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**Baseline results from the EU28 EUROMOD:
2014-2017**

Miko Tammik

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with

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Abstract

This paper presents baseline results from the latest version of EUROMOD (version H1.0+), 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 distributional indicators across all EU 28 countries and over time between 2014 and 2017. Finally, we provide estimates of marginal effective tax rates (METR) for all 28 EU countries in order to explore the effect of tax and benefit systems on work incentives at the intensive margin. Throughout the paper, 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 Makovec and Tammik (2017).

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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 household 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, work 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 **Europe 2020**, EUROMOD provides the capacity for assessing the distributional and budgetary effects 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**.¹ There are many applications and many potential users in both the scientific and policy monitoring/analysis communities. It is a highly flexible model, incorporating large amounts of complex information (Sutherland and Figari, 2013). For more information, see <https://www.euromod.ac.uk/>.

This report presents baseline results for the 28 EU countries from the latest version of EUROMOD (H1.0+), being constructed with support from DG-EMPL of the European Commission. It updates and extends the material reported in a 2017 EUROMOD Working Paper (Makovec and Tammik, 2017).²

The next section provides a brief description of the EUROMOD project and its mode of working. This is followed, in section 3, by a presentation of estimates of poverty and income inequality for the 28 EU countries, calculated using incomes simulated by EUROMOD for 2014-2017 tax/benefits policies, based on micro-data from the 2015 EU-SILC.³ The calculations for 2014 provide the ‘*base year*’, in which policy rules on taxes and benefits coincide with the income year of the corresponding SILC survey. Section 4 assesses the quality of the results produced by EUROMOD, and discusses why EUROMOD results may differ from statistics calculated using directly EU-SILC data on household income. Section 5 discusses estimates of Marginal Effective Tax Rates (METR) and their main components using EUROMOD. Section 6 concludes and presents the next steps for EUROMOD.

2. The EUROMOD project

The annual EUROMOD update project involves 4 key tasks: (1) updating the input database, (2) updating policy systems to the latest year (here, for 2017), (3) validating the baseline outputs and (4) documenting the work in Country Reports. These are described briefly in turn in the following paragraphs.

¹ Subject to permission to access the input micro-data (EU-SILC).

² <https://www.euromod.ac.uk/publications/baseline-results-eu28-euromod-2011-2016>

³ 2015 data for Germany were not available at the release of the latest model version H1.0+ and instead 2014 data were used with the corresponding baseline year of 2013

2.1 Updating input databases

The aim of this task is to build input databases for all countries from the most recent EU-SILC UDB.⁴ However, in most countries, the UDB does not contain all the information needed to inform tax-benefit calculations. Where possible, and with the explicit permission of Eurostat, we have therefore explored the possibility of merging variables from the underlying national data (often referred to as the “national SILC”) into the EUROMOD input database obtained from the UDB. However, access to the merged data for external EUROMOD users is subject to approval by Eurostat, by the National Statistical Office in each country, and requires negotiation between the EUROMOD team and the users on a bilateral basis. As documented in Appendix 1 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 yield the same results 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 used by EUROMOD must be imputed. The process depends on the specific components that have been aggregated (and a first step is to establish what these are: this information is not part of the standard UDB documentation). It obviously involves approximations and has implications for the results.

For the latest update, all countries except Germany and the UK have updated input databases to EU-SILC 2015. The baseline results presented in this report are based on:

- (a) SILC 2015 for all EU-28 countries except Germany and the UK
- (b) Family Resources Survey (FRS) 2014/15 for the UK
- (c) SILC 2014 for Germany

2.2 Updating policy systems until 2017

Based on detailed descriptions of policies provided by national teams, 2017 policies have been modelled using the EUROMOD tax-benefit modelling “language” for each country. Together with updating factors, to bring 2014 incomes from 2015 EU-SILC input data up to the level corresponding to the following policy years (2015, 2016, 2017), it is now possible to simulate tax/benefits policies from each of these 4 policy years for each of the 28 EU countries. These alternative “baselines” also form the starting points for modelling possible reforms, making use of the EUROMOD language.

The aim is 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 (since information on past work and contribution history is not available in the EU-SILC or most other cross-sectional survey data sources) and many disability benefits (since information on the nature and severity of the disability is not included in the UDB data). The extent of these types of benefits varies across countries. For example, in some countries it

⁴ A network contract with Eurostat for this purpose has been established [59/2013-EU-SILC-LFS].

is possible to simulate non-contributory pensions; on the contrary, in countries where such pensions do not exist, pension systems cannot be simulated.

In some other cases, benefits can only be partially simulated, using assumptions based on the information available in the data, for example, entitlement to unemployment benefits is simulated using information on reported receipt of the benefits in the EU-SILC. In some countries, the user can choose whether to use the simulated values of unemployment benefits or the values inputted from the data 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.⁵ Complete details of the benefits and taxes fully or partially simulated in this paper, and of those which are instead taken from the input data, are provided in the Country Reports.

2.3 Validation

Three distinct types of validation are usually carried out before the release of baseline results. 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 built-in tools. This is known as “micro-validation”.

Secondly, once a country component in EUROMOD is working satisfactorily, aggregate estimates for expenditure on each benefit and revenues from each tax are compared with official external sources, such as national administrative statistics. Where available, the numbers of recipients and taxpayers are also compared against external data. This “macro-validation” also helps to spot errors and problems in the implementation (either in the policy rules or the data, or in both). Once finalised, a report on the “macrovalidation” is included in each Country Report, to inform model users about how the baseline results from EUROMOD correspond to other external statistics, and discusses the reasons behind the differences.⁶

A third type of validation takes place when the model is used comparatively across-countries. Whether a discrepancy can be considered large or small (important or unimportant) sometimes becomes clearer in cross-national perspective. In addition, unexpected differences in distributional indicators between countries can point to possible problems in the implementation of certain taxes and benefits, or to 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 Eurostat statistics calculated directly from the EU-SILC.

Two main issues arise 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 the assumption of full compliance and benefits full take-up can be interpreted as the “de jure” or intended effects of the system.

In this paper, we model benefit non-take up and tax evasion using a country-specific approach, relying on the best available information from external administrative data. At the same time, we attempt to make our modelling as transparent as possible, by enabling external users to switch off (or modify)

⁵ For example, see Fernandez Salgado, Figari, Sutherland and Tumino (2013).

⁶ It should be noted that external statistics are often available only with a time lag (e.g. macro-validation of 20175 policies typically cannot be finalised until late 20186). Country Reports will document these issues.

the model components specific to tax evasion and take-up, depending on their research objectives. Tax evasion adjustments are included in the models of Bulgaria, Greece, Italy, and Romania, while benefit non take-up is modelled for Belgium, Estonia, France, Ireland, Greece, Latvia, Poland, Portugal, Romania, and Finland and United Kingdom. See Appendix 3 for a country-by-country description of the treatment of these issues.

2.4 Country Reports

Each national team, as shown in Appendix 2, has produced a Country Report conforming to common guidelines in terms of style and content. The intention is to provide comprehensive documentation for EUROMOD users and serve as reference for developers and national teams in the future.⁷

3. Poverty and inequality indicators with EUROMOD

Policy systems for years 2014 to 2017 are simulated in EUROMOD allowing the analysis of the effect of policy changes on income distribution. Table 1 shows selected poverty and inequality indicators for these policy years. Risk of poverty rates for the whole population of each of the 28 EU 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 included. A commonly used indicator of income inequality is also shown: the Gini coefficient.

The one area that EUROMOD is especially designed to address is the role of taxes and benefits in reducing inequality and poverty risk. Tables 2, 3 and 4 show the effects of various tax and benefit components on poverty risk, poverty gap and inequality (as measured by using the Gini coefficient) between 2014 and 2017. Table 5 shows an alternative to Gini for measuring inequality: the Atkinson index.

Note that for Tables 2 and 3 the poverty threshold is the same throughout, using 60% of median household disposable income in the respective year. The poverty threshold stays constant as income components are added and subtracted in order to highlight the role played by the component in poverty reduction. Columns 3-7 in Tables 2 to 4, show what happens to poverty and inequality if each component (means-tested benefits, non-means-tested benefits (not including public pensions), taxes and social insurance contributions) is added back (in the case of taxes) or deducted (in the case of benefits), in turn, from disposable income. Column 8 depicts poverty and inequality estimates on the basis of original income and column 9 presents what happens to these indices when public pensions are added to original income. The role of public pensions (in contrast with that of direct taxes and non-pension benefits, which are usually considered to be the main instruments of redistribution) is also graphically illustrated in Figures 1 (effects on poverty risk) and 2 (effects on inequality).

Results for all years are based on the same input database, so do not capture the effects of changes in population composition and characteristics. In each case, we have calculated the indicators using the same methods in principle as Eurostat although, as explained in section 5, there are a number of reasons why the values may differ from those produced by Eurostat from the EU-SILC data directly.

Incomes that are not simulated (e.g. market incomes) are updated from the base year 2014 (2013 in the case of Germany) to the following years based on indices for each separate income source (e.g.

⁷ The country reports are available at <https://www.euromod.ac.uk/using-euromod/country-reports/>

earnings indices for earnings, pension uprating indices for pension-related incomes). These tables show how poverty and inequality indicators evolve over time in each country, as a result of policy changes and changes in income levels, abstracting from changes in socio-demographic characteristics of the population, which are kept constant as in the base year.

3.1. Poverty risk: baseline year and trends

Table 1 shows the evolution over time of the poverty threshold, defined as 60% of the median equivalised household disposable income, in nominal terms across countries. In this analysis the poverty line can shift because of inflation, changes in market and non-market incomes, tax and benefit policy reforms and uprating of policies over the period considered. In the non-euro-zone countries, poverty thresholds, which are expressed in euro, can also be affected by fluctuations in the exchange rate.

The countries experiencing the largest average annual growth in the poverty line between 2014 and 2017 are: Estonia (7%), Romania (6.8%), Lithuania (6%), Bulgaria (5.6%), Poland (5.2%), Latvia (4.8%) and Czech Republic (4.3%). A number of countries experienced a lower annual shift in the poverty line of between 1% and 2.7%: Slovenia, Denmark, Hungary, Portugal, Netherlands, France, Luxembourg, Malta, Austria, Ireland, Slovakia and Croatia. On the other hand, the poverty line has not moved substantially in Cyprus, Finland, Spain, Sweden, Italy and Belgium, where the average annual growth rate remained below 1%. Finally, the poverty line has dropped in nominal terms in Greece (by -0.3% on average per year) and in the United Kingdom (by -0.7% on average per year).

Table 1 shows that the highest at risk of poverty rate using the 60% poverty line in the base year 2014 is observed in Romania (24.7%), followed by Estonia, Lithuania, Latvia, Bulgaria and Spain (above 21%) and Greece, Hungary, Italy, Portugal and Croatia (above 18%). The lowest poverty rates (below 12%) are registered in Finland, Slovakia, Netherlands, Belgium, France, Denmark, Luxembourg and Czech Republic (9%). The ranking of countries at both the top and at the bottom of the league-table seem to remain stable when considering alternative poverty thresholds (50% and 70% of the poverty line). Poverty risk results are higher for more vulnerable categories, such as children and elderly people. In Romania, child poverty reaches 36% in the base year, followed by Spain (29%), and by Hungary, Lithuania and Italy (where it varies between 25%-27%). The lowest child poverty rates (below 13%) are observed in Slovenia, Sweden, Czech Republic, Finland and Denmark (8%). Elderly poverty reaches 34% in Estonia, 33% in Bulgaria, 30% in Latvia, 26% in Croatia and 22% in Lithuania. At the other end of the spectrum, the countries with the lowest elderly poverty rates (below 7%) are France, Czech Republic, Ireland, Hungary, Slovakia, Denmark, Netherlands and Luxembourg.

Table 1 also shows that over the period 2014 – 2017 changes in poverty rates due to changes in tax-benefit policies and income levels tend to be relatively small. The largest increase in poverty rates was registered in Ireland, Latvia and Bulgaria where the poverty rates increased by 1.4, 1.3 and 1.2 percentage points respectively. Increase in poverty rates in these countries seem to be mostly associated with an increase in elderly poverty rates. In Bulgaria and Ireland there was also a slight increase in child poverty while the opposite was true in Latvia.

The country experiencing the largest poverty reduction due to changes in policy and income levels between 2014 and 2017 according to Table 1, is Poland where the poverty rate decreased by 3.2 percentage points. One of the policy changes associated with such a high poverty reduction is the introduction of a generous child benefit in 2016. Prior to that, in fact, poverty in Poland had been relatively stable.

Table 1 also shows poverty trends due to changes in policy and income levels between 2014 and 2017 for different population subgroups (children and elderly people). Poland has been the country experiencing the strongest reduction also in child poverty (by 12 percentage points) in the period considered, while United Kingdom, Bulgaria and Ireland are the countries where child poverty has increased the most. In Latvia, elderly poverty increased by 7.8 percentage points in 3 years, followed by Lithuania, which shows a 5.4 percentage points increase. In Cyprus, on the other hand, elderly poverty dropped by 1 percentage point.

It should be emphasised that these figures are not expected to coincide with the value of social indicators produced by the EU-SILC for 2015 (based on 2014 incomes). The EUROMOD estimates show the movement in poverty and inequality indicators resulting from policy changes over the period 2014-2017, and from changes in average values of different income sources over the same period. 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 the mentioned indicators. To the extent that they are not or that there is differential change across income sources or structural policy reforms, differences can be observed in the indicators. This is informative if, for example, poverty and inequality are generally growing or predicted to do so (meaning that things would be worse without the policy effect) or if poverty and inequality are falling fast (meaning that policy effects are not the sole explanation). It is useful to know the direction and relative size of the policy effect since it is this that policy makers can influence directly.

