EUROMOD WORKING PAPER SERIES

EM 6/19

Baseline results from the EU28 EUROMOD: 2015-2018

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March 2019

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with

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Abstract

This paper presents baseline results from the latest version of EUROMOD (version I1.0+), 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 2015 and 2018. 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 Tammik (2018).

JEL: C15, H24, H31, H55, I3

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

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* The results presented here are based on EUROMOD version I1.0+. EUROMOD is maintained, developed and managed by the Institute for Social and Economic Research (ISER) at the University of Essex, in collaboration with national teams from the EU member states. We are indebted to the many people who have contributed to the development of EUROMOD. The process of maintaining and updating EUROMOD is financially supported by the European Union Programme for Employment and Social Innovation 'Easi' (2014-2020).
We are grateful for access to micro-data from the EU Statistics on Incomes and Living Conditions (EU-SILC) made available by Eurostat under contract 59/2013-EU-SILC-LFS, the Italian version of the EU-SILC (IT-SILC) made available by ISTAT, the Austrian version of the EU-SILC made available by Statistik Austria, the Lithuanian version of the EU-SILC (PGS) made available by the Lithuanian Department of Statistics, the Greek SILC Production Database (PDB) made available by the Greek Statistical Office, additional indicator variables provided by the Polish Central Statistical Office (GUS), national SILC variables made available by the respective NSIs for Estonia, Luxembourg and Slovakia and the Family Resources Survey (FRS), made available by the UK Department of Work and Pensions (DWP) through the UK Data Service. Material from the FRS is Crown Copyright and is used with permission. Neither the DWP nor the Data Service bears any responsibility for the analysis or interpretation of the data reported here. An equivalent disclaimer applies to all other data sources and their respective providers cited in this acknowledgement.

Table of Contents

List of Figures

List of Tables

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**.[2] There are many applications and many potential users in both the scientific and policy monitoring/analysis communities. It is a highly flexible model, incorporating large amounts of complex information (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 (I1.0+), being constructed with support from DG-EMPL of the European Commission. It updates and extends the material reported in a 2018 EUROMOD Working Paper (Tammik, 2018).[3]

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 2015-2018 tax/benefits policies, based on micro-data from the 2016 EU-SILC[4]. The calculations for 2015 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 2018), (3) validating the baseline outputs and (4) documenting the work in Country Reports. These are described briefly in turn in the following paragraphs.

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

[3] https://www.euromod.ac.uk/publications/baseline-results-eu28-euromod-2014-2017

[4] The latest model version I1.0+ is accompanied with two new datasets for Germany, based on SILC 2015 and SILC 2016. Therefore, for Germany we also display results for the year 2014 based on the micro-data from 2015 EU-SILC.

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.[5] 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.

The baseline results presented in this report are based on:

(a) SILC 2016 for all EU-28 countries except the UK
(b) Family Resources Survey (FRS) 2015/16 for the UK

2.2 Updating policy systems until 2018

Based on detailed descriptions of policies provided by national teams, 2018 policies have been modelled using the EUROMOD tax-benefit modelling "language" for each country. Together with updating factors, to bring 2015 incomes from 2016 EU-SILC input data up to the level corresponding to the following policy years (2016, 2017, 2018), 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 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

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

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.[6] 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.[7]

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) 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.

[6] For example, see Fernandez Salgado, Figari, Sutherland and Tumino (2013).

[7] It should be noted that external statistics are often available only with a time lag (e.g. macro-validation of 2018 policies typically cannot be finalised until late 2019). Country Reports will document these issues.

In addition it needs to be noted that EUROMOD implements policies as they were on the 30th of June. In some cases where major reforms happen for example on the 1st of July the policy effect will not be captured in EUROMOD which can also have an effect on the validation results. However to capture these types of measures some countries have implemented Full year adjustments, which is intended to simulate situations where major policy instruments were in effect for only a part of the year. Appendix 4 describes where these types of adjustments have been implemented. However by default they are off when calculating the baseline results.

2.4 County 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.[8]

3. Poverty and inequality indicators with EUROMOD

Policy systems for years 2015 to 2018 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 2015 and 2018. 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.

[8] The country reports are available at https://www.euromod.ac.uk/using-euromod/country-reports/

Incomes that are not simulated (e.g. market incomes) are updated from the base year 2015 to the following years based on indices for each separate income source (e.g. 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 2015 and 2018 are: Estonia (8.6%), Lithuania (8.3%), Latvia (7.1%), Bulgaria (6.8%) and Czech Republic (5.6%). A number of countries experienced a slightly lower annual shift in the poverty line of between 2% and 4.6%: Luxembourg, Belgium, Hungary, Germany, Austria, Malta, Slovakia, Poland, Croatia and Romania. On the other hand, the poverty line has not moved substantially in Ireland, Portugal, Denmark, France, Slovenia, Netherlands, Finland, Italy and Spain, where the average annual growth rate remained below 2%. Finally, the poverty line has dropped in nominal terms in Cyprus (by -0.2% on average per year), Sweden (-0.9%), Greece (-1%) and in the United Kingdom (-5.5%). However it needs to be noted that the large decrease in the poverty line in the United Kingdom is the due to the fact that for comparative purposes we measure the poverty line in Euros and the British Pound to Euro exchange rate has dropped significantly over the observed period.

Table 1 shows that the highest at risk of poverty rate using the 60% poverty line in the base year 2015 is observed in Romania (23.7%), followed Spain, Bulgaria, Lithuania, Greece, Estonia and Latvia (above 20%) and Italy, Hungary , Croatia and Portugal (above 18%). The lowest poverty rates (below 12%) are registered in Belgium, Slovakia, Netherlands, Denmark, Czech Republic, Finland and Luxembourg (7%). 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 33% in the base year, followed by Spain (30%), Bulgaria (29%), Hungary (28%) and Greece (27%). The lowest child poverty rates (below 13%) are observed in Slovenia, Denmark, Luxembourg and Finland (7%). Elderly poverty reaches 38% in Estonia, 34% in Latvia, 26% in Croatia and 25% in Lithuania and Bulgaria. At the other end of the spectrum, the countries with the lowest elderly poverty rates (below 7%) are Ireland, Denmark, Slovakia, Luxembourg, and Netherlands. However, as we demonstrate in Chapter 4, in the case of Ireland and to a smaller extent to Luxembourg and Netherlands there is a large discrepancy between EUROMOD estimates and external information on elderly poverty rates which needs to be kept in mind when interpreting the results for these countries.

