and tax evasion are given in Annex 3

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

Table 2 compares some indicators of poverty and inequality from the EU-SILC 2007 (as provided by Eurostat on its web site and through New Cronos) with broadly equivalent estimates from EUROMOD using 2006 policies and incomes. Given that EUROMOD uses 2007 SILC as its input data one would expect the estimates for 2006 incomes (using 2007 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 3 in most countries (Poland uses release 2): see Annex 2. Statistics provided by Eurostat use the most recent release, we assume. To the extent that the relevant data change between releases, we would expect differences in the indicators from the two sources.

- In this analysis the Lithuanian results from EUROMOD use the 2006 EU-SILC, with incomes updated from 2005 to 2006. We make comparisons with the 2007 SILC estimates nevertheless as it is 2006 incomes that EUROMOD attempts to model. However if there

are strong differences between the characteristics of the populations (or the samples provided in the SILC) between 2006 and 2007 these will not be captured in our estimates.

- The UK uses a different data source in this version of EUROMOD: the Family Resources Survey for 2008/09. It is unlikely that two independent surveys with different questionnaires will produce the same results. Furthermore the FRS income data are two years more recent than the EU-SILC; they have been backdated to 2006 prices and incomes but this is an approximate process.

- The standard definition of household disposable income produced by EUROMOD and used here is slightly different to the definition of the UDB variable (HY020) used for the official indicator calculations. In EUROMOD we add in any income from private pensions and generally deduct any inter-household transfers paid as well as adding payment received. We do not include any non-cash employment income.[6] This is likely to have an effect on the income distribution for example by lowering the poverty risk of older people in countries with significant private pensions (such as the UK) or reducing the median and the poverty threshold in countries with significant non-cash employment income.

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

- In 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.[7] 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.

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

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

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

The comparisons shown in Table 2 suggest that this is indeed the case. In most countries EUROMOD poverty rates for the populations (using three cut-offs: 50%, 60% and 70% of the median) are a little lower than those calculated by Eurostat using 2007 SILC The exceptions are Hungary, Lithuania where they tend to be higher using EUROMOD and Belgium, Slovakia and the UK where they are consistently and substantially lower. They are also lower using EUROMOD for particular poverty thresholds in the Netherlands, and for particular groups in Latvia and Lithuania (older people) and Czech Republic, Cyprus and Portugal (children). Inequality, as measured by the Gini coefficient, also tends to be lower using EUROMOD simulated incomes, particularly so in Belgium, Ireland and Slovakia.

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

		Poverty risk: all			Poverty risk (60%)		Poverty threshold (60%median) €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Belgium	Eurostat	8.0	15.2	23.4	16.9	23.0	10,540	26.3
	EUROMOD	4.9	11.5	19.8	12.0	17.8	10,118	22.8
Czech Republic	Eurostat	5.0	9.6	16.8	16.6	5.5	3,254	25.3
	EUROMOD	4.2	9.1	16.5	14.5	5.1	3,214	24.2
Estonia	Eurostat	11.0	19.4	27.1	18.2	33.2	2,669	33.4
	EUROMOD	11.3	19.3	27.5	17.5	33.8	2,718	32.9
Ireland	Eurostat	8.9	17.2	26.2	19.2	28.3	13,239	31.3
	EUROMOD	8.5	17.9	27.7	19.7	31.4	13,300	28.9
Greece	Eurostat	13.2	20.3	28.1	23.3	22.9	6,120	34.3
	EUROMOD	12.8	19.7	27.2	21.6	23.8	6,036	34.2
Spain	Eurostat	12.9	19.7	27.6	24.3	28.2	7,223	31.3
	EUROMOD	12.6	19.4	27.0	23.4	27.4	7,137	30.8
Italy	Eurostat	12.4	19.9	27.5	25.6	21.9	9,007	32.3
	EUROMOD	10.9	18.7	27.3	24.4	19.4	8,660	31.4
Cyprus	Eurostat	8.9	15.5	23.1	12.4	50.6	9,609	29.8
	EUROMOD	8.0	14.6	21.8	10.5	51.0	9,561	28.8
Latvia	Eurostat	14.4	21.2	29.9	20.5	33.3	2,010	35.4
	EUROMOD	12.8	19.2	28.8	19.1	27.2	1,783	34.0
Lithuania	Eurostat	12.3	19.1	26.1	22.1	29.8	1,966	33.8