Table 1. EUROMOD poverty and inequality statistics: 2014-2017

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age ≥65	€/year	
Belgium	2014	5.911	11.369	19.804	13.764	9.236	12,546	0.227
	2015	5.857	11.101	19.502	13.435	8.947	12,508	0.226
	2016	5.669	10.803	19.303	13.059	8.803	12,819	0.223
	2017	5.810	11.143	19.371	13.480	9.057	12,898	0.223
Bulgaria	2014	15.433	21.869	28.904	23.969	33.293	2,047	0.348
	2015	15.628	22.251	29.006	24.306	34.553	2,150	0.351
	2016	16.088	22.794	29.040	25.117	36.474	2,301	0.357
	2017	16.207	23.073	29.482	25.555	37.244	2,411	0.359
Czech Republic	2014	4.831	9.040	16.467	12.688	6.272	4,352	0.241
	2015	4.966	9.115	16.626	12.743	6.253	4,480	0.242
	2016	5.131	9.463	17.112	12.999	6.874	4,621	0.245
	2017	5.292	9.823	17.311	13.692	7.031	4,941	0.247
Denmark	2014	6.034	10.237	18.665	8.640	3.744	16,345	0.248
	2015	5.949	10.370	18.802	8.821	4.205	16,397	0.251
	2016	6.005	10.299	18.916	8.704	4.077	16,684	0.251
	2017	5.979	10.698	19.077	9.963	3.865	16,919	0.253
Germany	2013	8.600	15.056	22.765	14.451	15.026	11,720	0.277
	2014	8.860	15.222	22.917	14.712	15.107	11,956	0.278
	2015	8.933	15.414	23.111	14.895	15.714	12,168	0.280
	2016	8.827	15.418	22.942	15.092	14.811	12,472	0.279
	2017	8.910	15.384	22.897	14.957	14.952	12,754	0.279
Estonia	2014	11.555	21.038	28.458	19.065	34.746	4,610	0.335
	2015	11.111	21.185	28.587	17.985	36.576	5,000	0.330
	2016	10.980	21.188	28.771	17.344	38.687	5,395	0.328
	2017	10.808	21.364	29.161	18.368	36.869	5,645	0.330
Ireland	2014	5.889	13.436	22.868	15.938	6.145	11,470	0.290
	2015	6.174	14.068	24.418	16.378	6.448	11,751	0.293
	2016	6.529	14.888	25.408	17.507	6.921	12,052	0.296
	2017	6.379	14.825	25.188	17.515	6.596	12,240	0.295
Greece	2014	12.473	18.328	25.940	23.637	8.533	4,853	0.325
	2015	13.432	19.613	27.019	24.901	10.001	4,939	0.325
	2016	13.049	19.121	26.684	23.296	10.143	4,811	0.324
	2017	12.734	18.749	26.316	22.896	11.041	4,811	0.318
Spain	2014	15.764	21.938	29.224	29.517	11.365	8,003	0.337
	2015	15.670	22.151	29.418	29.341	12.336	8,096	0.337
	2016	15.753	22.181	29.502	29.385	12.189	8,139	0.339
	2017	15.651	22.023	29.338	29.200	12.194	8,186	0.338
France	2014	5.533	11.766	20.524	15.786	6.900	12,470	0.275
	2015	5.640	11.958	20.834	16.177	7.242	12,658	0.274
	2016	5.596	12.131	21.326	15.832	7.816	12,882	0.274
	2017	6.021	12.364	21.578	16.253	8.312	13,047	0.275
Italy	2014	12.564	18.689	26.808	25.379	11.853	9,145	0.312
	2015	12.060	18.243	26.490	24.198	12.368	9,269	0.309
	2016	11.900	18.051	26.344	23.940	12.173	9,355	0.308

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age ≥65	€/year	
Cyprus	2017	11.936	17.971	26.395	23.979	11.731	9,395	0.307
	2014	6.660	15.101	24.950	14.769	18.854	8,738	0.319
	2015	6.621	14.912	24.833	14.705	18.207	8,709	0.319
	2016	6.546	14.834	24.731	14.705	17.704	8,677	0.319
Latvia	2017	6.527	14.964	24.772	14.787	17.878	8,763	0.321
	2014	13.340	21.478	29.205	22.586	30.893	3,295	0.341
	2015	14.176	21.973	29.637	21.380	34.879	3,477	0.347
	2016	14.831	22.613	30.019	21.577	37.151	3,627	0.349
Lithuania	2017	15.066	22.810	30.395	21.358	38.694	3,795	0.350
	2014	13.940	21.089	29.560	26.858	22.969	3,010	0.365
	2015	14.484	21.549	30.442	26.858	25.131	3,157	0.368
	2016	14.899	21.525	30.086	26.538	26.338	3,359	0.371
Luxembourg	2017	15.011	21.904	30.446	26.343	28.438	3,588	0.371
	2014	1.833	9.905	22.134	14.178	2.540	21,158	0.240
	2015	1.833	9.659	22.022	13.950	2.314	21,117	0.239
	2016	1.872	9.522	22.115	13.055	2.219	21,147	0.240
Hungary	2017	2.061	10.295	22.150	15.121	2.540	22,258	0.241
	2014	12.273	18.408	26.134	27.173	5.255	2,686	0.285
	2015	12.925	18.884	26.175	27.849	6.182	2,622	0.288
	2016	13.101	19.170	26.058	27.494	7.474	2,676	0.290
Croatia	2017	12.937	18.826	25.844	27.312	7.275	2,782	0.289
	2014	12.733	19.229	25.887	18.611	26.411	3,314	0.291
	2015	12.907	19.511	25.950	18.721	27.044	3,347	0.296
	2016	12.809	19.315	26.028	17.953	27.331	3,430	0.295
Malta	2017	13.513	19.958	26.747	19.096	28.039	3,590	0.301
	2014	7.238	15.088	24.914	18.235	20.988	8,240	0.275
	2015	7.285	15.193	24.980	17.250	22.599	8,439	0.279
	2016	7.710	15.922	25.252	18.496	23.523	8,730	0.283
Netherlands	2017	7.320	15.567	25.231	18.359	22.276	8,773	0.281
	2014	5.473	11.357	19.540	13.869	2.567	13,187	0.256
	2015	5.261	11.228	19.642	13.079	2.682	13,340	0.256
	2016	5.749	11.672	20.807	12.953	4.682	13,642	0.257
Austria	2017	5.365	11.260	20.340	12.766	3.412	13,735	0.254
	2014	3.745	12.423	21.294	14.698	11.222	13,555	0.248
	2015	3.694	12.129	21.221	13.987	11.150	13,737	0.247
	2016	4.925	13.185	21.497	15.650	12.204	14,274	0.250
Poland	2017	4.987	13.170	21.484	15.830	12.106	14,454	0.250
	2014	11.216	17.541	25.241	21.757	11.590	3,140	0.304
	2015	11.445	17.645	25.386	21.834	11.925	3,332	0.305
	2016	8.585	14.441	22.945	10.084	14.247	3,424	0.285
Portugal	2017	8.514	14.344	22.851	9.929	14.394	3,656	0.284
	2014	13.005	18.844	26.302	22.920	16.540	5,227	0.332
	2015	13.179	19.141	26.754	23.050	17.674	5,304	0.337
	2016	13.172	19.205	26.687	22.469	18.764	5,374	0.336
	2017	13.105	19.238	26.698	22.358	19.058	5,433	0.337

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age ≥65	€/year	
Romania	2014	18.855	24.684	30.777	36.543	19.108	1,404	0.366
	2015	16.972	23.829	29.832	33.462	20.618	1,524	0.353
	2016	18.067	24.202	30.128	33.803	21.772	1,629	0.358
	2017	18.445	24.068	30.482	34.641	20.090	1,708	0.365
Slovenia	2014	7.181	14.119	21.416	12.919	16.036	7,168	0.242
	2015	7.265	14.428	21.508	13.416	16.314	7,280	0.247
	2016	6.922	14.326	21.573	13.141	16.556	7,371	0.247
	2017	6.830	14.282	21.582	13.337	16.160	7,418	0.248
Slovakia	2014	6.929	11.313	17.232	18.433	4.869	4,108	0.213
	2015	7.244	11.477	17.319	18.571	4.946	4,206	0.215
	2016	7.340	11.631	17.404	18.830	4.971	4,299	0.217
	2017	7.335	11.665	17.574	18.851	5.036	4,424	0.217
Finland	2014	3.714	10.832	19.866	8.938	10.296	13,962	0.236
	2015	3.658	10.543	19.568	8.852	9.935	14,040	0.235
	2016	3.679	10.382	19.726	8.580	9.993	14,178	0.235
	2017	3.607	10.359	19.753	8.772	9.876	14,240	0.234
Sweden	2014	7.129	14.181	22.342	12.834	16.371	15,694	0.239
	2015	7.353	14.557	22.450	12.869	17.826	15,997	0.241
	2016	7.485	14.533	22.352	13.096	16.314	16,010	0.238
	2017	7.550	14.655	22.300	13.319	16.473	16,105	0.238
United Kingdom	2014	8.563	14.861	23.238	17.314	13.491	11,653	0.311
	2015	8.600	14.981	23.359	17.492	13.877	13,390	0.311
	2016	8.688	15.168	23.557	17.676	13.851	11,666	0.312
	2017	8.927	15.791	24.127	19.213	13.744	11,197	0.315

Source: EUROMOD version H1.0+

Notes: EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes) and include, therefore, the results for base-year 2013. For the UK, results are based on FRS 2014/15.

3.2. The effect of taxes and benefits on the risk of poverty

Figure 1 shows that the effect of adding public pensions to market income reduces poverty before taxes and benefits significantly in all countries. In the base year 2014, public pensions show the largest anti-poverty effect among various instruments of EU tax-benefits systems. Table 2 shows that in Greece, when added to market incomes, pensions contribute to reducing the poverty rate by nearly 27 percentage points, the largest effect across countries. Other countries where public pensions play a major role in reducing poverty are: in Czech Republic and Poland, poverty drops by 22 percentage points when pensions are added to original income, in Hungary, Belgium, Italy, Luxembourg and Portugal where poverty drops between 20 and 21 percentage points. On the contrary, the countries where public pensions are less effective in reducing poverty when added to original incomes are United Kingdom, Netherlands and Ireland. In these countries in fact an important part of the pensions system consists of occupational and private pensions (included in original income), while public pensions have the role of a residual safety net.

After public pensions, means-tested benefits represent another important instrument for poverty reduction, in particular in Ireland, United Kingdom, and, to a lesser extent, the Netherlands and

Finland. In these countries, when means-tested benefits are subtracted from disposable income, the poverty rate increases by 14 percentage points for the first and 8 percentage points for the second pair of countries. On the other hand, in many countries, the anti-poverty effect of means-tested benefits remains modest. In fact, in 12 countries the increase is below 3 percentage points; and for Latvia, and Estonia, the anti-poverty effect of means-tested benefits is below 1 percentage point.

In addition, in several countries an important anti-poverty role is played by universal benefits or benefits not subject to a means-test (e.g. unemployment benefits). This is the case for Luxembourg, Austria, Sweden, Netherlands, Finland and United Kingdom: in these countries, when non-means tested benefits are subtracted from disposable income, the poverty rate increases between 7 and 11 percentage points. On the other hand, the anti-poverty effect of non-means-tested benefits in the base year remains very modest in Greece, Romania and Bulgaria.

Adding back taxes to disposable income has a relatively small poverty-reducing. Larger effects are observed in the Nordic countries, where the tax system has a more marked redistributive role: in fact, in Sweden and in Denmark the poverty-reducing effect of adding taxes back to the disposable income is 6 and 5 percentage points respectively. Other countries experiencing a noticeable effect above 4 percentage points are Poland (4.9), Hungary (4.2) and Finland (4). On the other hand, for 11 EU countries, the poverty-reducing effect remains below 1 percentage point.

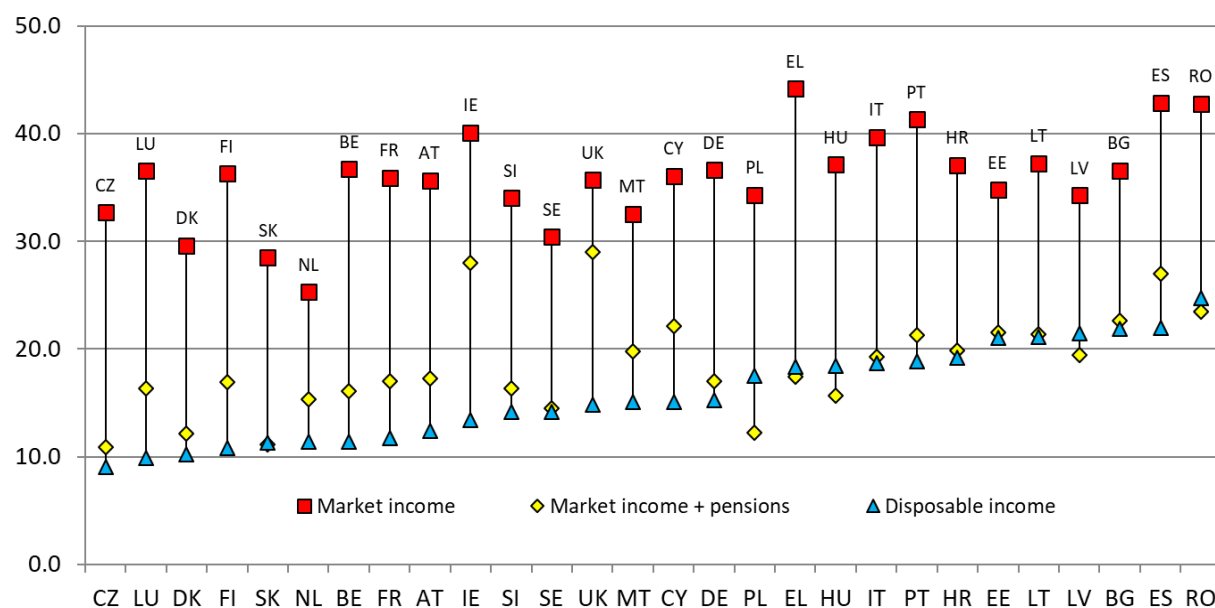
Regarding the poverty-reducing effect of adding back social insurance contributions (SIC) to disposable income, we observe similar magnitudes as for taxes. The strongest poverty-reducing effects are observed in the Netherlands, Luxembourg, Hungary and Poland (between 5 and 6 percentage points). On the other hand, SICs have a really minor poverty-reducing effect (less than 1 percentage point) in Finland, Estonia, United Kingdom, Ireland and Denmark.

Table 2 offers also a comparison of how the impact of different components of the tax/benefits systems on poverty changed between 2014 and 2017. In general, the rankings of the countries, in terms of the anti-poverty effectiveness of the single tax/benefits instruments, are largely preserved, with some exceptions. With respect to means-tested benefits, for instance, the country in which they show the largest change in terms of poverty reduction is Poland, where in 2017, poverty increases by 5.5 percentage points more, compared to 2014, when means-tested benefits are subtracted from disposable income. As mentioned earlier, this effect is likely to be explained by the introduction of generous means-tested family benefits, in particular child benefits, in 2016. For most other countries, the performance of means-tested benefits remains basically unchanged (between -1 and 1 percentage points), while we observe a slight decline in anti-poverty effectiveness (between 1 and 2 percentage points), in Ireland, Greece and United Kingdom.

As far as non-means-tested benefits are concerned, at the EU level we do not observe large differences in their anti-poverty impact between 2014 and 2017. The effect for all countries stays between -1 and 1 percentage points.

As far as taxes are concerned, between 2014 and 2017 we again do not observe much variation in the poverty-reducing effect of adding taxes back to disposable income. The effect for all but one country stays between -1 and 1 percentage points. We observe a slight increase in the poverty-reducing effect of 1.4 percentage points for Luxembourg. Similar findings apply to Social Insurance Contributions with the effect size for all the countries remaining between -1 and 1 percentage points. Finally, when looking at how the anti-poverty effects of public pensions have changed over time, while for most countries we do not observe any substantial change, we see a decline in the poverty-reduction effect of between 1 and 2 percentage points in Latvia, Romania, Lithuania, Bulgaria, Estonia.

Figure 1. Poverty risk and the role of public pensions and non-pension benefits and taxes (2014 incomes and policies)



Source: EUROMOD version H1.0+

Note: Countries have been ranked according to the poverty estimates for disposable income. EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes). For the UK, results are based on FRS 2014/15.