Table 1 also shows that over the period 2015 – 2018 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 Latvia, United Kingdom and Bulgaria where the poverty rates increased by 1.8, 1.5 and 1.2 percentage points respectively. Increase in poverty rates in Latvia and Bulgaria seems to be mostly associated with an increase in elderly poverty rates while in United Kingdom the increase in poverty was mostly seen among children.

The country experiencing the largest poverty reduction due to changes in policy and income levels between 2015 and 2018 according to Table 1, is Slovenia where the poverty rate decreased by 4 percentage points. This reduction in poverty rates happened largely thanks to multiple changes to various child benefits in 2018 which resulted in the child poverty rate dropping from 11% in 2017 to 4% in 2018. A considerable decrease in poverty rates was also seen in Poland with a 2.7 percentage point decrease. One of the policy changes associated with such a high poverty reduction in Poland 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 2015 and 2018 for different population subgroups (children and elderly people). Poland has been the country experiencing the strongest reduction also in child poverty (by 10 percentage points) in the period considered, while United Kingdom, Romania and Luxembourg are the countries where child poverty has increased the most. In Latvia, elderly poverty increased by 8.9 percentage points, followed by Bulgaria, which shows a 6.4 percentage points increase. In Cyprus, on the other hand, elderly poverty dropped by 1.3 percentage points.

It should be emphasised that these figures are not expected to coincide with the value of social indicators produced by the EU-SILC for 2016 (based on 2015 incomes). The EUROMOD estimates show the movement in poverty and inequality indicators resulting from policy changes over the period 2015-2018, 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: 2015-2018

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age>=65	€/year	
Belgium	2015	6.453	11.939	19.202	14.046	8.483	12,583	0.224
	2016	6.440	11.796	19.016	13.845	8.465	12,943	0.221
	2017	6.445	11.657	19.089	13.823	7.780	13,194	0.221
	2018	6.668	12.257	19.321	14.831	8.422	13,416	0.222
Bulgaria	2015	15.120	22.619	29.465	29.778	25.488	1,919	0.369
	2016	15.627	22.979	29.919	29.588	28.009	2,059	0.375
	2017	16.547	23.489	30.510	29.893	29.940	2,204	0.380
	2018	16.711	23.844	31.011	29.694	31.852	2,340	0.382
Czech Republic	2015	4.689	9.314	16.724	13.640	7.140	4,623	0.241
	2016	4.712	9.439	16.959	13.663	7.483	4,757	0.244
	2017	5.329	9.985	17.605	14.277	8.423	5,162	0.247
	2018	5.696	10.186	17.813	14.269	8.980	5,447	0.251
Denmark	2015	4.566	9.927	17.574	8.606	5.254	17,045	0.245
	2016	4.588	9.993	17.875	8.606	5.274	17,368	0.246
	2017	4.899	10.223	18.102	9.247	5.154	17,661	0.248
	2018	5.019	10.241	18.188	9.247	5.154	17,931	0.248
Germany	2014	8.597	15.935	23.854	14.886	14.692	12,183	0.277
	2015	8.548	15.719	23.347	15.293	16.405	12,576	0.273
	2016	8.595	15.524	23.543	15.190	14.958	12,934	0.272
	2017	8.702	15.649	23.496	15.452	15.245	13,247	0.271
	2018	8.807	15.831	23.505	15.511	15.755	13,503	0.273
Estonia	2015	11.128	20.759	28.214	16.825	38.934	5,104	0.316
	2016	11.325	20.552	28.189	16.636	40.031	5,500	0.314
	2017	11.131	21.147	28.816	17.262	40.097	5,796	0.316
	2018	12.952	20.782	28.962	14.664	42.771	6,532	0.307
Ireland	2015	6.163	14.083	23.873	18.753	5.960	12,118	0.289
	2016	6.767	14.380	24.239	19.129	6.011	12,377	0.291
	2017	6.707	14.392	24.126	19.276	5.946	12,606	0.291
	2018	6.514	14.298	24.097	19.076	5.779	12,812	0.291
Greece	2015	14.738	20.884	28.265	27.080	9.955	4,808	0.335
	2016	13.930	20.187	27.731	26.164	8.760	4,812	0.328
	2017	12.050	18.135	25.630	23.454	10.238	4,780	0.317
	2018	13.004	18.954	26.059	22.525	12.350	4,672	0.324
Spain	2015	16.040	22.686	30.455	30.358	12.397	8,319	0.340
	2016	15.886	22.692	30.493	30.331	12.505	8,275	0.339
	2017	15.869	22.498	30.225	30.142	12.515	8,274	0.338
	2018	15.870	22.477	30.185	30.094	12.545	8,348	0.338
France	2015	6.279	13.094	21.177	18.730	7.782	12,793	0.277
	2016	5.978	12.969	21.265	18.165	8.279	12,965	0.277
	2017	6.143	13.697	21.938	19.818	8.784	13,239	0.278
	2018	6.161	13.691	21.940	19.555	9.027	13,449	0.276
Italy	2015	13.727	19.564	26.651	24.736	12.490	9,112	0.319
	2016	13.682	19.420	26.530	24.501	12.124	9,199	0.318
	2017	13.687	19.350	26.345	24.438	11.853	9,254	0.317
	2018	13.729	19.427	26.358	24.521	11.912	9,349	0.315