	EUROMOD	13.0	19.8	27.5	25.9	20.5	1,646	34.1
Hungary	Eurostat	7.1	12.3	20.0	18.8	6.1	2,361	25.6
	EUROMOD	8.3	14.0	21.1	21.3	4.0	2,051	25.9
Netherlands	Eurostat	5.2	10.2	19.3	14.0	9.5	10,946	27.6
	EUROMOD	3.7	10.4	20.0	14.1	9.1	11,100	27.0
Poland	Eurostat	11.1	17.3	25.2	24.2	7.8	2,101	32.2
	EUROMOD	10.4	16.9	24.4	23.2	8.2	2,004	31.3
Portugal	Eurostat	11.5	18.1	25.6	20.9	25.5	4,544	36.8
	EUROMOD	10.9	18.4	26.4	19.5	28.8	4,794	35.7
Slovenia	Eurostat	6.3	11.5	18.8	11.3	19.4	5,944	23.2
	EUROMOD	6.3	12.3	19.3	12.5	18.7	5,604	23.8
Slovakia	Eurostat	5.8	10.5	17.9	17.2	8.4	2,383	24.5
	EUROMOD	4.5	8.8	16.2	14.7	5.8	2,332	22.4
Sweden	Eurostat	6.1	10.5	18.8	12.0	9.9	11,307	23.4
	EUROMOD	5.4	10.5	18.0	11.9	8.0	11,129	22.4
UK	Eurostat	11.3	18.8	26.4	22.9	26.9	12,743	32.5
	EUROMOD	9.7	17.2	26.2	21.5	17.7	11,013	33.4

Source: Eurostat web site and New Cronos (accessed 09/09/2011); EUROMOD version F5.0+.

Notes: EUROMOD figures for Lithuania are based on SILC 2006, updated and those for UK are based on FRS2008/9, backdated.

In understanding these discrepancies among the factors to be taken into account are the following:

- Over-simulation of some particular means-tested benefits (without accounting for non take-up) appears to explain some of the low EUROMOD poverty rates: for example of housing benefit in the Czech Republic leading to low child poverty estimates,

- In many countries group of elderly are concentrated around the 60% median poverty threshold meaning that their risk of poverty is sensitive to small shifts in the threshold.

- However, comparisons of the threshold are only straightforward for the euro-zone countries (or for those with long term fixed exchange rates). For example, the threshold for Portugal is much higher using EUROMOD than in the Eurostat statistics. This is due to estimates of income tax and social contributions being substantially lower at the median using EUROMOD simulations of liabilities rather than SILC estimates. (The reason for this remains to be investigated.) The higher threshold leads to higher poverty risk estimates for the elderly but *lower* poverty risk estimates for children (possibly because of the full take up assumption). 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 2006 which in Poland and the Czech Republic at least, this explains much of the discrepancy between the EUROMOD and SILC estimates, and therefore is not the explanation for differing risk of poverty rates or Gini coefficients.

- In Latvia we have evidence that there is a high rate of evasion of taxes. This is not yet accounted for in EUROMOD. It means that the poverty threshold using simulated incomes is lower than it should be. Since most income received by those ages 65+ is pensions, on which taxes are unlikely to be evaded, this is a possible explanation for the elderly poverty rate in Latvia being much lower than that estimated from the EU-SILC.

- In Slovakia, it appears that the EU-SILC does not adequately capture some population groups. For example, children aged less than 1 are under-represented by a factor close to 3 (19,675 in EU-SILC vs. 53,637 in official statistics). This leads to an under-simulation of some family benefits in EUROMOD. In addition, while simulated social assistance number of recipients and aggregate amounts roughly match administrative data, they are over twice as large as those derived directly from SILC suggesting that the survey does not adequately capture this type of income.

- In Lithuania the comparisons in Table 2 are for 2006 incomes and 2007 characteristics (Eurostat) with 2005 incomes updated to 2006 and 2006 characteristics. It is also worth comparing the EUROMOD statistics with those for the 2006 SILC which estimate poverty risk for children and the elderly respectively as 25.1% and 22.0% which are rates much

closer to those produced by EUROMOD (25.9%, 20.5%) than the SILC estimates from 2007 shown in Table 2 (22.1%, 29.8%).

- In the UK the comparisons are not only of two different datasets but the UK data come from 2008 and are backdated to 2006 values. Comparisons of EUROMOD estimates of poverty risk for 2008 with national statistics using the same underlying data are shown below. They are quite close. The comparison is also shown for the 2009 SILC (using 2008 incomes) which is also close.