Table 2. Effects of tax-benefit components on poverty risk: 2014-2017

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Belgium	2014	11.369	16.936	16.236	11.241	10.049	36.706	16.061
	2015	11.101	16.769	16.102	11.159	9.847	36.652	16.008
	2016	10.803	16.622	15.910	11.059	9.712	37.079	16.107
	2017	11.143	16.698	16.153	11.274	9.880	37.257	16.320
Bulgaria	2014	21.869	24.786	23.878	20.425	19.930	36.560	22.641
	2015	22.251	24.747	24.293	20.770	20.056	36.352	22.690
	2016	22.794	24.959	24.596	21.305	20.416	35.556	22.626
	2017	23.073	25.114	24.839	21.500	20.759	35.476	22.722
Czech Republic	2014	9.040	11.653	11.809	8.738	6.793	32.655	10.901
	2015	9.115	11.745	11.876	8.823	6.769	32.718	10.943
	2016	9.463	12.067	12.262	9.104	7.034	32.566	11.076
	2017	9.823	12.229	12.487	9.416	7.208	32.187	10.973
Denmark	2014	10.237	16.319	16.985	4.993	9.924	29.612	12.183
	2015	10.370	16.152	17.082	5.207	9.810	29.371	12.190
	2016	10.299	16.118	17.088	5.207	9.995	29.316	12.085
	2017	10.698	16.059	17.414	5.207	10.252	29.392	12.164
Germany	2013	15.056	18.711	20.459	14.080	11.505	36.614	17.075
	2014	15.222	18.754	20.521	14.099	11.563	36.619	17.046
	2015	15.414	18.768	20.518	14.269	11.722	36.413	17.025
	2016	15.418	18.611	20.390	14.231	11.518	36.502	16.797
	2017	15.384	18.693	20.342	14.289	11.521	36.479	16.796
Estonia	2014	21.038	21.038	25.726	18.694	20.174	34.785	21.527
	2015	21.185	21.198	26.524	19.021	20.471	35.242	22.592
	2016	21.188	21.211	26.612	19.629	20.462	35.292	23.178
	2017	21.364	21.576	26.732	19.137	20.627	35.159	22.919
Ireland	2014	13.436	27.842	19.367	11.962	13.076	40.111	27.969
	2015	14.068	27.802	20.288	12.755	13.698	39.941	27.972
	2016	14.888	27.908	21.071	13.491	14.626	40.117	28.175
	2017	14.825	27.791	20.798	13.486	14.504	40.212	28.183
Greece	2014	18.328	23.516	19.128	16.541	14.241	44.144	17.444
	2015	19.613	23.523	20.513	17.462	15.129	43.991	17.364
	2016	19.121	23.177	19.997	16.611	14.309	43.243	16.614
	2017	18.749	22.655	19.526	16.356	14.511	43.198	16.568
Spain	2014	21.938	26.710	25.380	21.576	19.732	42.867	27.014
	2015	22.151	26.843	25.733	21.888	19.982	43.333	27.440
	2016	22.181	26.921	25.801	21.890	20.067	43.287	27.438
	2017	22.023	26.865	25.671	21.750	19.982	43.140	27.369
France	2014	11.766	18.732	18.237	9.341	8.823	35.910	16.981
	2015	11.958	18.955	18.251	9.614	8.903	35.872	17.078
	2016	12.131	19.089	18.456	9.869	9.072	35.777	17.097
	2017	12.364	18.942	18.452	10.069	9.210	35.628	17.129
Italy	2014	18.689	21.850	21.680	16.800	16.013	39.668	19.300
	2015	18.243	21.693	21.215	16.598	15.763	39.644	19.316
	2016	18.051	21.588	21.189	16.742	15.614	39.785	19.473

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Cyprus	2017	17.971	21.456	21.104	16.770	15.543	39.840	19.458
	2014	15.101	22.183	18.500	14.417	12.823	36.076	22.126
	2015	14.912	22.021	18.386	14.432	12.695	36.299	22.043
	2016	14.834	21.923	18.098	14.408	12.536	36.309	21.993
	2017	14.964	21.969	18.211	14.593	12.750	36.325	22.039
Latvia	2014	21.478	21.531	25.228	18.431	19.237	34.247	19.405
	2015	21.973	22.026	26.085	19.095	19.874	34.058	20.255
	2016	22.613	22.644	26.636	19.675	20.366	33.880	20.809
	2017	22.810	22.874	26.785	19.785	20.473	33.795	20.958
Lithuania	2014	21.089	22.915	24.655	19.776	18.876	37.244	21.394
	2015	21.549	23.404	25.208	20.024	19.508	37.196	21.920
	2016	21.525	23.194	24.861	20.374	19.558	37.021	22.026
	2017	21.904	23.386	24.998	21.099	19.902	37.225	22.636
Luxembourg	2014	9.905	14.535	21.060	8.929	4.219	36.555	16.379
	2015	9.659	14.446	20.716	8.853	4.208	36.481	16.338
	2016	9.522	14.439	20.738	8.483	4.146	36.481	16.246
	2017	10.295	14.816	20.975	10.688	4.890	36.879	16.941
Hungary	2014	18.408	19.661	24.378	14.207	13.193	37.095	15.633
	2015	18.884	19.994	24.476	14.539	13.660	36.734	15.812
	2016	19.170	20.246	24.331	14.963	13.999	36.678	16.240
	2017	18.826	20.000	24.069	14.761	14.028	36.519	16.042
Croatia	2014	19.229	22.155	21.537	19.092	16.092	37.076	19.866
	2015	19.511	22.384	21.688	19.445	16.389	37.083	20.035
	2016	19.315	22.444	21.909	19.238	16.250	37.066	20.075
	2017	19.958	22.959	22.408	19.934	16.714	37.219	20.590
Malta	2014	15.088	21.763	19.123	14.425	12.504	32.552	19.751
	2015	15.193	22.219	19.216	14.538	12.692	32.143	19.941
	2016	15.922	22.161	19.472	15.024	13.252	32.010	20.230
	2017	15.567	22.260	19.188	14.870	12.902	32.052	20.201
Netherlands	2014	11.357	18.898	19.320	9.742	5.376	25.306	15.371
	2015	11.228	19.279	19.418	9.104	5.355	25.339	15.468
	2016	11.672	19.540	19.817	9.745	5.394	25.660	15.775
	2017	11.260	19.578	19.516	9.163	5.324	25.836	15.866
Austria	2014	12.423	16.928	21.983	11.455	8.385	35.650	17.252
	2015	12.129	16.753	21.939	11.366	8.279	35.582	17.164
	2016	13.185	17.081	22.344	13.002	8.993	36.518	18.115
	2017	13.170	17.030	22.272	12.972	9.035	36.394	17.995
Poland	2014	17.541	19.387	19.813	12.663	12.569	34.297	12.255
	2015	17.645	19.408	19.895	12.791	12.746	34.266	12.353
	2016	14.441	21.717	16.534	9.914	9.998	35.635	14.001
	2017	14.344	21.644	16.374	10.003	9.921	35.580	13.913
Portugal	2014	18.844	21.217	22.356	17.884	17.120	41.290	21.261
	2015	19.141	21.436	22.698	18.308	17.530	41.395	21.550
	2016	19.205	21.589	22.954	18.424	17.614	41.384	21.741
	2017	19.238	21.679	22.992	18.473	17.673	41.370	21.832

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Romania	2014	24.684	26.964	26.487	21.475	22.805	42.784	23.491
	2015	23.829	26.420	26.370	20.335	21.570	42.444	23.632
	2016	24.202	26.830	26.528	21.000	22.156	42.490	24.147
	2017	24.068	27.280	26.492	20.791	22.212	42.215	24.236
Slovenia	2014	14.119	17.776	20.513	13.436	9.872	34.027	16.348
	2015	14.428	17.843	20.611	13.606	9.858	33.574	16.290
	2016	14.326	18.026	20.404	13.553	9.715	33.485	16.303
	2017	14.282	18.008	20.331	13.634	9.524	33.606	16.293
Slovakia	2014	11.313	12.859	15.522	10.591	7.355	28.468	11.106
	2015	11.477	12.866	15.560	10.727	7.583	28.338	11.096
	2016	11.631	12.865	15.674	10.769	7.787	27.935	11.018
	2017	11.665	12.905	15.699	10.880	8.089	27.818	10.917
Finland	2014	10.832	18.619	18.699	6.913	9.845	36.299	16.948
	2015	10.543	18.520	18.385	6.816	9.478	36.223	16.905
	2016	10.382	18.449	18.242	6.870	9.370	36.186	16.946
	2017	10.359	18.499	18.208	6.949	9.156	36.172	16.948
Sweden	2014	14.181	15.885	23.373	8.136	12.325	30.417	14.475
	2015	14.557	15.884	23.647	8.226	12.759	30.321	14.430
	2016	14.533	15.651	23.666	8.290	12.627	30.332	14.143
	2017	14.655	15.581	23.747	8.264	12.688	30.426	14.097
United Kingdom	2014	14.861	29.215	22.283	11.750	14.144	35.720	29.027
	2015	14.981	29.105	22.265	12.004	14.271	35.872	29.100
	2016	15.168	29.003	22.477	12.180	14.414	35.892	29.069
	2017	15.791	28.946	23.088	12.692	15.019	35.912	29.029

Source: EUROMOD version H1.0+

Notes: EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes) and include, therefore, the results for base-year 2013. For the UK, results are based on FRS 2014/15.

3.3. The effect of taxes and benefits on the poverty gap

Table 3 shows the effects of tax/benefits instruments on the poverty gap, which measures the average distance between the disposable income of the poor and the poverty line (as % of the poverty line). The table shows that the countries with the highest poverty rates are also the countries with the highest poverty gap in the base year. The poverty gap reaches 35% in Romania and exceeds 33% in Spain. In Italy, Greece, Portugal and Hungary the poverty gap is between 27% and 30%. The countries with the lowest poverty gap are: Austria (12%), Finland (11%), and Luxembourg (7%). Comparing the 2017 results with the base year, we do not observe substantial differences or re-rankings.

Table 3 also enables us to decompose the effects of taxes and benefits on the poverty gap using the same approach followed in Table 2. Public pensions lower the poverty gap on average by 45 percentage points when added to market incomes in the base year (2014). This effect varies widely across countries, however, reaching 66 percentage points in Greece, around 65 in Czech Republic and Croatia, 63 in Estonia and 60 in Slovakia, Lithuania and Austria, while on the other hand very small effects can be found in Ireland, the Netherlands, Denmark and the United Kingdom. On average,

means-tested benefits represent the second most important instrument, after public pensions, in terms of effectiveness at reducing the poverty gap. On average they help in closing the poverty gap by 10 percentage points, and up to 50 and 25 percentage points in Ireland, and United Kingdom, respectively. On the other hand, they have very modest effects (below 2 percentage points) in Hungary, Greece, Latvia and Estonia. Non-means tested benefits have a smaller impact on average, helping to close the gap by around 5 percentage points. The poverty gap reduction effect is stronger in Denmark (16 percentage points), Luxembourg, Netherlands, Sweden and Hungary, while only modest effects (below 1 percentage points) can be found in Poland, United Kingdom and Bulgaria. The poverty gap estimates are not significantly affected by the addition of taxes and social insurance contributions.

When we look at how effectiveness of tax/benefits instruments at closing the poverty gap have changed over time, we cannot observe substantial changes between 2014 and 2017. Few exceptions are represented by a stronger effectiveness of means tested benefits in Poland, Romania and Estonia. At the other side of the spectrum, Hungary, Ireland, Bulgaria and Slovakia, experienced a worsening in the capacity of their means-tested benefits to close the poverty gap.

Table 3. Effects of tax-benefit components on poverty gap: 2014-2017

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Belgium	2014	17.522	23.270	25.386	19.331	18.842	99.463	45.718
	2015	18.001	23.053	25.714	19.261	18.712	99.399	45.746
	2016	17.600	23.164	26.715	18.529	18.194	99.352	45.220
	2017	17.360	23.293	25.409	18.689	18.327	99.292	45.149
Bulgaria	2014	26.027	33.476	25.720	26.385	25.183	82.861	34.443
	2015	26.256	33.074	25.757	26.396	25.927	83.540	33.833
	2016	26.875	32.581	26.537	26.723	27.051	84.328	34.149
	2017	27.251	32.259	27.067	27.491	27.262	84.306	33.190
Czech Republic	2014	18.892	28.145	21.859	19.479	17.559	99.219	34.501
	2015	19.788	28.690	22.329	20.198	18.691	99.179	33.907
	2016	18.805	28.081	22.383	19.302	17.333	99.463	32.988
	2017	19.426	27.964	22.836	19.879	17.525	99.653	32.803
Denmark	2014	22.238	32.234	40.928	32.019	23.337	80.848	68.320
	2015	23.605	32.678	41.646	29.745	23.911	81.300	67.932
	2016	23.601	32.574	41.883	30.166	23.962	81.354	67.879
	2017	21.604	33.538	41.223	31.633	23.873	80.982	67.818
Germany	2013	19.648	35.349	24.415	20.634	21.638	95.114	50.432
	2014	19.554	35.569	24.521	20.761	21.632	95.320	50.603
	2015	19.392	35.461	24.859	20.790	21.462	95.546	50.491
	2016	19.986	35.610	25.061	21.120	22.000	95.451	51.556
	2017	20.529	35.934	25.149	21.310	22.184	95.506	51.383
Estonia	2014	19.751	20.118	24.033	20.436	19.121	86.985	23.982
	2015	17.601	19.533	23.980	18.184	17.235	86.023	24.220
	2016	17.484	19.806	23.119	17.903	17.159	86.062	23.901
	2017	17.087	19.712	23.267	17.533	16.785	86.659	23.912
Ireland	2014	13.376	63.657	21.534	13.127	13.163	98.771	78.162
	2015	14.186	63.897	21.646	13.591	14.215	98.980	77.549