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age>=65	€/year	
Cyprus	2015	7.205	15.138	25.339	16.285	20.721	8,874	0.309
	2016	7.158	15.124	25.230	16.285	20.669	8,858	0.309
	2017	7.302	15.342	25.354	16.807	20.606	8,922	0.311
	2018	7.007	14.993	25.084	16.521	19.417	8,810	0.311
Latvia	2015	13.333	20.580	27.790	17.074	34.480	3,589	0.338
	2016	14.297	21.388	28.571	17.026	37.601	3,761	0.341
	2017	14.723	21.790	29.004	16.595	40.127	3,999	0.344
	2018	15.293	22.393	29.312	16.480	43.424	4,411	0.343
Lithuania	2015	15.247	21.677	29.093	25.907	25.937	3,326	0.357
	2016	15.642	22.205	29.680	26.274	27.923	3,584	0.359
	2017	15.392	22.317	29.344	25.791	30.317	3,865	0.361
	2018	13.028	20.473	28.329	21.175	29.345	4,222	0.346
Luxembourg	2015	0.979	7.281	21.846	8.080	3.378	19,310	0.243
	2016	0.975	6.854	21.678	7.401	3.378	19,331	0.242
	2017	1.009	8.487	22.693	10.826	3.710	20,464	0.244
	2018	0.975	7.867	22.004	9.435	3.629	20,477	0.243
Hungary	2015	13.465	19.567	26.440	28.378	10.953	2,622	0.291
	2016	13.740	19.833	26.646	28.278	11.882	2,726	0.293
	2017	13.574	20.042	26.543	28.560	12.050	2,887	0.293
	2018	13.871	20.043	26.344	28.639	12.179	2,801	0.293
Croatia	2015	12.281	18.687	25.284	18.672	26.175	3,425	0.286
	2016	12.250	18.690	25.424	18.587	26.315	3,510	0.286
	2017	12.341	18.987	25.561	18.687	27.277	3,698	0.292
	2018	12.565	18.947	25.724	18.172	27.996	3,862	0.293
Malta	2015	6.409	15.033	23.833	15.457	23.845	8,250	0.278
	2016	6.964	15.324	24.530	16.285	23.845	8,573	0.282
	2017	6.821	15.342	24.657	16.055	24.253	8,792	0.283
	2018	7.077	15.723	25.274	16.383	24.976	9,041	0.285
Netherlands	2015	5.072	10.306	18.833	13.847	3.048	13,335	0.254
	2016	5.273	11.021	19.984	14.427	4.576	13,625	0.254
	2017	5.169	10.589	19.614	13.941	4.036	13,805	0.252
	2018	5.232	10.523	19.409	13.916	3.856	13,900	0.252
Austria	2015	3.552	12.233	21.518	14.091	9.607	13,802	0.247
	2016	4.844	13.179	21.975	14.894	11.322	14,426	0.251
	2017	5.195	13.218	22.144	15.001	11.322	14,638	0.251
	2018	4.867	13.248	21.994	15.191	11.467	14,826	0.251
Poland	2015	11.418	17.879	25.981	21.471	12.740	3,431	0.297
	2016	8.398	14.165	22.206	9.639	14.630	3,487	0.277
	2017	8.427	14.082	22.181	9.562	14.591	3,726	0.277
	2018	8.882	15.124	22.860	11.379	16.437	3,862	0.285
Portugal	2015	12.056	18.277	26.248	21.647	16.865	5,424	0.331
	2016	11.913	18.306	26.458	21.293	17.503	5,516	0.330
	2017	11.744	18.332	26.476	21.128	17.997	5,594	0.332
	2018	11.738	18.384	26.631	21.052	18.202	5,725	0.333
Romania	2015	16.678	23.685	29.889	33.896	18.882	1,510	0.324
	2016	17.422	23.992	30.356	34.439	20.282	1,611	0.328

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age>=65	€/year	
	2017	18.579	24.333	31.137	34.822	20.411	1,775	0.341
	2018	17.963	24.279	30.305	35.666	17.761	1,722	0.336
Slovenia	2015	7.785	14.294	21.765	11.709	17.134	7,164	0.243
	2016	7.520	14.332	22.001	11.531	17.405	7,266	0.243
	2017	7.444	14.278	21.833	11.641	16.968	7,302	0.244
	2018	3.324	10.256	20.377	4.649	16.255	7,494	0.235
Slovakia	2015	6.716	11.150	18.263	17.523	4.540	4,134	0.217
	2016	6.784	11.289	18.459	17.626	4.794	4,224	0.219
	2017	7.063	11.744	18.754	18.745	4.858	4,351	0.222
	2018	7.184	11.794	18.865	18.613	5.045	4,535	0.225
Finland	2015	2.963	9.086	17.840	7.098	9.485	14,045	0.231
	2016	2.909	9.181	17.949	7.225	10.020	14,164	0.231
	2017	2.885	9.239	18.290	7.196	10.112	14,322	0.232
	2018	2.956	9.866	19.120	7.345	10.669	14,470	0.235
Sweden	2015	8.829	15.224	24.390	17.943	10.844	15,174	0.264
	2016	9.040	15.423	24.172	18.353	9.962	15,247	0.267
	2017	9.244	15.654	24.016	18.461	10.348	15,330	0.267
	2018	9.108	14.993	23.628	18.123	10.552	14,751	0.265
United Kingdom	2015	7.935	14.323	23.074	14.943	14.487	13,472	0.303
	2016	8.056	14.647	23.478	15.523	14.511	11,769	0.304
	2017	8.421	15.567	24.292	17.684	14.462	11,219	0.306
	2018	8.769	15.832	24.583	18.021	14.376	11,318	0.309

Source: EUROMOD version I1.0+
Note: EUROMOD figures for 2015-2018 for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16. For Germany, results for 2014 are based on SILC 2015 (2014 incomes).

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 2015, 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 Belgium and Czech Republic, poverty drops by 21 percentage points when pensions are added to original income, in Portugal, Italy, Poland and Hungary where poverty drops between 20 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 United Kingdom, Ireland and, to a lesser extent, the Luxembourg, Cyprus, Netherlands and Denmark. In these countries, when means-tested benefits are subtracted from disposable income, the poverty rate increases between 14 and 8 percentage points. 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 Lithuania, Estonia and Latvia, 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, Finland, Sweden, Austria, Netherlands, United Kingdom and Denmark: in these countries, when non-means tested benefits are subtracted from disposable income, the poverty rate increases between 13 and 7 percentage points. On the other hand, the anti-poverty effect of non-means-tested benefits in the base year remains very modest in Greece - just around 1 percentage point.

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 Denmark and Sweden 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) and Hungary (4.3). On the other hand, for 12 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 Hungary, Poland, Luxembourg, Slovenia and Slovakia (around 4 percentage points). On the other hand, SICs have a really minor poverty-reducing effect (less than 1 percentage point) in Finland, United Kingdom, Estonia, Ireland and Denmark.