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

	Poverty risk: all		
	50%	60%	70%
Eurostat 2009 SILC	10.2	17.3	25.7
EUROMOD 2008 incomes	9.5	16.9	25.8
HBAI 2008 incomes	10	17	26

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

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

Policies are simulated for four policy years. Table 3 shows some of the same statistics for the 2006 policy year as in Table 1, but contrasting them with statistics for the 2007, 2008 and 2009 policy years. This shows how policy changes in the period 2006-9 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 2007 SILC, with two exceptions. The exceptions are the UK where the input database is FRS 2008/2009 and Lithuania where it is the 2006 SILC.

Incomes that are not simulated (e.g. market incomes) are updated from 2006 to 2007, 2008 and 2009 using indexes for each income source separately (e.g. earnings indexes for earnings). While the construction of these indexes has followed common guidelines, it is possible that some of the cross-country differences, or in the effects 2006-9, are due to the assumptions that have been made about the change in non-simulated incomes over the period. In some countries updating factors do not currently take account of the detailed differences in movements in incomes by source, which may be particularly important during periods of changing macro-economic conditions.

Table 3 shows how the poverty threshold shifts in nominal terms, with few exceptions increasing between 2006 and 2008 but by varying amounts. This is due to a combination of inflation and growth in non-simulated incomes and policy reforms and routine uprating of policy over the 4-year period. In the non euro-zone countries it is also affected by fluctuations

in the exchange rate. Growth in nominal (euro) median income is particularly large in this period in Estonia, Lithuania, Latvia, Slovenia, Cyprus, Slovakia and Spain and small in Ireland and Hungary. In 2009, slower growth or a reduction in the median is evident in all countries (except Belgium, Slovakia and Greece), due to the effect of the beginning of the recession on average incomes. Most non euro-zone countries have experienced falling exchange rates against the Euro in 2009 which partly explains the falling nominal euro incomes. The reduction in the median 2008-2009 is particularly large in Poland, Ireland, the Netherlands and Sweden.

In all countries changes in poverty risk due to changes in tax-benefit policies tend to be relatively small. Exceptions include Belgium, where poverty risk falls in 2008, especially for older people which is consistent with a large rise in income support for the elderly in 2007, although it rises again in 2009. In Estonia and Lithuania the poverty risk also falls for older people and in the latter also for children. In contrast in Sweden both child and elderly poverty are rising. The same rising poverty trends for both children and the elderly are present in Slovenia and Slovakia. In Poland elderly poverty is rising. In Both Portugal and Spain child poverty is falling and elderly poverty rising. Child poverty falls somewhat in the UK (due to reforms introduced aiming to do just that) and poverty among the elderly also falls, due to real increases in means-tested pension payments. Substantial decreases in elderly poverty during the period are noticeable in Ireland and Latvia.

In Estonia and Lithuania the reduction in poverty risk for elderly people in 2009 can be explained by the fact that pensions were increased while average market incomes fell significantly. In Estonia, for example, earnings from employment fell on average by 5% between 2008 and 2009 and while some benefits were cut, pensions increased on average by 8%. Official national statistics (based on national SILC) show an even larger reduction in risk of poverty for elderly people: from 33.9% to 15.1%.

A similar combination of circumstances explains the Lithuanian reduction in poverty among elderly people but, because the Lithuanian data are a year older (2006 rather than 2007 SILC) they probably do not capture the changes generally so well.

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

It should be emphasised that these figures for 2009 are unlikely to coincide with the value of social indicators that will be produced by the EU-SILC 2010 (2009 incomes). The EUROMOD estimates show the implications for the movement in the indicators of policy changes over the period 2006-2009 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.[8]

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

Table 3 Comparison of EUROMOD poverty and inequality statistics 2006, 2007, 2008 and 2009