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Greece	2016	15.026	64.089	22.507	14.669	14.899	99.065	77.007
	2017	15.120	64.205	22.394	14.613	15.090	99.027	76.754
	2014	28.768	29.915	29.934	28.303	28.647	97.782	31.307
	2015	28.164	29.316	29.277	27.715	28.855	98.422	31.031
Spain	2016	28.115	30.301	29.158	27.044	27.595	99.308	32.568
	2017	27.444	29.316	28.702	26.075	27.077	99.308	32.568
	2014	33.719	44.660	36.227	34.233	32.183	72.332	46.693
	2015	32.172	44.123	36.449	32.389	30.812	73.911	46.433
France	2016	32.400	44.205	36.517	32.503	30.840	73.131	46.434
	2017	32.677	44.152	36.517	32.795	31.143	73.136	46.503
	2014	15.685	27.811	24.514	16.682	16.059	78.859	39.990
	2015	15.482	27.879	24.373	16.668	16.637	78.919	39.424
Italy	2016	15.343	27.808	23.709	16.356	16.848	79.036	39.255
	2017	15.862	27.728	24.944	17.209	17.362	79.119	39.367
	2014	29.941	32.152	31.898	32.303	30.103	85.052	37.754
	2015	29.571	31.748	31.464	31.836	29.294	87.284	37.619
Cyprus	2016	29.169	31.120	31.337	31.283	28.758	87.071	37.434
	2017	29.347	31.288	31.582	31.288	28.961	87.387	37.424
	2014	14.822	21.796	18.218	14.822	13.152	62.410	25.098
	2015	14.716	22.021	18.069	14.739	13.150	62.241	25.392
Latvia	2016	14.602	22.250	17.936	14.497	12.918	62.216	25.404
	2017	15.060	22.096	18.283	14.904	13.081	62.292	25.430
	2014	24.395	25.146	27.845	25.769	24.414	83.815	31.427
	2015	24.330	25.017	27.658	25.024	24.423	84.009	30.035
Lithuania	2016	24.941	25.520	27.965	25.216	25.450	84.378	29.692
	2017	25.253	25.649	28.257	25.484	25.607	84.390	30.278
	2014	24.293	27.744	26.029	23.585	22.240	92.028	31.252
	2015	25.385	28.913	27.101	25.269	23.350	92.415	31.022
Luxembourg	2016	26.293	29.652	27.590	26.293	25.268	92.714	31.990
	2017	26.412	29.940	27.951	26.291	24.197	92.296	31.601
	2014	7.236	19.298	19.406	7.592	7.654	68.491	30.024
	2015	7.067	19.766	19.392	7.333	7.871	68.578	29.898
Hungary	2016	7.309	19.761	19.782	7.708	7.023	68.631	30.170
	2017	7.412	20.897	19.302	7.975	6.660	67.902	29.280
	2014	27.431	28.816	37.331	26.069	25.906	96.188	40.398
	2015	28.602	29.064	38.181	26.333	26.183	96.723	39.460
Croatia	2016	28.956	29.246	38.237	26.214	26.665	96.702	39.071
	2017	28.893	29.119	38.149	25.172	25.646	96.882	39.031
	2014	24.180	30.288	26.703	24.317	26.017	98.590	33.654
	2015	24.348	30.110	26.893	24.348	26.042	98.663	33.805
Malta	2016	24.701	30.038	26.705	24.701	25.776	98.983	34.335
	2017	24.864	30.534	27.079	24.749	26.737	98.714	35.729
	2014	16.077	24.852	18.788	16.194	14.348	84.770	29.976
	2015	15.667	24.758	18.940	15.713	13.526	84.789	29.951
	2016	16.069	24.863	20.351	16.461	14.444	84.695	29.307

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Netherlands	2017	15.227	24.258	20.053	15.358	13.837	84.757	29.397
	2014	15.850	34.422	24.722	17.475	21.668	63.480	65.480
	2015	15.815	33.701	25.317	16.862	21.012	63.504	65.054
	2016	16.580	33.981	24.896	16.822	22.325	63.798	63.917
Austria	2017	15.798	33.935	25.111	17.836	22.535	63.669	64.047
	2014	12.166	21.807	19.500	12.610	11.380	94.545	33.993
	2015	12.391	22.024	19.178	12.411	11.092	94.685	33.766
	2016	12.573	22.897	20.594	13.191	12.029	93.064	33.473
Poland	2017	12.890	22.933	20.674	13.623	12.254	93.282	33.208
	2014	24.162	29.055	24.913	23.556	21.884	77.279	28.295
	2015	24.674	29.463	25.243	24.829	22.483	77.813	28.571
	2016	21.802	29.429	22.386	23.540	22.982	74.233	28.036
Portugal	2017	21.301	28.800	21.993	23.528	21.891	74.587	28.238
	2014	27.484	31.803	30.193	27.738	26.152	86.716	32.328
	2015	27.476	31.946	29.917	27.649	26.476	86.423	32.587
	2016	26.760	32.059	27.879	26.691	25.201	86.198	32.528
Romania	2017	26.578	32.006	27.575	26.459	24.945	85.965	32.520
	2014	35.184	43.141	40.347	33.742	37.731	95.077	51.204
	2015	29.491	41.144	36.476	29.558	32.336	95.571	48.865
	2016	32.208	42.164	39.075	31.581	34.932	95.948	49.189
Slovenia	2017	32.646	42.842	39.911	31.618	35.875	96.319	50.764
	2014	17.060	26.921	21.940	16.791	16.099	86.607	31.175
	2015	16.741	27.253	21.646	16.815	16.067	84.555	31.022
	2016	16.232	27.233	20.973	16.144	15.239	84.955	31.094
Slovakia	2017	16.167	27.490	20.794	15.866	15.141	84.802	30.793
	2014	21.569	32.120	24.611	21.569	23.936	99.350	38.564
	2015	22.755	32.205	25.519	22.906	25.276	99.552	38.245
	2016	23.784	31.699	26.192	24.012	25.803	99.682	38.395
Finland	2017	25.240	31.413	26.918	25.703	26.199	99.780	38.650
	2014	11.445	30.204	19.557	10.454	11.215	92.704	40.186
	2015	11.303	30.010	18.849	10.561	11.183	92.807	40.002
	2016	11.682	29.687	18.838	10.906	11.343	92.861	39.868
Sweden	2017	11.200	29.966	18.698	10.757	11.006	92.858	39.819
	2014	16.690	25.346	28.358	22.220	16.938	84.550	44.481
	2015	16.908	25.752	28.332	23.643	16.966	84.680	44.799
	2016	17.474	25.524	28.580	22.744	17.303	84.868	45.695
United Kingdom	2017	17.392	25.869	28.612	23.909	17.433	84.813	45.601
	2014	20.960	46.930	21.359	20.699	21.299	72.471	57.470
	2015	20.294	47.082	21.364	20.234	20.932	72.653	57.260
	2016	20.460	47.637	21.526	20.214	21.011	72.974	57.491
	2017	20.733	48.000	22.170	20.579	21.001	73.076	57.508

Source: EUROMOD version H1.0+

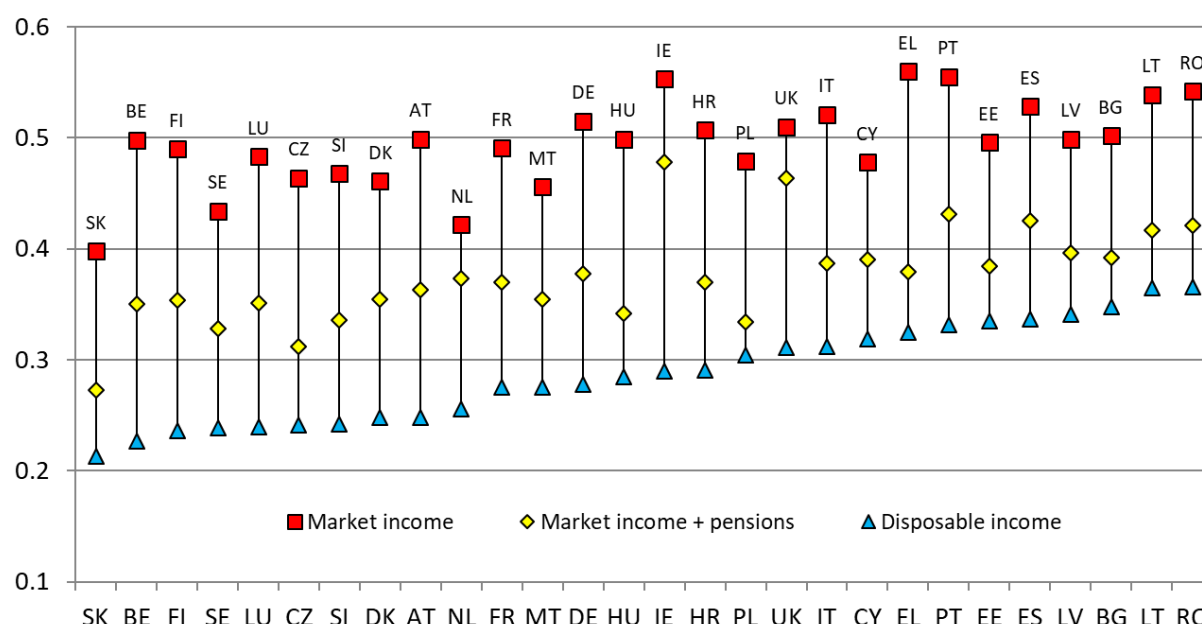
Notes: EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes) and include, therefore, the results for base-year 2013. For the UK, results are based on FRS 2014/15.

3.4. The effect of taxes and benefits on inequality

Table 4 and Figure 2 show the role of tax-benefit components of household income in reducing income inequality as measured by the Gini coefficient. Inequality of market income including public pensions (before tax) is everywhere lower than inequality of market income but higher than that of disposable income.

As in the case of poverty, public pensions are the most significant income component in reducing inequality in market incomes. The countries experiencing the largest reduction in the Gini coefficient once public pensions are added to original income are Greece, Hungary, Czech Republic, Belgium and Poland (the Gini drops by over 14 percentage points), followed by Croatia, Finland, Austria, Italy, Slovenia and Luxembourg (13 percentage points). At the other extreme of the spectrum, in Netherlands and United Kingdom the Gini coefficient drops only by 5 and 4.5 percentage points, respectively, given the greater importance of private and occupational pensions (included here in market income) in these countries, in addition to publicly provided old age pensions.

Figure 2. Income inequality (Gini coefficient) and the role of public pensions and non-pension benefits and taxes (2014 incomes and policies)



Source: EUROMOD version H1.0+

Note: Countries have been ranked according to the value of the Gini coefficient for disposable income. EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes). For the UK, results are based on FRS 2014/15.

Non-pension benefits and taxes (income taxes and social contributions) vary in their effectiveness in reducing income inequality across countries. They have a relatively large role compared with other countries in Belgium (taxes), Ireland (both benefits and taxes), Sweden and Denmark (non-means tested benefits) and the United Kingdom (means-tested benefits).

After pensions, means-tested benefits are on average the second instrument in order of importance to reduce inequality. The largest effect of means-tested benefits on the Gini coefficient can be found by far in Ireland and the United Kingdom, where the Gini increases by over 9 and 8 percentage points respectively when means-tested benefits are removed from disposable income. The other countries

where means-tested benefits have a large effect on the Gini are Netherlands and Finland (close to 5 percentage points). On the other hand, the countries where means-tested benefits have the smallest inequality reducing effect are Hungary, Latvia and Estonia, followed by Italy, Lithuania and Poland. In these countries, the increase in the Gini index is no more than 1.5 percentage points when means-tested benefits are subtracted from disposable income. This ranking can be explained partly by the higher importance of non-means tested benefits in some of the latter countries. In fact, when considering the inequality-reducing effect of non-means tested benefits, we find that in Sweden, Denmark and Netherlands non-means tested benefits have the largest inequality-reducing effect (above 4 percentage points). On the other hand, in countries such as Croatia, Lithuania, Poland, Italy, Greece, Cyprus and Bulgaria, non-means tested have the smallest anti-inequality effect just below 1 percentage points.

Table 4 shows us that direct income tax systems can have differential effects on inequality. In particular, the largest inequality-reducing effect of direct taxes can be found in Ireland, Belgium, Luxembourg, Portugal, Austria, Netherlands, Italy and Denmark where the Gini coefficient increases by over 5 percentage points when direct taxes are added back to disposable income. These countries are characterized by progressive tax systems, which could explain the equalizing effect of direct taxes on the income distribution. On the contrary, in Hungary, Bulgaria, and Poland direct taxes do not substantially affect inequality. In the case of Bulgaria and Hungary, this might be related to their flat tax systems. Finally, as far as SIC are concerned, in Belgium, Croatia and Slovenia SICs have a modest (2 percentage points) inequality reducing effect, while they have a very small effect in the majority of other countries.

Looking at changes between 2014 and 2017, the effects of taxes and benefits instruments in reducing income inequality seem to have remained largely stable over time. The sole exception being Poland, where the inequality-reducing effect of non-means tested benefits was considerably strengthened over time.

Table 4. Effects of tax-benefit components on Gini coefficient: 2014-2017

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Belgium	2014	0.227	0.251	0.254	0.299	0.252	0.498	0.350
	2015	0.226	0.250	0.253	0.299	0.251	0.498	0.350
	2016	0.223	0.248	0.250	0.295	0.248	0.498	0.347
	2017	0.223	0.248	0.250	0.296	0.248	0.498	0.348
Bulgaria	2014	0.348	0.375	0.350	0.356	0.357	0.502	0.392
	2015	0.351	0.376	0.353	0.359	0.361	0.503	0.394
	2016	0.357	0.380	0.359	0.366	0.366	0.502	0.397
	2017	0.359	0.380	0.360	0.367	0.368	0.502	0.398
Czech Republic	2014	0.241	0.261	0.254	0.271	0.256	0.464	0.312
	2015	0.242	0.262	0.255	0.272	0.257	0.464	0.312
	2016	0.245	0.264	0.257	0.275	0.259	0.464	0.314
	2017	0.247	0.266	0.260	0.278	0.261	0.464	0.315
Denmark	2014	0.248	0.287	0.289	0.299	0.249	0.461	0.355
	2015	0.251	0.289	0.293	0.302	0.252	0.464	0.358
	2016	0.251	0.289	0.293	0.303	0.253	0.464	0.358
	2017	0.253	0.290	0.295	0.305	0.254	0.465	0.359
Germany	2013	0.277	0.310	0.300	0.332	0.287	0.515	0.377
	2014	0.278	0.310	0.300	0.333	0.288	0.515	0.378
	2015	0.280	0.312	0.301	0.336	0.290	0.516	0.380
	2016	0.279	0.311	0.301	0.335	0.288	0.516	0.377
	2017	0.279	0.311	0.300	0.335	0.288	0.516	0.377
Estonia	2014	0.335	0.340	0.354	0.361	0.340	0.496	0.384
	2015	0.330	0.336	0.352	0.356	0.334	0.494	0.382
	2016	0.328	0.336	0.349	0.355	0.332	0.494	0.384
	2017	0.330	0.339	0.351	0.356	0.334	0.494	0.384
Ireland	2014	0.290	0.386	0.311	0.365	0.308	0.553	0.478
	2015	0.293	0.387	0.314	0.369	0.311	0.553	0.479
	2016	0.296	0.388	0.316	0.370	0.313	0.553	0.479
	2017	0.295	0.387	0.316	0.369	0.313	0.553	0.479
Greece	2014	0.325	0.347	0.330	0.354	0.329	0.560	0.379
	2015	0.325	0.345	0.331	0.354	0.330	0.558	0.377
	2016	0.324	0.345	0.329	0.354	0.329	0.558	0.377
	2017	0.318	0.342	0.323	0.347	0.329	0.558	0.377
Spain	2014	0.337	0.371	0.351	0.386	0.335	0.528	0.425
	2015	0.337	0.370	0.352	0.383	0.334	0.530	0.424
	2016	0.339	0.372	0.354	0.384	0.336	0.529	0.424
	2017	0.338	0.372	0.353	0.384	0.336	0.529	0.425
France	2014	0.275	0.311	0.300	0.314	0.285	0.491	0.370
	2015	0.274	0.311	0.299	0.315	0.285	0.491	0.371
	2016	0.274	0.310	0.300	0.315	0.285	0.491	0.371
	2017	0.275	0.310	0.301	0.317	0.287	0.491	0.371
Italy	2014	0.312	0.328	0.319	0.366	0.321	0.521	0.387
	2015	0.309	0.326	0.315	0.364	0.319	0.522	0.387
	2016	0.308	0.324	0.314	0.364	0.318	0.522	0.387