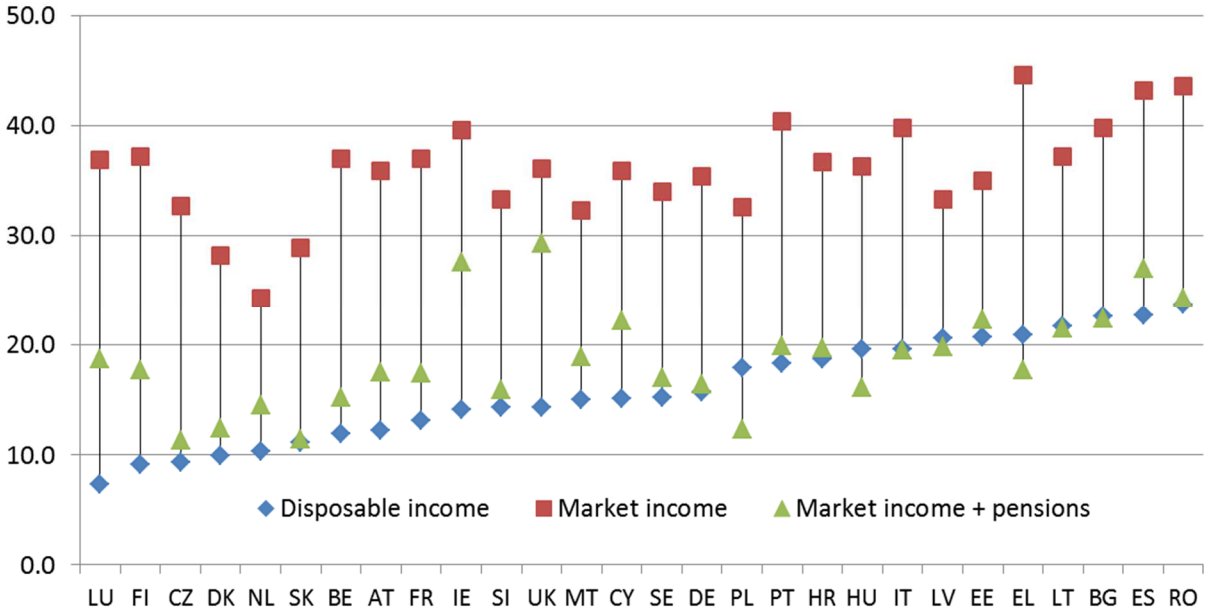
Table 2 offers also a comparison of how the impact of different components of the tax/benefits systems on poverty changed between 2015 and 2018. In general, the rankings of the countries, in terms of the anti-poverty effectiveness of the single tax/benefits instruments, are largely preserved. With respect to means-tested benefits, for instance, for most 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 of 1.5 percentage points in United Kingdom and increase in anti-poverty effectiveness in Poland and Slovenia of 4.3 percentage points. The latter is most likely due to the changes in respective child benefit instruments.

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 2015 and 2018. The effect for all but one country stays between -1 and 1 percentage points. The exception is Lithuania where we observe a slight increase of 1.9 percentage points in anti-poverty effectiveness of non-means-tested benefits.

As far as taxes are concerned, between 2015 and 2018 we observe similar variation in the poverty-reducing effect of adding taxes back to disposable income as we did in the case of non-means-tested benefits. The effect for most countries stays around -1 and 1 percentage points. We observe a slight increase in the poverty-reducing effect of 1.3 and 1.1 percentage points respectively in Estonia and Romania. Similar findings apply to Social Insurance Contributions with the effect size for all but 2 of the countries remaining between -1 and 1 percentage points. Exceptions are Romania where there is a decline of 2.3 percentage points and in Slovenia where there is an increase of 1.2 percentage points in the effectiveness of the anti-poverty impact of SIC.

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, Bulgaria, Poland, Estonia, and Czech Republic.

Figure 1. Poverty risk and the role of public pensions and non-pension benefits and taxes (2015 incomes and policies)



Source: EUROMOD version I1.0+

Note: Countries have been ranked according to the poverty estimates for disposable income. EUROMOD figures for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16.

Table 2. Effects of tax-benefit components on poverty risk: 2015-2018

	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	2015	11.939	16.734	15.231	11.437	10.483	37.032	15.201
	2016	11.796	16.675	15.106	11.374	10.454	37.524	15.395
	2017	11.657	16.523	14.989	11.322	10.394	37.484	15.289
	2018	12.257	16.586	15.410	11.603	10.696	37.828	15.712
Bulgaria	2015	22.619	24.858	24.720	20.742	20.389	39.817	22.368
	2016	22.979	25.125	24.904	21.237	21.046	39.128	22.681
	2017	23.489	25.566	25.533	21.693	21.597	38.671	22.898
	2018	23.844	25.837	25.996	22.032	21.582	38.311	23.204
Czech Republic	2015	9.314	11.431	12.223	9.044	7.145	32.670	11.313
	2016	9.439	11.581	12.195	9.186	7.233	32.253	11.251
	2017	9.985	11.832	12.617	9.642	7.742	31.966	11.319
	2018	10.186	12.009	12.768	9.779	7.956	31.695	11.416
Denmark	2015	9.927	17.970	17.166	3.430	9.555	28.176	12.403
	2016	9.993	17.954	17.298	3.646	9.717	28.232	12.403
	2017	10.223	17.835	17.577	3.676	9.930	28.162	12.373
	2018	10.241	17.751	17.577	3.679	10.011	28.276	12.403
Germany	2014	15.935	19.030	20.840	14.765	13.156	36.395	17.024
	2015	15.719	18.157	21.516	14.460	12.736	35.423	16.408
	2016	15.524	17.917	21.548	14.314	12.566	35.538	16.161
	2017	15.649	18.065	21.583	14.428	12.597	35.460	16.100
	2018	15.831	18.091	21.559	14.677	12.744	35.301	16.093
Estonia	2015	20.759	20.801	26.860	18.630	20.237	35.011	22.304
	2016	20.552	20.552	26.742	19.138	19.995	35.075	22.730