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold (60% median) €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Belgium	2006	4.9	11.5	19.8	12.0	17.8	10,118	22.8
	2007	4.7	11.5	19.9	12.0	18.1	10,405	22.9
	2008	4.4	10.8	19.4	10.5	17.8	10,703	22.4
	2009	4.3	10.7	19.2	10.5	18.6	11,033	22.0
Czech Republic	2006	4.2	9.1	16.5	14.5	5.1	3,214	24.2
	2007	4.7	9.6	16.6	14.7	5.2	3,438	24.1
	2008	5.0	9.1	15.9	14.6	5.1	4,528	24.3
	2009	4.9	8.9	15.9	14.4	4.8	4,355	24.2
Estonia	2006	11.3	19.3	27.5	17.5	33.8	2,718	32.9
	2007	12.0	19.8	28.2	18.5	34.5	3,215	33.3
	2008	10.8	19.2	26.7	18.1	30.9	3,749	32.7
	2009	10.0	16.8	24.8	19.1	17.7	3,595	32.1
Ireland	2006	8.5	17.9	27.7	19.7	31.4	13,300	28.9
	2007	7.5	16.6	27.4	18.2	27.8	14,304	28.6
	2008	6.8	15.6	27.2	17.3	23.9	14,787	27.9
	2009	4.4	13.1	23.3	17.1	11.3	13,844	25.7
Greece	2006	12.8	19.7	27.2	21.6	23.8	6,036	34.2
	2007	12.9	20.0	27.6	21.7	24.2	6,369	34.4
	2008	13.0	20.0	27.5	21.5	24.6	6,667	34.8
	2009	13.1	20.2	27.7	21.8	24.8	6,877	35.1
Spain	2006	12.6	19.4	27.0	23.4	27.4	7,137	30.8
	2007	12.5	19.2	27.0	23.3	27.5	7,487	30.8

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold (60% median) €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
	2008	12.6	19.3	27.0	22.7	28.9	7,965	30.8
	2009	11.5	18.5	26.7	21.6	28.8	8,173	30.3
Italy	2006	10.9	18.7	27.3	24.4	19.4	8,660	31.4
	2007	10.8	18.5	27.2	24.2	18.9	8,916	31.2
	2008	10.8	18.6	27.3	24.4	19.2	9,144	31.3
	2009	10.8	18.6	27.2	24.4	19.0	9,255	31.2
Cyprus	2006	8.0	14.6	21.8	10.5	51.0	9,561	28.8
	2007	8.7	14.9	22.1	10.9	52.1	10,183	28.6
	2008	8.8	15.1	22.0	10.9	53.1	10,827	28.8
	2009	8.3	14.8	21.7	10.6	52.3	11,096	28.7

/continued

….. Table 3 continued

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold (60% median) €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Latvia	2006	12.8	19.2	28.8	19.1	27.2	1,783	34.0
	2007	14.6	21.7	30.4	18.8	38.9	2,316	35.0
	2008	14.3	20.7	30.1	18.7	35.5	2,869	34.7
	2009	11.6	18.3	27.0	19.3	22.0	2,987	33.1
Lithuania	2006	13.0	19.8	27.5	25.9	20.5	1,646	34.1
	2007	13.5	20.4	28.3	26.8	21.5	2,058	35.0
	2008	13.6	20.3	28.1	26.2	20.3	2,589	35.0
	2009	10.5	17.2	26.5	19.5	16.3	2,579	33.6
Hungary	2006	8.3	14.0	21.1	21.3	4.0	2,051	25.9
	2007	8.3	13.9	20.9	21.5	3.6	2,455	25.5
	2008	8.6	14.1	20.9	21.7	3.4	2,652	25.4
	2009	8.6	14.3	21.3	22.3	3.0	2,413	25.4
Netherlands	2006	3.7	10.4	20.0	14.1	9.1	11,100	27.0
	2007	4.2	11.0	20.5	14.5	8.8	11,640	28.9
	2008	3.9	10.2	19.6	13.6	6.7	11,947	28.2
	2009	3.7	9.9	19.6	13.7	5.6	12,160	26.5
Poland	2006	10.4	16.9	24.4	23.2	8.2	2,004	31.3
	2007	9.9	16.4	24.4	21.4	8.5	2,238	31.0
	2008	10.3	16.7	24.7	22.3	7.9	2,683	31.0
	2009	10.4	17.1	24.9	23.3	7.0	2,088	31.4
Portugal	2006	10.9	18.4	26.4	19.5	28.8	4,794	35.7
	2007	11.0	18.6	26.4	19.6	29.4	5,006	35.5

	2008	10.9	18.5	26.4	19.1	29.9	5,171	35.3
	2009	10.7	17.9	26.0	17.8	29.3	5,305	35.1
Slovenia	2006	6.3	12.3	19.3	12.5	18.7	5,604	23.8
	2007	6.7	12.4	19.7	12.3	19.3	6,014	24.4
	2008	7.6	13.2	20.8	13.6	21.5	6,611	24.8
	2009	7.6	13.3	20.8	13.6	21.7	6,818	24.8
Slovakia	2006	4.5	8.8	16.2	14.7	5.8	2,332	22.4
	2007	4.5	8.8	16.3	14.9	5.6	2,737	22.5
	2008	4.8	9.1	16.5	14.9	7.0	3,152	22.7
	2009	4.8	9.1	16.3	15.0	7.6	3,471	22.5