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Cyprus	2017	0.307	0.323	0.314	0.363	0.317	0.522	0.386
	2014	0.319	0.353	0.321	0.353	0.319	0.478	0.390
	2015	0.319	0.353	0.321	0.353	0.319	0.478	0.390
	2016	0.319	0.353	0.321	0.353	0.319	0.478	0.390
Latvia	2017	0.321	0.354	0.323	0.353	0.321	0.478	0.390
	2014	0.341	0.346	0.356	0.371	0.352	0.499	0.396
	2015	0.347	0.351	0.362	0.374	0.358	0.499	0.399
	2016	0.349	0.353	0.364	0.377	0.360	0.498	0.401
Lithuania	2017	0.350	0.354	0.365	0.378	0.361	0.498	0.403
	2014	0.365	0.380	0.374	0.388	0.375	0.539	0.417
	2015	0.368	0.383	0.378	0.391	0.378	0.539	0.419
	2016	0.371	0.384	0.380	0.395	0.381	0.539	0.421
Luxembourg	2017	0.371	0.383	0.380	0.397	0.381	0.539	0.423
	2014	0.240	0.261	0.276	0.303	0.248	0.483	0.351
	2015	0.239	0.261	0.274	0.303	0.247	0.483	0.351
	2016	0.240	0.261	0.274	0.303	0.248	0.483	0.351
Hungary	2017	0.241	0.262	0.273	0.304	0.248	0.483	0.351
	2014	0.285	0.291	0.318	0.293	0.298	0.499	0.342
	2015	0.288	0.293	0.320	0.296	0.301	0.499	0.344
	2016	0.290	0.295	0.321	0.299	0.305	0.499	0.347
Croatia	2017	0.289	0.294	0.320	0.299	0.304	0.499	0.347
	2014	0.291	0.313	0.300	0.323	0.315	0.507	0.370
	2015	0.296	0.318	0.305	0.324	0.319	0.507	0.370
	2016	0.295	0.318	0.304	0.324	0.319	0.507	0.371
Malta	2017	0.301	0.323	0.310	0.326	0.324	0.507	0.373
	2014	0.275	0.309	0.290	0.312	0.277	0.456	0.355
	2015	0.279	0.314	0.294	0.313	0.281	0.455	0.357
	2016	0.283	0.315	0.297	0.318	0.284	0.455	0.359
Netherlands	2017	0.281	0.313	0.295	0.316	0.282	0.455	0.358
	2014	0.256	0.306	0.296	0.312	0.258	0.422	0.373
	2015	0.256	0.308	0.296	0.312	0.257	0.423	0.373
	2016	0.257	0.308	0.297	0.312	0.259	0.423	0.373
Austria	2017	0.254	0.306	0.294	0.309	0.255	0.423	0.373
	2014	0.248	0.277	0.281	0.307	0.262	0.499	0.363
	2015	0.247	0.277	0.281	0.306	0.262	0.499	0.363
	2016	0.250	0.278	0.283	0.306	0.263	0.499	0.363
Poland	2017	0.250	0.279	0.283	0.307	0.264	0.499	0.363
	2014	0.304	0.316	0.313	0.317	0.305	0.479	0.334
	2015	0.305	0.317	0.314	0.318	0.307	0.480	0.335
	2016	0.285	0.318	0.293	0.300	0.289	0.481	0.338
Portugal	2017	0.284	0.318	0.292	0.301	0.289	0.481	0.338
	2014	0.332	0.351	0.348	0.392	0.347	0.555	0.431
	2015	0.337	0.355	0.352	0.396	0.347	0.555	0.431
	2016	0.336	0.357	0.351	0.393	0.346	0.554	0.431
	2017	0.337	0.359	0.352	0.393	0.347	0.554	0.430

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Romania	2014	0.366	0.388	0.378	0.386	0.375	0.542	0.421
	2015	0.353	0.379	0.370	0.375	0.363	0.540	0.420
	2016	0.358	0.382	0.374	0.380	0.369	0.542	0.423
	2017	0.365	0.390	0.380	0.382	0.375	0.543	0.425
Slovenia	2014	0.242	0.270	0.269	0.279	0.265	0.468	0.336
	2015	0.247	0.275	0.274	0.284	0.268	0.466	0.339
	2016	0.247	0.276	0.272	0.283	0.268	0.466	0.339
	2017	0.248	0.278	0.274	0.282	0.268	0.466	0.338
Slovakia	2014	0.213	0.233	0.232	0.231	0.225	0.398	0.273
	2015	0.215	0.233	0.233	0.233	0.227	0.398	0.273
	2016	0.217	0.234	0.235	0.235	0.229	0.398	0.275
	2017	0.217	0.234	0.236	0.236	0.231	0.399	0.275
Finland	2014	0.236	0.284	0.269	0.284	0.249	0.490	0.354
	2015	0.235	0.283	0.267	0.284	0.248	0.490	0.354
	2016	0.235	0.283	0.267	0.285	0.249	0.490	0.354
	2017	0.234	0.282	0.266	0.283	0.250	0.490	0.354
Sweden	2014	0.239	0.255	0.289	0.279	0.242	0.434	0.328
	2015	0.241	0.256	0.290	0.281	0.244	0.435	0.328
	2016	0.238	0.253	0.288	0.280	0.241	0.435	0.327
	2017	0.238	0.252	0.288	0.280	0.241	0.435	0.326
United Kingdom	2014	0.311	0.392	0.339	0.354	0.328	0.510	0.464
	2015	0.311	0.391	0.339	0.354	0.328	0.510	0.464
	2016	0.312	0.392	0.340	0.355	0.330	0.511	0.465
	2017	0.315	0.392	0.342	0.358	0.332	0.512	0.465

Source: EUROMOD version H1.0+

Notes: EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes) and include, therefore, the results for base-year 2013. For the UK, results are based on FRS 2014/15.

Another possible way for measuring income inequality is the Atkinson measure of inequality displayed in table 5. The main difference between Gini and Atkinson is that while the Gini is a purely statistical measure while the Atkinson inequality measure is a normative one that allows to put different weights to the lower end of the income distribution. The Atkinson measure is useful in determining which end of the distribution contributes most to the observed inequality. The results for Atkinson measure of inequality are dependent on the choice of epsilon (inequality aversion parameter) used in the calculations. Higher epsilon values mean that relatively more weight is attached to inequality at the lower end of the distribution, and relatively less at the upper end. In this report we are showing results based on the common epsilon values of 0.5, 1 and 1.5.

Table 5 shows that the Atkinson index and Gini produce similar results in the rankings of countries: Romania, Lithuania, Bulgaria, Latvia and Spain have the highest income inequality while Sweden, Finland, Belgium and Slovakia experience lowest inequality. However, looking at the pre-redistribution incomes it is clear that Gini and Atkinson produce different results. Results produced with an epsilon value of 1.5 (inequality at the bottom of the income distribution has more weight) show that the countries with highest income inequality are Malta, Finland, Belgium, Austria and Sweden – all of them are countries with low or very low inequality when measured by Gini. This

means that in those countries, the very poor have a much worse starting position compared to the rest of the population if no redistributive mechanisms are considered. At the opposite end of the spectrum with the lowest inequality as measured by Atkinson (1.5) are Poland, Hungary, Croatia, Cyprus and Greece. While Poland and Cyprus are also ranked as having low income inequality according to Gini, Greece is ranked as having the highest inequality by Gini. This shows that while overall the pre-redistribution incomes in Greece are very unequally distributed in society, the situation of the very poor, however, is not that far behind the rest of the population.

Table 5. Effects of tax-benefit components on the Atkinson index: 2014-2017

	Policy year	Disposable income			Original Income			Original Income plus pensions		
		A(0.5)	A(1)	A(1.5)	A(0.5)	A(1)	A(1.5)	A(0.5)	A(1)	A(1.5)
Belgium	2014	0.043	0.087	0.156	0.218	0.351	0.959	0.099	0.191	0.570
	2015	0.043	0.087	0.161	0.218	0.351	0.956	0.099	0.191	0.560
	2016	0.042	0.085	0.164	0.218	0.351	0.959	0.097	0.188	0.565
	2017	0.042	0.085	0.163	0.217	0.351	0.956	0.098	0.189	0.559
Bulgaria	2014	0.101	0.220	0.269	0.172	0.343	0.592	0.129	0.269	0.397
	2015	0.103	0.223	0.274	0.173	0.345	0.607	0.129	0.271	0.397
	2016	0.106	0.231	0.284	0.173	0.345	0.606	0.131	0.275	0.401
	2017	0.107	0.233	0.287	0.173	0.345	0.602	0.131	0.276	0.401
Czech Republic	2014	0.049	0.105	0.142	0.127	0.239	0.656	0.080	0.166	0.291
	2015	0.050	0.106	0.139	0.127	0.239	0.658	0.080	0.166	0.292
	2016	0.050	0.107	0.141	0.127	0.239	0.661	0.081	0.167	0.295
	2017	0.051	0.109	0.145	0.127	0.238	0.663	0.082	0.168	0.297
Denmark	2014	0.173	0.121	0.167	0.879	0.392	0.892	0.466	0.207	0.661
	2015	0.175	0.122	0.176	0.883	0.393	0.879	0.470	0.209	0.631
	2016	0.177	0.122	0.177	0.896	0.395	0.880	0.482	0.209	0.631
	2017	0.056	0.126	0.184	0.187	0.364	0.877	0.111	0.237	0.624
Germany	2013	0.065	0.136	0.204	0.235	0.413	0.918	0.116	0.232	0.630
	2014	0.065	0.136	0.206	0.236	0.414	0.921	0.117	0.232	0.635
	2015	0.066	0.138	0.208	0.237	0.415	0.924	0.118	0.234	0.639
	2016	0.066	0.137	0.209	0.236	0.415	0.922	0.116	0.231	0.637
	2017	0.065	0.137	0.209	0.237	0.414	0.923	0.116	0.231	0.639
Estonia	2014	0.058	0.131	0.247	0.187	0.370	0.864	0.113	0.244	0.405
	2015	0.058	0.132	0.240	0.188	0.370	0.910	0.112	0.244	0.432
	2016	0.059	0.135	0.232	0.188	0.374	0.910	0.113	0.248	0.427
	2017	0.090	0.188	0.237	0.156	0.295	0.911	0.118	0.242	0.430
Ireland	2014	0.068	0.136	0.194	0.138	0.264	0.708	0.099	0.195	0.556
	2015	0.070	0.139	0.197	0.138	0.264	0.707	0.100	0.198	0.557
	2016	0.069	0.138	0.200	0.138	0.264	0.725	0.100	0.198	0.565
	2017	0.067	0.140	0.200	0.179	0.346	0.728	0.148	0.298	0.565
Greece	2014	0.087	0.182	0.283	0.156	0.293	0.590	0.116	0.239	0.402
	2015	0.085	0.179	0.275	0.156	0.293	0.590	0.117	0.240	0.402
	2016	0.087	0.181	0.271	0.156	0.293	0.591	0.117	0.241	0.404
	2017	0.092	0.199	0.229	0.171	0.366	0.596	0.120	0.259	0.404
Spain	2014	0.091	0.198	0.333	0.169	0.361	0.780	0.118	0.257	0.514
	2015	0.089	0.191	0.337	0.169	0.361	0.807	0.118	0.256	0.523

	Policy year	Disposable income			Original Income			Original Income plus pensions		
		A(0.5)	A(1)	A(1.5)	A(0.5)	A(1)	A(1.5)	A(0.5)	A(1)	A(1.5)
France	2016	0.084	0.184	0.335	0.170	0.361	0.792	0.118	0.256	0.523
	2017	0.095	0.188	0.327	0.215	0.413	0.791	0.145	0.290	0.518
	2014	0.045	0.097	0.172	0.225	0.379	0.885	0.108	0.209	0.547
	2015	0.045	0.097	0.172	0.225	0.379	0.885	0.109	0.210	0.547
	2016	0.045	0.096	0.177	0.225	0.379	0.886	0.109	0.210	0.547
Italy	2017	0.064	0.142	0.177	0.224	0.424	0.886	0.121	0.255	0.548
	2014	0.068	0.142	0.275	0.179	0.346	0.845	0.149	0.301	0.415
	2015	0.070	0.144	0.262	0.180	0.347	0.892	0.149	0.302	0.429
	2016	0.069	0.144	0.279	0.180	0.348	0.893	0.149	0.301	0.428
	2017	0.081	0.166	0.279	0.211	0.398	0.902	0.124	0.256	0.428
Cyprus	2014	0.087	0.203	0.211	0.164	0.350	0.546	0.126	0.289	0.324
	2015	0.087	0.203	0.211	0.164	0.350	0.549	0.126	0.289	0.324
	2016	0.087	0.203	0.210	0.164	0.350	0.557	0.126	0.289	0.324
	2017	0.088	0.206	0.212	0.164	0.350	0.556	0.126	0.289	0.324
	2014	0.047	0.100	0.259	0.186	0.346	0.872	0.101	0.209	0.396
Latvia	2015	0.047	0.100	0.266	0.187	0.346	0.878	0.101	0.209	0.416
	2016	0.047	0.100	0.279	0.186	0.345	0.879	0.101	0.208	0.406
	2017	0.094	0.197	0.272	0.171	0.323	0.882	0.127	0.261	0.408
	2014	0.080	0.163	0.297	0.215	0.402	0.618	0.124	0.256	0.390
	2015	0.079	0.162	0.310	0.215	0.402	0.621	0.124	0.256	0.393
Lithuania	2016	0.079	0.162	0.307	0.216	0.402	0.624	0.123	0.255	0.397
	2017	0.108	0.235	0.324	0.175	0.358	0.626	0.137	0.296	0.398
	2014	0.109	0.239	0.127	0.175	0.357	0.896	0.138	0.298	0.436
	2015	0.111	0.242	0.126	0.175	0.357	0.896	0.140	0.301	0.436
	2016	0.111	0.242	0.126	0.175	0.357	0.896	0.141	0.303	0.436
Luxembourg	2017	0.047	0.100	0.127	0.186	0.345	0.897	0.101	0.208	0.436
	2014	0.072	0.145	0.210	0.140	0.274	0.524	0.107	0.219	0.340
	2015	0.071	0.144	0.217	0.140	0.274	0.536	0.108	0.219	0.341
	2016	0.074	0.150	0.225	0.140	0.274	0.526	0.109	0.221	0.343
	2017	0.066	0.133	0.221	0.138	0.264	0.526	0.098	0.193	0.343
Hungary	2014	0.064	0.142	0.212	0.224	0.424	0.524	0.121	0.256	0.347
	2015	0.064	0.142	0.219	0.224	0.424	0.533	0.122	0.256	0.356
	2016	0.065	0.143	0.216	0.224	0.424	0.542	0.122	0.256	0.354
	2017	0.069	0.140	0.223	0.140	0.274	0.543	0.107	0.217	0.356
	2014	0.097	0.203	0.167	0.171	0.324	0.972	0.129	0.265	0.885
Croatia	2015	0.098	0.206	0.169	0.171	0.323	0.971	0.130	0.268	0.884
	2016	0.098	0.207	0.175	0.171	0.323	0.970	0.131	0.269	0.880
	2017	0.061	0.130	0.172	0.219	0.376	0.970	0.114	0.222	0.880
	2014	0.063	0.134	0.163	0.218	0.375	0.846	0.116	0.224	0.808
	2015	0.064	0.137	0.163	0.218	0.375	0.847	0.116	0.226	0.809
Malta	2016	0.064	0.136	0.165	0.218	0.375	0.844	0.116	0.225	0.805
	2017	0.056	0.119	0.162	0.161	0.305	0.844	0.125	0.241	0.805
	2014	0.051	0.112	0.135	0.221	0.396	0.926	0.112	0.231	0.457
	2015	0.051	0.112	0.134	0.221	0.396	0.927	0.112	0.231	0.458
	2016	0.052	0.113	0.138	0.221	0.396	0.927	0.112	0.231	0.458
Austria	2017	0.052	0.113	0.138	0.222	0.396	0.927	0.112	0.231	0.458