	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
	2017	21.147	21.241	27.194	18.756	20.466	34.782	22.592
	2018	20.782	20.782	27.513	19.944	20.164	36.091	24.510
Ireland	2015	14.083	26.700	19.785	13.345	13.595	39.602	27.611
	2016	14.380	26.658	20.130	13.855	13.891	39.634	27.640
	2017	14.392	26.543	20.144	13.902	13.912	39.677	27.702
	2018	14.298	26.556	19.882	13.777	13.887	39.639	27.622
Greece	2015	20.884	24.019	22.114	17.533	17.147	44.578	17.706
	2016	20.187	24.324	21.441	16.982	16.372	44.513	17.736
	2017	18.135	23.294	19.217	15.097	15.183	43.577	16.985
	2018	18.954	22.811	20.223	15.695	15.929	43.137	16.465
Spain	2015	22.686	27.475	25.070	22.538	20.292	43.219	27.037
	2016	22.692	27.519	25.049	22.551	20.258	43.305	26.970
	2017	22.498	27.482	24.871	22.357	20.083	43.309	26.919
	2018	22.477	27.522	24.834	22.331	19.936	43.131	26.895
France	2015	13.094	19.419	19.053	10.401	9.627	36.988	17.406
	2016	12.969	19.380	19.114	10.015	9.416	36.750	17.262
	2017	13.697	19.352	19.609	10.502	9.727	36.648	17.254
	2018	13.691	19.214	19.534	10.143	9.959	36.405	17.155
Italy	2015	19.564	22.923	22.329	17.648	16.809	39.734	19.449
	2016	19.420	22.739	22.343	17.622	16.628	39.904	19.605
	2017	19.350	22.569	22.344	17.587	16.567	39.922	19.606
	2018	19.427	22.585	22.378	17.660	16.576	39.900	19.602
Cyprus	2015	15.138	23.554	17.870	14.584	12.859	35.898	22.164
	2016	15.124	23.518	17.856	14.584	12.827	35.858	22.060
	2017	15.342	23.721	17.847	14.878	12.900	36.059	22.299
	2018	14.993	23.486	17.773	14.625	12.668	36.321	22.338
Latvia	2015	20.580	20.598	25.311	17.848	18.348	33.263	19.850
	2016	21.388	21.411	26.102	18.548	19.194	32.859	20.372
	2017	21.790	21.875	26.556	18.804	19.636	32.491	20.832
	2018	22.393	22.501	27.203	19.934	20.155	32.904	22.001
Lithuania	2015	21.677	22.526	24.859	20.260	19.734	37.181	21.557
	2016	22.205	22.779	25.363	21.058	20.335	37.198	22.172
	2017	22.317	22.711	25.137	21.840	20.708	37.100	22.647
	2018	20.473	21.915	25.549	19.632	18.470	37.781	22.941
Luxembourg	2015	7.281	16.719	20.700	6.830	2.902	36.872	18.669
	2016	6.854	16.808	20.613	6.614	2.624	36.911	18.708
	2017	8.487	17.758	20.794	8.519	3.479	37.522	19.345
	2018	7.867	17.664	20.502	8.301	3.000	37.588	19.422
Hungary	2015	19.567	20.632	24.938	15.280	14.587	36.329	16.109
	2016	19.833	20.899	24.917	15.711	15.122	36.368	16.470
	2017	20.042	20.929	24.514	15.374	15.205	36.035	16.341
	2018	20.043	20.735	24.369	15.493	15.305	35.906	16.370
Croatia	2015	18.687	21.438	21.952	18.637	15.353	36.718	19.721
	2016	18.690	21.533	21.964	18.632	15.372	36.609	19.744
	2017	18.987	21.696	22.266	18.896	15.850	36.577	19.945
	2018	18.947	21.533	22.451	18.919	15.873	36.376	19.976

	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
Malta	2015	15.033	20.960	19.397	14.268	12.095	32.297	18.898
	2016	15.324	20.935	19.213	14.542	12.445	31.906	18.848
	2017	15.342	20.897	19.210	14.589	12.415	31.577	18.790
	2018	15.723	21.027	19.358	15.065	12.556	31.495	19.000
Netherlands	2015	10.306	18.485	18.172	8.701	6.804	24.335	14.545
	2016	11.021	18.640	18.574	9.145	7.327	24.674	14.700
	2017	10.589	18.715	18.301	8.712	7.173	24.808	14.798
	2018	10.523	18.791	18.281	8.764	7.184	24.808	14.767
Austria	2015	12.233	16.675	21.922	11.291	8.779	35.883	17.534
	2016	13.179	16.883	22.300	12.795	9.994	36.460	18.254
	2017	13.218	16.928	22.330	12.923	10.083	36.447	18.225
	2018	13.248	16.877	22.354	12.706	10.016	36.309	18.153
Poland	2015	17.879	19.812	20.190	12.987	13.155	32.596	12.337
	2016	14.165	21.433	16.149	9.886	10.471	33.929	13.489
	2017	14.082	21.416	16.147	9.927	10.394	33.977	13.489
	2018	15.124	21.244	17.090	10.579	11.238	32.850	13.566
Portugal	2015	18.277	20.491	20.950	17.436	16.332	40.341	19.928
	2016	18.306	20.734	21.097	17.589	16.393	40.342	20.201
	2017	18.332	20.743	21.185	17.563	16.345	40.288	20.312
	2018	18.384	20.848	21.214	17.594	16.461	40.291	20.339
Romania	2015	23.685	26.658	27.081	21.690	21.213	43.558	24.336
	2016	23.992	26.573	26.915	22.400	21.660	43.286	24.269
	2017	24.333	27.346	27.213	22.690	21.912	42.866	25.077
	2018	24.279	26.650	26.943	23.395	19.528	40.607	22.381
Slovenia	2015	14.294	17.426	20.597	13.704	10.183	33.272	15.903
	2016	14.332	17.561	20.429	13.662	10.125	33.177	15.918
	2017	14.278	17.569	20.410	13.574	9.887	33.194	15.797
	2018	10.256	17.666	17.038	9.248	7.348	32.820	15.523
Slovakia	2015	11.150	13.161	15.375	10.653	7.060	28.905	11.405
	2016	11.289	13.221	15.487	10.640	7.313	28.724	11.477
	2017	11.744	13.340	15.733	11.109	7.410	28.445	11.516
	2018	11.794	13.453	15.745	11.007	7.532	28.131	11.417
Finland	2015	9.086	16.951	20.399	5.809	8.100	37.203	17.702
	2016	9.181	16.974	20.262	5.882	8.056	37.160	17.828
	2017	9.239	17.033	20.287	6.071	8.140	37.278	17.965
	2018	9.866	17.222	20.735	6.381	8.516	37.145	17.929
Sweden	2015	15.224	18.756	25.005	10.117	13.433	33.999	17.028
	2016	15.423	18.685	25.063	10.124	13.639	33.984	16.675
	2017	15.654	18.630	25.151	10.145	13.800	33.937	16.610
	2018	14.993	17.885	24.908	10.589	13.327	34.392	17.010
United Kingdom	2015	14.323	28.769	22.167	11.318	13.672	36.049	29.285
	2016	14.647	28.774	22.444	11.501	13.951	36.025	29.145
	2017	15.567	28.778	23.102	12.171	14.808	35.919	29.120
	2018	15.832	28.681	23.676	12.424	15.036	35.830	29.101

Source: EUROMOD version I1.0+

Note: EUROMOD figures for 2015-2018 for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16. For Germany, results for 2014 are based on SILC 2015 (2014 incomes).