/ continued

….. Table 3 continued

	Policy year	Poverty risk: all			Poverty risk (60%)		Poverty threshold (60% median) €/year	Gini coefficient (%)
		50%	60%	70%	age <18	age>=65		
Sweden	2006	5.4	10.5	18.0	11.9	8.0	11,129	22.4
	2007	6.0	11.0	19.3	12.4	9.3	11,795	23.1
	2008	6.3	11.5	20.5	12.8	11.1	12,082	23.5
	2009	6.5	11.6	21.0	13.1	11.0	10,861	23.2
UK	2006	9.7	17.2	26.2	21.5	17.7	11,013	33.4
	2007	9.7	17.2	26.2	21.6	17.5	11,694	33.4
	2008	9.6	16.8	25.7	20.7	16.8	10,338	33.3
	2009	9.2	16.4	25.4	19.9	16.3	9,921	33.1

Source: EUROMOD version F5.0+.

The role of taxes and benefits in reducing poverty risk is one area that EUROMOD is 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.[9]

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 how pension incomes are uprated. 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 the UK. The change in the effect due to policy changes between 2006 and 2009 is small and positive except in Estonia, Ireland, Latvia, Netherlands and Lithuania where it is larger and in Greece and Spain where it is negative.

The effect of non-pension benefits and taxes on all incomes is much smaller in comparison with that of pensions, except in the UK where it is much larger. In some countries it 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 2006 and 2009 in Greece, Italy, Latvia and Poland. The change in the effect due to policy changes between 2006 and 2009 is again small and positive except in Estonia, Latvia and the Netherlands (and to a negligible extent in Hungary, Slovenia and Sweden). In Ireland, the stronger poverty rate reduction attributable to taxes and benefits in 2009 is due to benefit increases in a context of falling market incomes.

Taking both types of payment together (last column of Table 4), only to a small extent in does the poverty-reducing impact of tax and benefit become smaller in percentage point terms over the period 2006-2009 in Cyprus, Sweden and Slovenia. It rises by more than 2 percentage points in the three Baltic States.

[9] 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, 2006 and 2009 policies

	Policy year	Poverty risk before taxes and benefits: market incomes		Poverty risk after taxes and benefits	Reduction due to (ppts)		
		excluding pensions	including pensions		pensions	taxes, and non-pension benefits	total taxes and benefits
Belgium	2006	33.5	16.1	11.5	17.4	4.6	22.1
	2009	34.0	16.3	10.7	17.6	5.7	23.3
Czech Republic	2006	32.2	11.8	9.1	20.3	2.7	23.1
	2009	33.4	12.6	8.9	20.8	3.7	24.5
Estonia	2006	32.8	20.0	19.3	12.9	0.7	13.5
	2009	33.4	16.6	16.8	16.8	-0.2	16.6
Ireland	2006	35.1	31.5	17.9	3.5	13.7	17.2
	2009	36.2	31.8	13.1	4.5	18.6	23.1
Greece	2006	38.4	18.2	19.7	20.2	-1.5	18.7
	2009	38.7	19.9	20.2	18.8	-0.2	18.6
Spain	2006	32.6	19.0	19.4	13.5	-0.3	13.2
	2009	33.0	20.2	18.5	12.8	1.7	14.5
Italy	2006	35.6	17.0	18.7	18.6	-1.7	16.9
	2009	35.2	16.5	18.6	18.7	-2.1	16.7
Cyprus	2006	25.9	17.7	14.6	8.2	3.1	11.3
	2009	25.5	17.5	14.8	7.9	2.7	10.6
Latvia	2006	28.8	17.7	19.2	11.2	-1.6	9.6
	2009	31.3	17.9	18.3	13.4	-0.4	13.0
Lithuania	2006	34.5	18.3	19.8	16.2	-1.6	14.7
	2009	36.2	18.5	17.2	17.7	1.3	19.0
Hungary	2006	38.5	14.9	14.0	23.6	0.9	24.6
	2009	40.1	15.5	14.3	24.5	1.3	25.8
Netherlands	2006	30.2	20.2	10.4	9.9	9.8	19.7
	2009	30.3	16.8	9.9	13.5	6.9	20.4
Poland	2006	35.8	13.4	16.9	22.4	-3.5	18.9
	2009	39.1	14.6	17.1	24.5	-2.5	22.1
Portugal	2006	35.7	19.8	18.4	15.9	1.4	17.3
	2009	35.7	19.9	17.9	15.8	2.0	17.8
Slovenia	2006	30.1	13.2	12.3	17.0	0.9	17.8
	2009	30.5	13.7	13.3	16.7	0.4	17.2
Slovakia	2006	31.7	11.5	8.8	20.2	2.8	22.9
	2009	31.8	11.8	9.1	20.0	2.6	22.7
Sweden	2006	30.9	13.7	10.5	17.2	3.2	20.5
	2009	31.7	14.7	11.6	17.0	3.1	20.1
UK	2006	35.0	28.9	17.2	6.2	11.7	17.8
	2009	35.5	29.2	16.4	6.3	12.7	19.0