	Policy year	Disposable income			Original Income			Original Income plus pensions		
		A(0.5)	A(1)	A(1.5)	A(0.5)	A(1)	A(1.5)	A(0.5)	A(1)	A(1.5)
Poland	2014	0.056	0.119	0.231	0.162	0.306	0.429	0.126	0.242	0.279
	2015	0.056	0.119	0.239	0.162	0.306	0.431	0.126	0.242	0.281
	2016	0.055	0.116	0.200	0.162	0.306	0.434	0.125	0.242	0.284
	2017	0.077	0.159	0.202	0.131	0.264	0.435	0.092	0.190	0.285
Portugal	2014	0.077	0.160	0.242	0.132	0.265	0.599	0.092	0.192	0.388
	2015	0.067	0.141	0.248	0.132	0.267	0.597	0.094	0.194	0.388
	2016	0.067	0.141	0.241	0.133	0.267	0.595	0.094	0.195	0.388
	2017	0.090	0.191	0.243	0.183	0.376	0.594	0.144	0.311	0.387
Romania	2014	0.092	0.197	0.347	0.182	0.375	0.637	0.144	0.311	0.532
	2015	0.091	0.195	0.302	0.182	0.375	0.636	0.144	0.311	0.532
	2016	0.092	0.197	0.316	0.182	0.374	0.648	0.144	0.311	0.542
	2017	0.133	0.418	0.330	0.174	0.332	0.656	0.170	0.487	0.549
Slovenia	2014	0.049	0.101	0.139	0.185	0.321	0.756	0.096	0.188	0.311
	2015	0.048	0.099	0.144	0.185	0.321	0.722	0.095	0.186	0.310
	2016	0.048	0.099	0.142	0.186	0.322	0.727	0.095	0.185	0.311
	2017	0.048	0.099	0.144	0.172	0.310	0.726	0.092	0.186	0.310
Slovakia	2014	0.050	0.105	0.113	0.168	0.308	0.595	0.093	0.191	0.249
	2015	0.050	0.104	0.116	0.169	0.308	0.627	0.093	0.191	0.254
	2016	0.051	0.106	0.118	0.169	0.308	0.663	0.093	0.190	0.262
	2017	0.038	0.077	0.120	0.097	0.174	0.702	0.060	0.118	0.270
Finland	2014	0.095	0.188	0.126	0.219	0.416	0.962	0.144	0.288	0.681
	2015	0.095	0.190	0.124	0.217	0.415	0.963	0.145	0.289	0.684
	2016	0.095	0.190	0.124	0.217	0.414	0.963	0.145	0.289	0.683
	2017	0.046	0.098	0.124	0.225	0.380	0.963	0.108	0.209	0.684
Sweden	2014	0.123	0.391	0.158	0.172	0.329	0.914	0.168	0.478	0.622
	2015	0.125	0.391	0.160	0.174	0.332	0.913	0.170	0.475	0.621
	2016	0.130	0.407	0.158	0.176	0.335	0.915	0.171	0.476	0.624
	2017	0.049	0.099	0.159	0.185	0.320	0.915	0.095	0.186	0.625
United Kingdom	2014	0.039	0.078	0.262	0.097	0.174	0.911	0.061	0.118	0.869
	2015	0.039	0.080	0.260	0.098	0.174	0.917	0.061	0.119	0.877
	2016	0.040	0.080	0.261	0.098	0.174	0.932	0.061	0.120	0.897
	2017	0.081	0.171	0.275	0.193	0.380	0.935	0.159	0.323	0.898

Source: EUROMOD version H1.0+

Notes: EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes) and include, therefore, the results for base-year 2013. For the UK, results are based on FRS 2014/15.

4. Comparing EUROMOD estimates with external statistics

In this section, we compare the poverty and inequality baseline results obtained from EUROMOD with external aggregate statistics. The results from the baseline can be assessed in two ways. The first is to compare aggregate values for expenditure on benefits, revenues from taxes and contributions, and recipients/payers of benefits/taxes, with figures taken from external statistics, usually official administrative sources. The second is to compare poverty and inequality indicators, such as those provided in Table 1, with similar estimates obtained directly from the EU-SILC data provided by Eurostat. These methods are considered in turn below.

4.1 Comparison with external aggregate statistics

This process is 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 (simulated or not simulated) in the EUROMOD baseline with figures taken from national administrative statistics for the same period. Similarly, the amount of annual benefits expenditure and tax revenues is compared for EUROMOD and national administrative estimates. Comparisons are often not straightforward to carry out 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 the regional level. In some cases, they are only available with a long time delay and in others they are not made publicly available at all.

Furthermore, the process of validation is cumulative. If there is a problem with one income component this will also affect the precision of simulation of the components which rely on it. As an example, if earnings are under-reported in the survey – not only will social contributions be under-estimated, but so will be the size of any tax relief on the contributions. Thus income taxes will be over-estimated for this reason, but at the same time 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 summarize the main challenges that typically arise by comparing EUROMOD results with national administrative statistics 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 taxes may be under-estimated because market incomes are under-reported or the available survey generally does not adequately represent high income taxpayers (as in the UK). Further, income tax may be over-estimated because of lack of modelling of tax evasion (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 tax avoidance measures (as in Portugal). Finally, it may be under- or over- estimated because of under- or over- estimation of simulated income components which are taxable.
- 2) The simulations are only as good as the underlying SILC data and, in the cases where it is necessary, as good as the imputation of income components from the UDB aggregates. Their quality also depends on the level of complexity of national tax and benefit systems.
- 3) Our assessment of whether a simulation is “good enough” depends on the importance of the instrument in total household disposable income, generally. If the instrument 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 income.
- 4) As indicated above, non take-up of benefits, or the application of local discretion decisions in the assignment of benefits, leads EUROMOD to over-simulate means-tested benefits in many instances (see also Appendix 3). In many countries, social assistance receipt is over-simulated by a factor of 2 or 3. The size of this effect (e.g. on poverty risk) varies with the emphasis on this type of benefit in each national system. Adjustments to account for non take-up behaviour can be applied, but these can only be approximate. If the EU-SILC data adequately capture social

assistance benefit recipients and payments (for example), then one solution is to tie “eligibility” to those with recorded receipt in the data. This results in baseline estimates that compare well with the SILC but might be less appropriate when modelling policy changes or “what if” scenarios involving new benefit entitlements, or swapping policies across countries. Examples of the treatment of non take-up and tax evasion are given in Appendix 3.

4.2 Why are poverty and inequality indicators estimated by EUROMOD different from those calculated using EU-SILC data?

Table 6 compares EUROMOD baseline results on poverty and inequality with official statistics published by Eurostat: EUROMOD results based on 2014 policies and incomes are compared to Eurostat figures based on EU-SILC 2015. Given that EUROMOD uses SILC as its input data, one would expect the estimates for the base year 2014 to be the most closely related. This comparison is of some use for validation purposes as, if the two sets of estimates are very different, this may suggest some problem with the simulations or the input data. However, there are several reasons for which the two sets of estimates in base years should not be expected to be identical. These include:

- The release version of EU-SILC data: EUROMOD uses release 1 or 2 of both EU-SILC 2015 (when available) and 2014 (for Germany) in most countries: details are provided in Appendix 1. Statistics provided by Eurostat are based on the most recent release, we assume. To the extent that the relevant underlying data change between releases, we would expect differences in the indicators from the two sources.
- The UK uses a different data source in EUROMOD: the Family Resources Survey (FRS) for 2014/2015. Although since the 2012 data the FRS is the basis of the EU-SILC for the UK, the two datasets differ in their preparation (e.g. different imputations) and sample size (EU-SILC includes only FRS data collected April until September).
- The standard definition of household disposable income produced by EUROMOD and used in this report is slightly different from the definition of the UDB variable (HY020) used for the official indicator calculations. In EUROMOD we do not include any non-cash employment income in the definition of disposable income (e.g., value of company car).⁸ 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 incomes in this form.
- In the EUROMOD input database we drop observations (households) from the SILC where one or more persons in the household have missing data on weights. This is not necessary in many countries, but in some countries 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 made to ensure that the information on the income reference period (and EUROMOD policy year) is consistent with the characteristics of the household (current at the time of the survey) is to drop children born after the EU-SILC income reference period and before the interview. This will affect household composition and hence the equivalence scale and the calculation of household equivalised disposable income.

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

- While we have made every effort to avoid it, differences in the methods of calculating the indicators may explain differences in results. We are not aware of any differences in formulae, assumptions or definitions used.⁹ We have not top- or bottom- coded the EUROMOD household disposable income variable.
- Finally, as mentioned above our use of simulated values for benefits and taxes without allowing for non take-up of benefits nor tax evasion in some countries, will tend to make the income distribution appear less unequal and, risk of poverty rates smaller than those calculated using the SILC directly (which itself may be subject to measurement errors). In this report, adjustments have been made to account for benefit non take-up in Belgium, Estonia, France, Greece, Ireland, Latvia, Poland, Portugal, Romania, Finland and the UK. Adjustments for tax evasion have been implemented in Bulgaria, Greece, Italy and Romania.

The EUROMOD and Eurostat/EU-SILC estimates of the poverty rate based on the 60% of the median household disposable income poverty line indeed differ, but remain bounded between 2 and -2 percentage points in 22 out of 28 countries in the base year 2014. In comparison with Eurostat figures, poverty rates are underestimated further in Luxembourg (5.4 percentage points), and to a lesser extent in Belgium, Greece and Ireland (between 2.8 and 3.5 percentage points of difference). In Hungary, on the contrary, poverty rates are slightly over-estimated by 3.5 percentage points. Differences with Eurostat do not appear more severe when looking at different poverty lines, calculated on the basis of 50% and 70% of the median household disposable income. The general tendency is to slightly underestimate rather than overestimate Eurostat poverty figures; the ranking of countries, however, does not seem to be affected.

When looking at poverty rates by for children and the elderly (defined as individuals aged below 18 and 65+, respectively), the differences with EU-SILC appear a bit more pronounced, and in some countries, large. This is the case for instance of child poverty in Luxembourg (7.3 percentage point difference), Sweden (5.3 percentage point difference) and Malta (5.2 percentage point difference). As far as elderly poverty is concerned, instead, EUROMOD underestimates Eurostat poverty rates by 8 percentage points in Ireland and 6 percentage points in Belgium.

The difference with Eurostat in the estimation of the Gini coefficient seem much less sizeable: the underestimation exceeds 4 percentage points only in Luxembourg.

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

- Over-simulation of some particular means-tested benefits can explain some of the low EUROMOD poverty rates. Over-simulation might result from several factors alone or in combination: unobserved differences at the municipality level, lack of information to simulate asset tests where these exist, and non take-up.¹⁰ For example (a) social assistance in Slovakia leading to underestimation of poverty rates, and (b) income support in Belgium due to the difficulty of fully capturing the means-test in the simulations, which leads to low poverty rates.

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

¹⁰ It is worth noting that in some countries simulated means-tested benefits correspond very well to external statistics; higher poverty estimates in the EU-SILC may also be due to under-reporting of benefits in the data. For example, Unemployment Benefit II in Germany has been oversimulated in comparison to EU-SILC input data. However, macrovalidation results show that the benefit is accurately simulated when compared to official statistics. These results clearly point out to issues in the EU-SILC input data. e.g. underreporting of the benefit.

- 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 poverty line. This is one explanation for the poverty rate being lower in EUROMOD than in the EU-SILC in Ireland. This discrepancy is also driven by the oversimulation of pensions in EUROMOD. Comparisons of the threshold itself are only straightforward for the euro-zone countries.¹¹ Among these countries, the difference is small in most cases and larger than 5% of the Eurostat estimate in Malta, Estonia, Portugal, Latvia, Greece and the Netherlands in the 2014 base year.
- Over-simulation of income taxes can lead to under-estimation of inequality and of median disposable income, and hence the risk of poverty estimates. The main contributing factors are the existence of tax evasion, which is not typically captured, and the non-simulation of some tax deductions due to lack of necessary information.

Table 6. Comparison of baseline poverty and inequality statistics: EUROMOD output (2014 incomes and policies) vs. Eurostat EU-SILC estimates

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold €/year	Gini
		50%	60%	70%	age <18	age ≥65		
Belgium	EUROMOD	5.911	11.369	19.804	13.764	9.236	12,546	22.691
	Eurostat	7.800	14.900	23.800	18.000	15.200	12,993	26.200
Bulgaria	EUROMOD	15.433	21.869	28.904	23.969	33.293	2,047	34.769
	Eurostat	15.500	22.000	28.800	25.400	31.700	1,999	37.000
Czech Republic	EUROMOD	4.831	9.040	16.467	12.688	6.272	4,352	24.135
	Eurostat	5.300	9.700	17.100	14.700	7.400	4,454	25.000
Denmark	EUROMOD	6.034	10.237	18.665	8.640	3.744	16,345	24.765
	Eurostat	7.100	12.200	20.500	10.400	9.100	17,019	27.400
Germany	EUROMOD	8.600	15.056	22.765	14.451	15.026	11,720	0.277
	Eurostat	9.600	16.100	23.600	15.200	15.000	11,757	0.283
Estonia	EUROMOD	11.555	21.038	28.458	19.065	34.746	4,610	33.540
	Eurostat	12.500	21.600	28.900	20.000	35.800	4,733	34.800
Ireland	EUROMOD	5.889	13.436	22.868	15.938	6.145	11,470	29.002
	Eurostat	8.800	16.300	25.600	17.900	14.200	13,013	29.800
Greece	EUROMOD	12.473	18.328	25.940	23.637	8.533	4,853	32.470
	Eurostat	15.000	21.400	27.900	26.600	13.700	4,512	34.200
Spain	EUROMOD	15.764	21.938	29.224	29.517	11.365	8,003	33.691
	Eurostat	15.900	22.100	29.200	29.600	12.300	8,011	34.600
France	EUROMOD	5.533	11.766	20.524	15.786	6.900	12,470	27.451
	Eurostat	6.500	13.600	21.600	18.700	8.000	12,849	29.200
Italy	EUROMOD	12.564	18.689	26.808	25.379	11.853	9,145	31.235
	Eurostat	13.400	19.900	27.400	26.800	14.700	9,508	32.400
Cyprus	EUROMOD	6.660	15.101	24.950	14.769	18.854	8,738	31.907
	Eurostat	9.000	16.200	25.600	16.700	17.300	8,276	33.600
Latvia	EUROMOD	13.340	21.478	29.205	22.586	30.893	3,295	34.119
	Eurostat	14.700	22.500	30.400	23.200	34.600	3,497	35.400
Lithuania	EUROMOD	13.940	21.089	29.560	26.858	22.969	3,010	36.508
	Eurostat	14.400	22.200	29.900	28.900	25.000	3,108	37.900
Luxembourg	EUROMOD	1.833	9.905	22.134	14.178	2.540	21,158	24.009
	Eurostat	8.200	15.300	23.900	21.500	7.900	21,162	28.500

¹¹ For non-euro-zone countries the comparison of the threshold is complicated by the choice of exchange rate to use and this makes a difference in cases where this is changing over the data and policy simulation reference period. In the policy simulation we use the exchange rate prevailing at 30th June 2014.