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 in general the countries with the highest poverty gap in the base year. The poverty gap reaches 34% in Italy and exceeds 31% in Greece. In Spain, Hungary, Lithuania and Romania the poverty gap is between 27% and 30%. The countries with the lowest poverty gap are: Austria (12%), Finland (11%), and Luxembourg (6%). Comparing the 2018 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 (2015). This effect varies widely across countries, however, reaching 66 percentage points in Czech Republic, 63 in Slovakia, 62 in Estonia and around 60 for Austria, Croatia and Greece. On the other hand very small effects can be found in United Kingdom, Denmark and Netherlands. 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 11 percentage points, and up to 41 and 26 percentage points in Ireland, and United Kingdom, respectively. On the other hand, they have very modest effects (below 2 percentage points) in Hungary, Greece, Estonia, Italy, Latvia. Non-means tested benefits have a smaller impact on average, helping to close the gap by around 6 percentage points. The poverty gap reduction effect is stronger in Denmark (18 percentage points), Luxembourg, Finland, Sweden and Netherlands (between 13 and 10 percentage points), while only modest effects (below 1 percentage points) can be found in Croatia, Greece and Poland. 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 2015 and 2018. Few exceptions are represented by a stronger effectiveness of means tested benefits in Slovenia, Poland and Greece. At the other side of the spectrum, Czech Republic experienced a slight worsening in the capacity of their means-tested benefits to close the poverty gap.

Table 3. Effects of tax-benefit components on poverty gap: 2015-2018

	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	2015	19.164	26.363	28.211	21.474	20.065	99.841	47.584
	2016	19.173	26.306	27.673	20.918	20.016	99.856	47.476
	2017	18.788	26.415	28.255	20.739	20.058	99.843	46.902
	2018	18.649	26.720	27.047	20.760	20.155	99.809	46.547
Bulgaria	2015	25.670	34.413	29.403	26.074	25.131	78.687	36.065
	2016	26.178	34.570	29.909	26.524	25.316	78.492	35.639
	2017	27.150	34.177	29.724	27.071	26.760	78.167	35.393
	2018	26.157	33.762	29.006	26.699	25.625	78.383	34.923
Czech Republic	2015	16.924	28.190	21.816	16.829	16.748	99.483	32.756
	2016	16.519	27.773	21.218	16.954	17.107	99.688	33.184
	2017	18.117	27.417	21.544	18.419	18.070	99.841	34.171
	2018	19.047	27.582	22.358	19.185	20.588	99.926	34.318
Denmark	2015	15.171	30.954	33.435	27.069	15.120	78.529	65.729
	2016	15.390	30.922	33.809	25.208	14.738	78.542	65.669
	2017	15.882	30.931	32.923	25.586	15.882	78.549	65.613
	2018	16.245	31.066	32.931	26.049	16.137	78.566	65.730
Germany	2014	18.153	35.128	24.471	19.426	19.993	95.623	48.565
	2015	18.961	35.721	24.732	20.118	21.541	96.289	47.864
	2016	19.356	36.616	24.716	20.199	21.906	96.053	48.484
	2017	19.300	35.963	24.810	20.290	22.403	96.252	48.703
	2018	19.724	35.922	25.119	20.245	22.557	96.535	48.812
Estonia	2015	18.122	19.721	24.302	18.447	17.891	86.654	24.045
	2016	18.254	20.465	24.715	18.427	18.013	86.408	24.536
	2017	17.591	20.732	24.351	17.944	17.542	88.084	24.626
	2018	21.549	22.670	24.585	22.207	21.555	82.864	25.648
Ireland	2015	15.018	56.280	23.897	14.277	15.109	98.019	64.424
	2016	16.041	56.502	24.650	14.882	16.188	97.994	64.785
	2017	16.025	57.154	24.878	15.127	15.802	97.894	64.992
	2018	15.465	57.076	24.238	14.596	15.465	97.943	65.065
Greece	2015	31.784	33.582	32.542	30.121	30.121	93.068	33.441
	2016	30.087	33.825	31.150	28.303	28.667	93.317	33.643
	2017	26.830	32.486	27.486	24.999	25.452	97.816	34.428
	2018	27.882	32.474	28.216	26.318	26.814	98.770	34.405
Spain	2015	30.329	41.614	34.143	30.375	28.341	73.868	43.326
	2016	30.249	41.728	34.078	30.336	28.214	74.797	43.462
	2017	30.343	41.664	34.259	30.397	28.135	74.869	43.400
	2018	30.368	41.567	34.312	30.458	28.411	74.909	43.517
France	2015	15.720	29.637	22.530	16.867	16.731	76.862	36.631
	2016	14.921	29.598	22.146	16.794	16.262	77.064	37.998
	2017	14.310	29.838	21.975	16.496	16.309	77.238	37.790
	2018	14.656	29.947	21.953	16.417	16.143	77.577	37.428
Italy	2015	34.408	35.842	35.307	34.231	34.751	87.817	43.140
	2016	34.851	35.980	34.958	34.852	34.851	87.379	43.049
	2017	34.971	35.847	35.269	35.241	35.197	87.943	43.022
	2018	34.508	36.117	35.453	35.210	34.854	87.508	42.943