Source: EUROMOD version F5.0+.

6. Conclusions and next steps

The results from EUROMOD shown above are limited to some simple analysis of the baselines for 2006-9 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 for a tool to explore alternative scenarios in terms of both policies and the characteristics of the populations on which they have impact. Next steps in the development will include:

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

- Another important development concerns adjustments for changes in labour markets (or demographics) so that simulations of 2009 (and later) policies can also take account of the effects of the economic downturn (and its recovery).

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

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

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

Country	Input data
Belgium	National SILC 2007
Czech Republic	UDB 2007 version 3 plus variables from the national SILC
Estonia	UDB 2007 version3
Ireland	UDB 2007 version 3 with imputations informed by national SILC
Greece	UDB 2007 version 3 plus variables from the national SILC
Spain	National SILC 2007
Italy	National SILC 2007
Cyprus	UDB 2007 version 3
Latvia	UDB 2007version 3
Lithuania	UDB 2006 version 1
Hungary	UDB 2007 version 3
Poland	UDB 2007 version 2 with additional information from the national SILC
Portugal	UDB 2007 version 3
Slovenia	UDB 2007 version 3
Slovakia	National SILC 2007
Sweden	UDB 2007 version 3 with imputations informed by national SILC
UK	National non-SILC data (Family Resources Survey 2008/9)

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

Tax evasion

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. 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 **Estonia** full compliance is assumed which is expected to result in a relatively small bias due to modest degree of tax evasion by international standards.

For **Greece** full compliance is currently assumed although it is known that extent of tax evasion in Greece is rather high. Adjustments to take tax evasion into account are planned for Year 3.

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 **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 year 3.

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 **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 **Slovakia** full compliance is assumed in the simulation of both social insurance contributions and the personal income tax. Simulated social insurance contributions are roughly 20% higher than administrative data 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 somewhat under- rather than over-estimated.

For **Belgium**, **Ireland**, **Lithuania**, **Hungary**, **Slovenia** and **Sweden** full compliance is assumed for both income taxes and social contributions.

Benefit non take-up

For **Belgium** and the **UK** we employ a simple non take-up correction of the main means-tested benefits by applying the take-up proportions estimated on a caseload basis (own calculations in case of Belgium; using statistics from the Department of Work and Pensions and HM Revenue and Customs in case of the UK). Take-up probabilities are applied at the household level (so that people entitled to the same benefits within a household exhibit the same take-up behaviour), for each benefit separately. In general we assume that take-up behaviour is not affected by changes in the size of benefit or tax credit entitlements. However, by applying differential take-up probabilities according to type of claimant, some of this effect is captured. Following the judgement of the national team, the baseline results for Belgium refer to the case which excludes the simulation of Income Support and Income Support for elderly from the results (and the values are taken from the data). Results including the simulation of the Income support benefits are included in the Country Report.

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

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 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 **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 overestimated. Overestimation is greater for social assistance. 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 **Slovakia** full take up is assumed for social assistance and all family benefits (the latter are universal). The simulated number of recipients and amounts for family benefits are very close to external figures (with the exception of the birth grant and parental leave which are underestimated). Both the number of recipients and the amounts of social assistance approximately match external figures.

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 **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.

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

For **Ireland** non take-up of in-work benefits is modelled based on external estimates. Full take-up is assumed for all other simulated benefits.

For **Italy**, **Cyprus**, **Latvia**, **Lithuania**, **Hungary** and **Sweden** full take up is assumed for all simulated means-tested benefits in the results reported in this paper.