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold €/year	Gini
		50%	60%	70%	age <18	age ≥65		
Hungary	EUROMOD	12.273	18.408	26.134	27.173	5.255	2,686	28.477
	Eurostat	9.000	14.900	22.900	22.700	4.600	2,734	28.200
Croatia	EUROMOD	12.733	19.229	25.887	18.611	26.411	3,314	29.055
	Eurostat	13.500	20.000	26.900	20.900	26.300	3,272	30.400
Malta	EUROMOD	7.238	15.088	24.914	18.235	20.988	8,240	27.538
	Eurostat	8.500	16.300	25.700	23.400	21.000	8,096	28.100
Netherlands	EUROMOD	5.473	11.357	19.540	13.869	2.567	13,187	25.604
	Eurostat	5.800	11.600	20.300	14.000	5.600	12,775	26.700
Austria	EUROMOD	3.745	12.423	21.294	14.698	11.222	13,555	24.752
	Eurostat	8.300	13.900	21.800	17.800	13.200	13,956	27.200
Poland	EUROMOD	11.216	17.541	25.241	21.757	11.590	3,140	30.390
	Eurostat	10.700	17.600	24.800	22.400	12.100	3,333	30.600
Portugal	EUROMOD	13.005	18.844	26.302	22.920	16.540	5,227	33.230
	Eurostat	13.800	19.500	27.000	24.800	17.000	5,061	34.000
Romania	EUROMOD	18.855	24.684	30.777	36.543	19.108	1,404	36.645
	Eurostat	19.800	25.400	31.600	38.100	19.400	1,389	37.400
Slovenia	EUROMOD	7.181	14.119	21.416	12.919	16.036	7,168	24.226
	Eurostat	8.400	14.300	21.200	14.200	17.200	7,399	24.500
Slovakia	EUROMOD	6.929	11.313	17.232	18.433	4.869	4,108	21.307
	Eurostat	8.400	12.300	18.800	20.100	5.600	4,158	23.700
Finland	EUROMOD	3.714	10.832	19.866	8.938	10.296	13,962	23.634
	Eurostat	5.300	12.400	21.300	10.000	13.800	14,258	25.200
Sweden	EUROMOD	7.129	14.181	22.342	12.834	16.371	15,694	23.933
	Eurostat	9.300	16.300	24.700	18.100	15.900	15,184	26.700
United Kingdom	EUROMOD	8.563	14.861	23.238	17.314	13.491	11,653	31.1497
	Eurostat	9.700	16.600	25.000	19.900	16.500	12,617	32.400

Source: EUROMOD version H1.0+

Notes: EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes) and include, therefore, the results for base-year 2013. For the UK, results are based on FRS 2014/15.

5. Work incentives: estimates of marginal effective tax rates

EUROMOD can be used to calculate the effect of tax and benefit systems on work incentives. In Table 7, we provide mean and median marginal effective tax rates (METR) based on 2015 data (2014 in the case of Germany) for 4 policy years (from 2014 to 2017) for the 28 EU countries.

EUROMOD calculates METRs for all individuals with earned income, taking account of the effect of earning 3% more such income (in gross terms) on their household disposable income. Following Jara and Tumino (2013), we present METR results for individuals of working age (18-64) who have more than 1 unit of national currency of monthly earnings. We exclude from our calculations the top percentile of the METR distribution if the value is above 150% and the lowest percentile if the value of METR is negative. The latter exclusions are made in order for average METR to be less sensitive to “outliers”, although such values are in principle plausible.

There can be different ways of calculating METR, depending on the interpretation that one wishes to place upon them, and comparability issues across countries should be borne in mind. One such issue relates to the treatment of benefit non take-up and tax evasion for the calculation of METR. The results presented below assume full take-up of benefits in all countries. In Bulgaria, Greece and Italy, where tax evasion has been modelled and used to obtain baseline statistics, full compliance has been assumed for the calculation of METRs. Hence, in all countries, all of the marginal earnings are

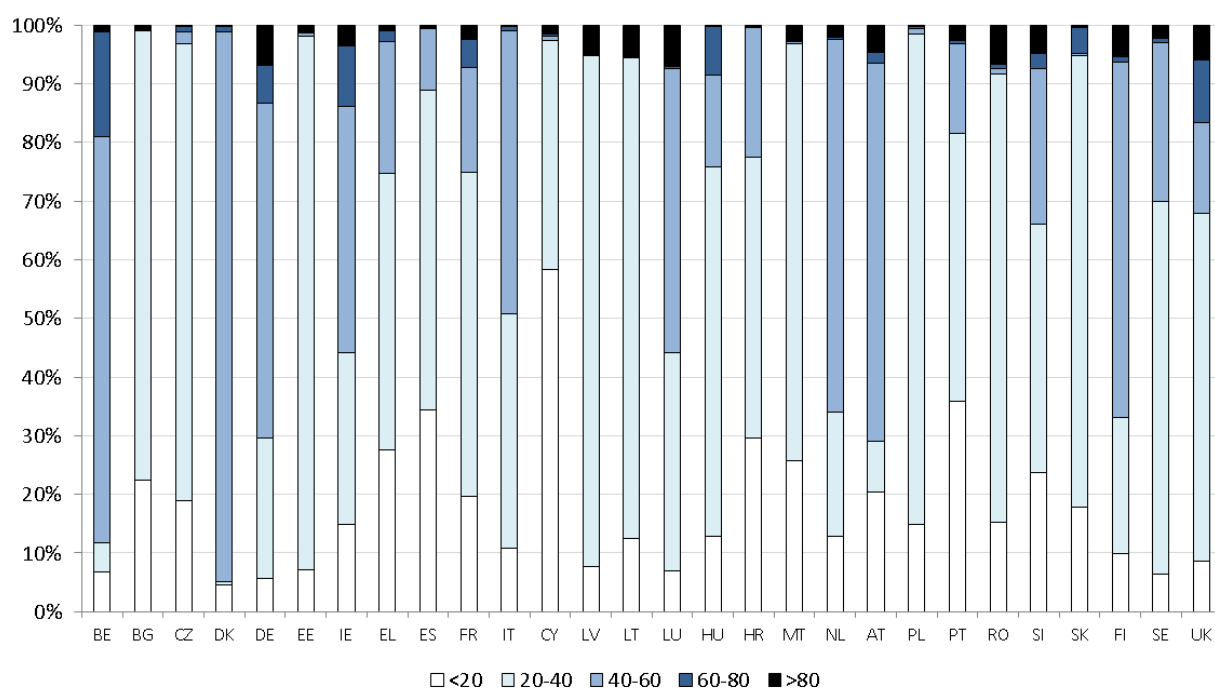
assumed to be earned in the official economy and are subject to taxes, contributions and benefit withdrawal, assuming full compliance. From the methodological standpoint, whether or not to take evasion into account at all when measuring work incentives is therefore an issue to consider. This depends 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. Further, the METRs focus on the components of disposable income and hence exclude employer SIC. Therefore, these calculations do not reflect the overall tax wedge.

Table 7 shows that Belgium exhibits by far the highest mean METR, followed by Denmark, Finland, Luxembourg, Austria and Ireland, where METRs range between 42% and 44%. The lowest mean METRs are observed in Malta, Estonia, Cyprus, Spain and Bulgaria (below 25%). The ranking of countries is in general confirmed when ranked by the median METR instead of the mean. The table is also useful to understand which countries have made progress towards reducing disincentives to labour market participation over the period considered, and which have worsened in the ranking. Looking at mean METR, Greece is the country with the largest increase in disincentives between 2014 and 2017 (4 percentage points), followed by more moderate increases in Sweden, Poland and France. On the other hand, reductions in mean METRs over time can be observed in Malta, Croatia and Hungary (4.4, 3 and 2.2 percentage points respectively). The ranking is in general preserved when ranked by the median results.

Even though average METRs already give a good indication of work incentives across countries, the distribution of METRs provides a more complete picture. Figure 3 shows the share of the working population with different levels of work incentives (under 20%, 20% to under 40%, 40% to under 60%, 60% to under 80% and 80% and above) for the 2014 policy system.

In a few countries, an important share of the working population show low METRs (below 20%). This is the case in Cyprus (59%), Spain (40%), Greece (38%) and Croatia (34%). On the other hand, the distribution of METR is very concentrated at higher levels (e.g. between 40% and 60%) in Denmark (86% of the working population has METR between 40% and 60%), Belgium (72%), Austria (65%) and Finland (63%). Marginal rates below 40% predominate in many countries. Further, there are cases where there are large shares of the population in paid work both with relatively low and relatively high marginal rates (Luxembourg and Finland). In almost all countries there is a minority facing very low incentives (i.e. METRs over 80%) which typically occurs because of the interaction of tax and contributions with benefit withdrawal, or because of discontinuities in entitlement to benefits or tax concessions. For example, in Romania, there are a number of means-tested benefits where income below a threshold brings entitlement to the full amount while income above the threshold results in zero entitlement. The share of working people with such high METRs is 5% or more in Romania, Slovenia, Cyprus, Luxembourg, and Finland.

Figure 3. Marginal effective tax rates 2014: share of population in paid work (%) by range of METR



Source: EUROMOD version H1.0+

Notes: EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes). For the UK, results are based on FRS 2014/15.

Table 7. Mean and median Marginal effective tax rates: 2014-2017

		2014	2015	2016	2017
Belgium	Mean	52.89	53.07	53.19	52.98
	Median	54.99	54.84	55.38	55.12
Bulgaria	Mean	21.74	22.31	22.06	22.37
	Median	21.61	21.61	21.61	22.01
Czech Republic	Mean	27.93	27.82	27.90	27.92
	Median	31.10	31.10	31.10	31.10
Denmark	Mean	44.81	44.76	44.73	44.53
	Median	42.60	42.83	42.83	42.82
Germany	Mean	43.82	43.98	43.91	45.04
	Median	44.32	44.40	44.44	44.45
Estonia	Mean	23.81	22.39	24.46	22.77
	Median	24.16	22.88	22.88	22.88
Ireland	Mean	42.09	41.84	40.71	40.36
	Median	52.00	52.00	50.50	50.00
Greece	Mean	28.35	28.20	28.26	32.39
	Median	27.00	26.70	29.50	36.05
Spain	Mean	22.99	22.08	21.59	21.55
	Median	29.53	29.20	28.59	28.59
France	Mean	37.61	38.03	38.95	39.04
	Median	33.36	37.04	35.69	36.75
Italy	Mean	35.76	36.92	37.02	36.06
	Median	40.20	40.55	40.66	40.30
Cyprus	Mean	23.74	23.70	23.67	23.32
	Median	11.46	11.45	11.45	11.87
Latvia	Mean	30.94	30.11	30.33	30.75
	Median	31.98	31.08	31.09	31.09

		2014	2015	2016	2017
Lithuania	Mean	27.42	27.36	26.99	26.42
	Median	27.90	27.90	29.10	29.85
Luxembourg	Mean	44.32	44.80	44.78	43.54
	Median	44.11	44.75	44.68	43.34
Hungary	Mean	33.07	34.63	29.44	30.88
	Median	34.50	34.50	33.50	34.50
Croatia	Mean	29.39	27.50	27.89	26.40
	Median	30.18	30.18	30.18	20.00
Malta	Mean	24.59	24.12	21.33	20.13
	Median	25.00	25.00	25.00	25.00
Netherlands	Mean	39.28	38.83	38.30	38.29
	Median	44.00	44.32	45.22	48.20
Austria	Mean	42.29	42.38	39.94	41.61
	Median	44.36	44.36	43.25	43.25
Poland	Mean	27.74	27.77	28.66	29.26
	Median	30.32	30.32	30.32	30.32
Portugal	Mean	32.33	31.38	30.92	30.68
	Median	29.02	25.50	31.81	32.36
Romania	Mean	33.18	32.52	32.74	32.66
	Median	31.86	31.86	29.86	29.86
Slovenia	Mean	35.71	35.61	36.35	36.03
	Median	34.56	34.56	34.74	34.56
Slovakia	Mean	31.98	32.63	32.67	32.47
	Median	29.85	29.85	29.85	29.85
Finland	Mean	44.56	44.87	45.02	45.52
	Median	44.95	45.19	45.77	46.87
Sweden	Mean	35.61	36.08	36.96	37.26
	Median	28.61	28.73	31.22	32.34
United Kingdom	Mean	39.57	39.36	39.31	38.90
	Median	34.09	34.06	34.62	34.42

Source: EUROMOD version H1.0+

Notes: EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes). The mean and median values for German base year 2013 were 43.71 and 44.31 respectively. For the UK, results are based on FRS 2014/15.

Figure 4 presents the decomposition by components of average METR for each country in the base year 2014. Average METR have been decomposed into three main components: taxes, representing the average increase in taxes paid at the household level as a proportion of the increase in individual gross earnings; social insurance contributions, including changes in both employee and self-employed social insurance contributions; and benefits, representing the average reduction in benefits and pensions paid at the household level as a proportion of the increase in earnings. The results of the decomposition for all the policy years 2014-2017 are reported in Table 8.