	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	2015	16.097	25.559	18.057	15.796	15.528	64.784	28.553
	2016	15.940	25.572	17.766	15.403	15.169	64.799	28.523
	2017	15.822	25.814	18.335	15.688	15.761	64.675	28.525
	2018	15.798	26.149	17.490	15.277	14.915	64.480	27.995
Latvia	2015	23.244	23.779	27.197	25.190	24.486	81.424	28.341
	2016	24.012	24.395	27.374	25.827	25.142	82.889	29.348
	2017	25.514	25.814	27.783	26.940	26.306	83.014	29.940
	2018	27.500	27.800	29.138	28.055	28.231	82.256	30.571
Lithuania	2015	27.636	31.145	29.010	26.904	26.361	90.981	34.668
	2016	29.006	32.582	30.116	29.136	26.644	91.010	34.936
	2017	27.964	31.269	29.048	27.619	27.183	91.203	32.875
	2018	22.765	28.265	27.210	23.034	22.442	89.605	33.044
Luxembourg	2015	5.594	20.851	19.255	5.765	6.245	62.949	32.078
	2016	5.285	20.424	19.227	4.761	5.589	62.882	31.940
	2017	5.700	22.492	18.653	6.970	6.180	61.605	30.991
	2018	5.754	22.875	18.009	6.219	7.859	61.157	30.927
Hungary	2015	28.352	30.219	36.553	30.972	32.226	97.208	51.300
	2016	29.911	30.463	36.444	31.432	33.081	97.144	50.938
	2017	29.007	29.688	36.620	32.036	32.760	97.797	50.731
	2018	29.319	30.878	37.649	32.380	32.581	98.104	50.427
Croatia	2015	26.492	31.172	27.319	26.693	28.706	95.194	35.127
	2016	26.411	31.347	27.086	26.457	27.471	95.472	34.946
	2017	26.688	32.179	28.069	26.688	28.503	95.460	34.839
	2018	27.742	32.471	28.511	27.499	29.530	96.024	35.403
Malta	2015	14.378	22.629	17.200	14.378	12.034	88.809	30.306
	2016	14.538	23.151	20.024	14.897	12.535	89.505	30.515
	2017	14.342	23.684	19.508	14.358	12.247	89.358	30.351
	2018	14.893	23.687	19.958	15.457	12.603	89.083	30.051
Netherlands	2015	16.392	35.014	27.173	18.035	21.149	63.865	64.493
	2016	15.918	35.675	27.007	18.018	20.678	63.577	64.232
	2017	16.204	35.861	26.652	18.299	20.397	63.648	63.737
	2018	16.157	35.579	26.862	18.105	20.140	63.646	63.964
Austria	2015	12.359	23.146	20.244	12.272	11.087	94.537	33.580
	2016	13.303	24.014	21.322	14.055	11.651	93.064	33.573
	2017	13.464	24.006	21.313	14.175	12.079	93.114	33.455
	2018	13.013	23.940	21.019	13.702	11.559	93.482	33.739
Poland	2015	24.662	27.384	24.994	23.075	21.596	84.095	28.788
	2016	21.246	28.297	22.565	20.772	18.794	80.310	29.039
	2017	21.229	28.079	22.073	21.313	18.398	80.323	29.085
	2018	21.070	27.513	22.353	21.556	19.263	84.056	29.037
Portugal	2015	24.505	29.887	27.930	24.569	23.899	87.198	30.958
	2016	23.067	29.833	26.254	22.731	22.462	87.011	30.847
	2017	22.962	30.122	26.085	22.583	22.645	86.668	30.830
	2018	23.217	30.024	26.166	22.898	22.469	86.516	31.038
Romania	2015	27.001	41.596	33.420	26.744	27.744	92.953	51.728
	2016	28.308	41.501	34.077	28.308	29.040	94.117	52.049

	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
	2017	30.339	44.110	35.988	31.108	32.611	95.693	52.941
	2018	29.816	44.666	37.581	29.812	30.815	100.000	55.604
Slovenia	2015	18.208	29.075	21.995	17.789	19.114	90.137	33.840
	2016	17.593	28.767	21.710	17.471	18.016	90.477	33.760
	2017	17.649	28.729	21.588	17.521	18.148	90.486	33.871
	2018	10.058	29.163	15.435	9.971	12.238	90.939	34.154
Slovakia	2015	21.376	29.264	23.705	21.260	22.301	98.789	35.083
	2016	22.136	29.110	24.164	22.027	23.510	99.144	35.115
	2017	22.987	30.368	25.505	23.247	23.552	99.509	34.360
	2018	23.885	30.486	26.435	24.882	24.751	99.733	34.313
Finland	2015	10.578	27.377	22.599	11.534	10.959	91.866	44.276
	2016	10.604	27.235	22.868	11.555	11.145	91.906	43.888
	2017	10.881	27.642	22.612	11.080	11.329	91.874	43.716
	2018	10.564	27.539	22.141	10.848	11.301	91.866	43.588
Sweden	2015	20.644	29.912	31.905	24.124	20.331	87.437	53.440
	2016	20.606	29.589	32.021	24.179	20.542	86.994	54.538
	2017	20.766	29.853	32.494	24.797	21.089	87.144	55.162
	2018	21.832	29.805	33.346	24.678	21.773	87.064	53.433
United Kingdom	2015	19.992	45.671	22.070	20.733	20.538	73.970	59.781
	2016	19.844	46.516	22.129	20.696	20.233	74.383	59.772
	2017	19.561	47.145	23.222	19.873	19.974	74.514	60.204
	2018	19.878	47.564	23.642	19.942	20.277	74.698	60.238

Source: EUROMOD version I1.0+
Note: EUROMOD figures for 2015-2018 for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16. For Germany, results for 2014 are based on SILC 2015 (2014 incomes).

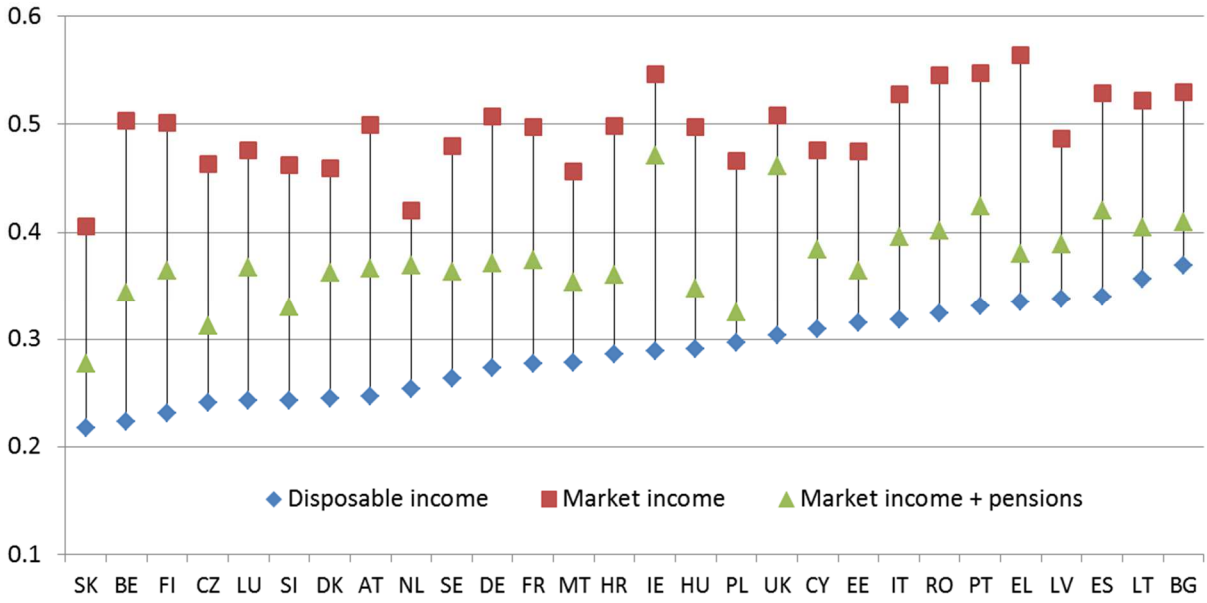
3.4. The effect of taxes and benefits on inequality

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, Belgium, Czech Republic, Hungary, Romania and Poland (the Gini drops by over 14 percentage points), followed by Croatia, Finland, Germany, Austria, Italy and Slovenia (13 percentage points). At the other extreme of the spectrum, in Netherlands and United Kingdom the Gini coefficient drops only by 5 and 4.7 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.