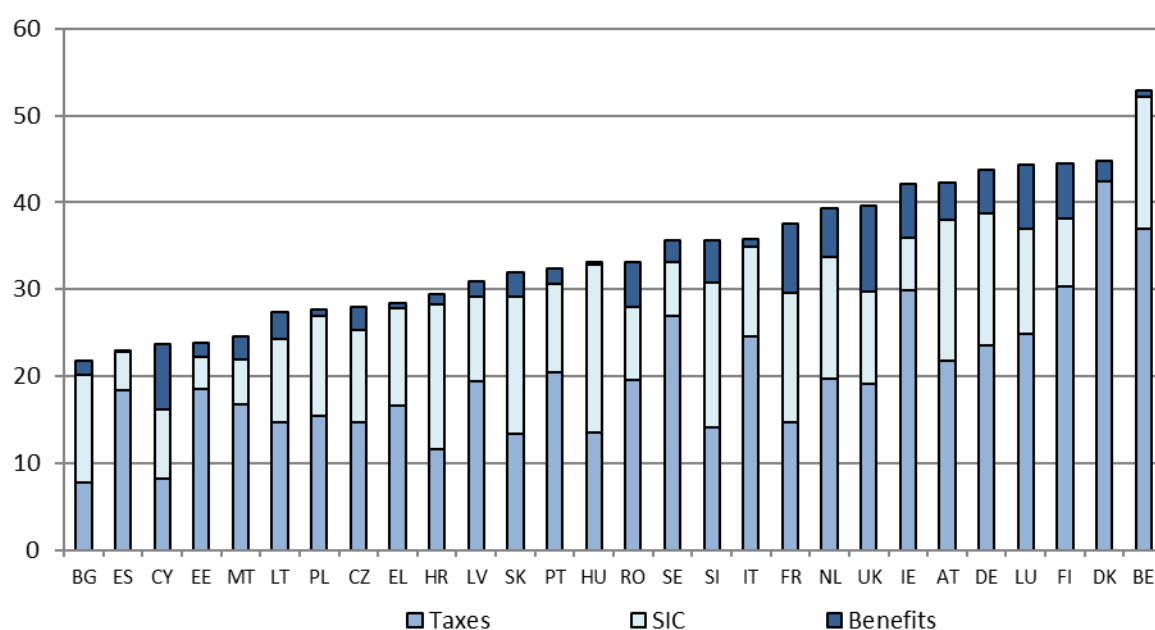
Despite a wide variation across countries, the graph shows that the tax component is usually the most important, the size of it varying significantly across countries and ranging from relatively low values in Bulgaria, Cyprus, and Croatia, to relatively high values in Belgium, Denmark, Finland and Luxembourg.

In Denmark, almost all of average METR is accounted for by taxes. While in Belgium, Finland and Luxembourg the share of taxes is lower but still accounting for most of the average METR. Nordic countries together with Ireland and Belgium also have the highest METR due to taxes in absolute terms (over 26%), while taxes seem to offer less disincentive to work at the margin in Slovakia, Croatia, Cyprus and Bulgaria, countries which are also characterized by a relatively flat wage distribution. Countries where the contribution of SIC to METR is the largest are instead Hungary,

Croatia, Slovenia, Austria, Slovakia and Belgium in all cases above 15%. At the other end of the spectrum, in Malta, Spain, Estonia and Denmark, the SIC contribution to METR is the lowest, below 6 percentage points (in Estonia, for example, most of SICs are paid by employers). In a few countries, the contribution of benefits is also relevant to the mean METR, however to a minor extent if compared to SIC and especially to taxes: this is the case of United Kingdom, France, Cyprus and Luxembourg.

The METR estimates presented here show only a very small selection of indicators of work incentives that may be of interest. Breakdowns by gender, family status, employment status and analysis of METRS across the income distribution are examples of additional analysis that can be carried using EUROMOD.

Figure 4. Marginal effective tax rates (%) by income component, 2014



Source: EUROMOD version H1.0+

EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes). For the UK, results are based on FRS 2014/15.

Table 8. Marginal effective tax rates by income component: 2014-2017

	Policy year	Taxes	SIC	Benefits	Total (mean)
Belgium	2014	36.956	15.244	0.696	52.896
	2015	37.088	15.251	0.734	53.073
	2016	36.783	15.614	0.794	53.191
	2017	36.625	15.559	0.796	52.980
Bulgaria	2014	7.732	12.434	1.570	21.736
	2015	8.403	12.438	1.471	22.312
	2016	8.413	12.398	1.245	22.056
	2017	8.379	12.768	1.222	22.368
Czech Republic	2014	14.659	10.670	2.601	27.930
	2015	14.750	10.546	2.526	27.822
	2016	14.893	10.485	2.523	27.901
	2017	15.099	10.374	2.443	27.917
Denmark	2014	42.386	0.000	2.421	44.807
	2015	42.512	0.000	2.246	44.758
	2016	42.529	0.000	2.205	44.734
	2017	42.400	0.000	2.130	44.530
Germany	2013	23.400	15.500	4.800	43.700
	2014	23.500	15.300	5.000	43.800
	2015	23.800	15.400	4.800	44.000
	2016	23.700	15.300	4.900	43.900
	2017	24.100	16.400	4.500	45.000
Estonia	2014	18.565	3.589	1.652	23.805
	2015	17.737	3.212	1.441	22.390
	2016	18.856	3.204	2.402	24.462
	2017	17.512	3.205	2.051	22.768
Ireland	2014	29.839	6.048	6.202	42.089
	2015	29.660	5.996	6.186	41.842
	2016	28.679	5.965	6.063	40.707
	2017	28.480	5.884	6.000	40.364
Greece	2014	16.592	11.186	0.577	28.355
	2015	16.838	10.721	0.636	28.196
	2016	16.643	11.020	0.598	28.261
	2017	15.003	16.342	1.043	32.388
Spain	2014	18.410	4.322	0.256	22.987
	2015	17.486	4.321	0.274	22.080
	2016	16.991	4.312	0.290	21.592
	2017	17.070	4.231	0.246	21.547
France	2014	14.665	14.864	8.079	37.607
	2015	14.644	14.878	8.505	38.026
	2016	18.735	14.773	5.446	38.953
	2017	17.843	14.770	6.425	39.038
Italy	2014	24.593	10.248	0.915	35.757
	2015	25.571	10.382	0.968	36.921
	2016	25.556	10.495	0.964	37.015

	Policy year	Taxes	SIC	Benefits	Total (mean)
Cyprus	2017	26.109	10.574	-0.623	36.060
	2014	8.190	7.926	7.626	23.741
	2015	8.126	7.941	7.636	23.703
	2016	8.076	7.949	7.644	23.669
Latvia	2017	7.717	7.929	7.669	23.315
	2014	19.395	9.787	1.761	30.943
	2015	18.681	9.845	1.582	30.108
	2016	19.074	9.801	1.456	30.331
Lithuania	2017	19.394	9.796	1.556	30.747
	2014	14.722	9.490	3.213	27.424
	2015	14.805	9.489	3.062	27.356
	2016	14.697	9.485	2.806	26.988
Luxembourg	2017	14.378	9.511	2.531	26.420
	2014	24.903	12.106	7.311	44.321
	2015	25.383	12.107	7.314	44.804
	2016	25.381	12.103	7.301	44.785
Hungary	2017	23.961	12.102	7.476	43.539
	2014	13.522	19.315	0.236	33.072
	2015	15.184	19.388	0.054	34.625
	2016	9.995	19.359	0.087	29.441
Croatia	2017	11.915	18.921	0.043	30.878
	2014	11.541	16.765	1.082	29.388
	2015	9.973	16.790	0.732	27.495
	2016	10.169	16.947	0.772	27.889
Malta	2017	9.258	16.431	0.709	26.398
	2014	16.737	5.241	2.613	24.591
	2015	16.022	5.240	2.855	24.116
	2016	16.908	5.040	-0.617	21.330
Netherlands	2017	17.030	5.223	-2.120	20.134
	2014	19.650	14.105	5.523	39.278
	2015	21.146	12.427	5.262	38.835
	2016	20.272	12.861	5.163	38.296
Austria	2017	20.523	12.364	5.405	38.292
	2014	21.711	16.309	4.272	42.292
	2015	21.809	16.439	4.132	42.379
	2016	19.193	16.222	4.522	39.937
Poland	2017	20.987	16.217	4.412	41.616
	2014	15.400	11.573	0.762	27.735
	2015	15.440	11.602	0.731	27.773
	2016	15.451	11.579	1.626	28.656
Portugal	2017	15.959	11.612	1.691	29.261
	2014	20.407	10.189	1.737	32.332
	2015	19.569	10.173	1.639	31.381
	2016	18.607	10.208	2.102	30.918
	2017	18.536	10.181	1.968	30.685

	Policy year	Taxes	SIC	Benefits	Total (mean)
Romania	2014	19.576	8.377	5.225	33.178
	2015	19.626	8.377	4.516	32.519
	2016	19.501	8.365	4.875	32.741
	2017	19.475	8.415	4.768	32.658
Slovenia	2014	14.046	16.671	4.996	35.713
	2015	14.130	16.652	4.825	35.607
	2016	14.342	16.686	5.322	36.350
	2017	14.004	16.643	5.383	36.031
Slovakia	2014	13.325	15.823	2.828	31.976
	2015	13.393	16.805	2.437	32.634
	2016	13.462	16.918	2.294	32.674
	2017	13.635	16.910	1.927	32.472
Finland	2014	30.380	7.808	6.377	44.565
	2015	30.498	7.939	6.435	44.872
	2016	30.102	8.395	6.521	45.018
	2017	28.883	10.021	6.619	45.523
Sweden	2014	26.994	6.203	2.416	35.613
	2015	27.717	6.012	2.348	36.077
	2016	28.638	6.021	2.297	36.955
	2017	28.982	6.080	2.201	37.263
United Kingdom	2014	19.105	10.705	9.763	39.573
	2015	19.004	10.702	9.650	39.356
	2016	18.896	11.002	9.416	39.314
	2017	18.707	11.092	9.100	38.899

Source: EUROMOD version H1.0+

Notes: EUROMOD figures for all countries, except for Germany and the UK, are based on SILC 2015 (2014 incomes). For Germany, results are based on SILC 2014 (2013 incomes) and include, therefore, the results for base-year 2013. For the UK, results are based on FRS 2014/15.

6. Conclusions

The results from EUROMOD shown above are both limited to some key statistical indicators of the baselines for 2014-2017 policies. On the one hand improvements and refinements are possible that will improve the quality, comparability and applicability of the baseline results. On the other hand, EUROMOD is not just intended to generate baseline statistics for a particular policy year; its main purpose is to be used as a tool to explore alternative scenarios in terms of both policies and the characteristics of the populations on which they have impact. Steps to improve EUROMOD's simulations of existing policy systems might 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 remain 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 misreported in surveys.

- Consideration of how to account for changes in labour markets or demographics so that simulations for recent years can also take account of the effects of economic shocks and the economic cycle in the period since the data were collected as well as demographic trends. Research performed on 27 EU countries suggests that in countries where there have been significant changes such adjustments can make a considerable difference to estimates of poverty and inequality and the effects of policies.¹² An experiment to explore using re-weighting to adjust for demographic change has been conducted by Kump and Navicke (2014).
- Continued explorations in 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 the disaggregated benefit variables now included in EU-SILC since 2014 for some countries. These are likely to improve the imputation of non-simulated benefits and hence the simulations.

7. References

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¹² See Gasior and Rastrigina (2017).

Appendix 1 EUROMOD input datasets used in the analysis in this paper

Country	Input dataset	
	2014	2015
Belgium		EU-SILC 2015-2
Bulgaria		EU-SILC 2015-1
Czech Republic		EU-SILC 2015-2
Denmark		EU-SILC 2015-1
Germany	EU-SILC 2014-1	
Estonia		EU-SILC 2015-2 and national SILC variables
Ireland		EU-SILC 2015-2
Greece		National SILC (UDB & PDB versions)
Spain		EU-SILC 2015-1
France		EU-SILC 2015-2
Croatia		EU-SILC 2015-1
Italy		National SILC 2015-1
Cyprus		EU-SILC 2015-2
Latvia		EU-SILC 2015-1
Lithuania		EU-SILC 2015-2 and national SILC variables
Luxembourg		EU-SILC 2015-2 and national SILC variables
Hungary		EU-SILC 2015-1
Malta		EU-SILC 2015-2
Netherlands		EU-SILC 2015-1
Austria		National SILC 2015-1
Poland		EU-SILC 2015-2
Portugal		EU-SILC 2015-1
Romania		EU-SILC 2015-2
Slovenia		EU-SILC 2015-1
Slovakia		National SILC (27/09/2016)
Finland		EU-SILC 2015-1
Sweden		EU-SILC 2015-2
United Kingdom		Family Resources Survey 2014/15

Appendix 2 National teams contributing to EUROMOD H1.0+

Country	National team – team leader
Belgium	University of Antwerp – Gerlinde Verbist K.U.Leuven – André Decoster
Bulgaria	University of National and World Economy (UNSS), Sofia – Ekaterina Tosheva
Czech Republic	CERGE-EI – Daniel Münich
Denmark	Roskilde University - Bent Greve
Germany	DIW Berlin (Deutsches Institut für Wirtschaftsforschung) – Peter Haan
Estonia	PRAXIS Center for Policy Studies – Märt Masso
Ireland	Teagasc - Cathal O'Donoghue
Greece	Athens University of Economics and Business (AUEB) – Panos Tsakloglou
Spain	Instituto de Estudios Fiscales (IEF) – Milagros Paniagua
France	Université de la Méditerranée, Marseille – Laurence Bouvard
Croatia	Institute of Public Finance – Ivica Urban
Italy	Bocconi University – Carlo Fiorio
Cyprus	University of Cyprus – Panos Pashardes
Latvia	Baltic International Centre for Economic Policy Studies (BICEPS) Anna Zasova
Lithuania	Vilnius University – Jekaterina Navicke
Luxembourg	LISER – Philippe Liégeois
Hungary	TÁRKI Social Research Institute – Péter Szivós
Malta	Ministry of Finance, the Economy and Investment - Godwin Mifsud
Netherlands	CentERdata – Klaas de Vos
Austria	European Centre for Social Welfare Policy and Research – Michael Fuchs
Poland	Center for Economic Analysis (CenEA) – Michal Myck
Portugal	Lisboa School of Economics & Management - Carlos Farinha Rodrigues
Romania	National Research Institute for Labour and Social Protection - Eva Militaru
Slovenia	Inštitut za Ekonomska Raziskovanja (IER) – Boris Majcen and Nataša Kump
Slovakia	Ministry of Finance of the Slovak Republic - Rastislav Gabik
Finland	Research Department of the Social Insurance Institution of Finland (KELA) – Pertti Honkanen
Sweden	Ministry of Health and Social Affairs – Tom Nilstierna and Statistics Sweden - Klas Lindström
United Kingdom	Institute for Social and Economic Research (ISER) - Paola De Agostini

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

- **Tax evasion**

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

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

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

For **Romania** all self-employed in agriculture living in rural areas and with a self-employment income below the average wage are assumed to evade taxes.

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

- **Benefit non take-up**

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

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

For **France** non take-up correction of the main means-tested social assistance benefit (RMI/RSA)¹³ is simulated to be random- proportions of non-take up -separately by active and inactive units (for RSA) taken from external data.

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

For **Greece** a random non take-up correction is simulated for unemployment assistance benefit for long-term unemployed. The receipt of social dividend (a lump-sum benefit only provided in 2014) was restricted to the amount of the primary budget surplus that was allocated to the benefit, i.e. approximately €450 million. The beneficiaries of food stamps and rent allowance (two benefits only provided in 2015 and 2016) were also calibrated to guarantee consistency with the official statistics. Full take-up is assumed for all other simulated means-tested benefits.

For **Latvia** non take up is simulated for paternity benefit based on the benefit receipt observed in the data.

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

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

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

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

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

¹³ RMI stands for Revenu minimum d'insertion and RSA for Revenu de solidarité active.