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 (means-tested benefits and taxes), Sweden and Finland (non-means tested benefits) and the United Kingdom (means-tested benefits).

Figure 2. Income inequality (Gini coefficient) and the role of public pensions and non-pension benefits and taxes (2015 incomes and policies)



Source: EUROMOD version I1.0+

Note: Countries have been ranked according to the value of the Gini coefficient for disposable income. EUROMOD figures for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16.

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 8 percentage points 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, Denmark and Finland (between 4 and 5 percentage points). On the other hand, the countries where means-tested benefits have the smallest inequality reducing effect are Hungary, Estonia and Latvia, followed by Poland and Lithuania. 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, Finland and Denmark non-means tested benefits have the largest inequality-reducing effect (above 4 percentage points). On the other hand, in countries such as Poland, Italy, Greece, Bulgaria and Cyprus, non -means tested have the smallest anti-inequality effect just below 1 percentage points.

Table 4 shows us that 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 and Netherlands where the Gini coefficient increases by over 6 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 Poland, Bulgaria and Hungary direct taxes do not substantially affect inequality. In the case of Bulgaria and Hungary, this is likely related to their flat tax systems. Finally, as far as SIC are concerned, in Belgium, Croatia and Slovenia SICs have a modest (slightly above 2 percentage points) inequality reducing effect, while they have a negligible effect in the majority of other countries.

Looking at changes between 2015 and 2018, the effects of taxes and benefits instruments in reducing income inequality seem to have remained largely stable over time.

Table 4. Effects of tax-benefit components on Gini coefficient: 2015-2018

	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	2015	0.224	0.249	0.247	0.295	0.249	0.503	0.344
	2016	0.221	0.247	0.244	0.292	0.246	0.503	0.342
	2017	0.221	0.247	0.244	0.292	0.246	0.503	0.341
	2018	0.222	0.248	0.246	0.291	0.247	0.503	0.341
Bulgaria	2015	0.369	0.392	0.374	0.377	0.377	0.530	0.409
	2016	0.375	0.396	0.380	0.384	0.383	0.529	0.413
	2017	0.380	0.399	0.385	0.388	0.387	0.528	0.416
	2018	0.382	0.402	0.386	0.390	0.389	0.529	0.418
Czech Republic	2015	0.241	0.259	0.255	0.271	0.258	0.463	0.312
	2016	0.244	0.261	0.257	0.274	0.260	0.463	0.315
	2017	0.247	0.264	0.260	0.278	0.264	0.463	0.317
	2018	0.251	0.266	0.263	0.282	0.266	0.462	0.318
Denmark	2015	0.245	0.294	0.290	0.299	0.246	0.459	0.362
	2016	0.246	0.294	0.290	0.299	0.247	0.460	0.362
	2017	0.248	0.295	0.292	0.301	0.249	0.461	0.363
	2018	0.248	0.295	0.293	0.301	0.250	0.461	0.363
Germany	2014	0.277	0.307	0.298	0.333	0.291	0.513	0.375
	2015	0.273	0.301	0.294	0.331	0.289	0.507	0.371
	2016	0.272	0.299	0.293	0.329	0.286	0.507	0.368
	2017	0.271	0.299	0.292	0.329	0.286	0.506	0.368
	2018	0.273	0.300	0.293	0.330	0.288	0.506	0.369
Estonia	2015	0.316	0.321	0.336	0.340	0.319	0.474	0.365
	2016	0.314	0.321	0.334	0.340	0.317	0.474	0.366
	2017	0.316	0.324	0.336	0.341	0.320	0.474	0.367
	2018	0.307	0.312	0.328	0.340	0.310	0.474	0.366
Ireland	2015	0.289	0.375	0.310	0.365	0.307	0.546	0.471
	2016	0.291	0.377	0.313	0.366	0.309	0.546	0.471
	2017	0.291	0.377	0.313	0.366	0.309	0.546	0.471
	2018	0.291	0.377	0.312	0.365	0.308	0.546	0.470
Greece	2015	0.335	0.354	0.341	0.356	0.340	0.564	0.380
	2016	0.328	0.352	0.334	0.353	0.334	0.565	0.381
	2017	0.317	0.349	0.322	0.343	0.330	0.565	0.382
	2018	0.324	0.350	0.329	0.349	0.337	0.565	0.382
Spain	2015	0.340	0.374	0.351	0.383	0.337	0.528	0.420
	2016	0.339	0.373	0.350	0.382	0.336	0.530	0.419
	2017	0.338	0.373	0.349	0.381	0.335	0.530	0.419
	2018	0.338	0.373	0.349	0.382	0.335	0.530	0.419
France	2015	0.277	0.314	0.303	0.318	0.287	0.497	0.374
	2016	0.277	0.313	0.303	0.318	0.288	0.497	0.375
	2017	0.278	0.312	0.304	0.320	0.289	0.497	0.375
	2018	0.276	0.310	0.302	0.321	0.287	0.497	0.375
Italy	2015	0.319	0.335	0.326	0.374	0.326	0.527	0.395
	2016	0.318	0.334	0.325	0.373	0.325	0.527	0.395
	2017	0.317	0.333	0.324	0.372	0.324	0.528	0.394
	2018	0.315	0.333	0.323	0.371	0.323	0.527	0.394

	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	2015	0.309	0.348	0.311	0.343	0.310	0.476	0.384
	2016	0.309	0.348	0.311	0.342	0.310	0.476	0.384
	2017	0.311	0.349	0.313	0.343	0.312	0.476	0.384
	2018	0.311	0.350	0.313	0.342	0.311	0.477	0.384
Latvia	2015	0.338	0.341	0.352	0.364	0.348	0.486	0.389
	2016	0.341	0.344	0.355	0.368	0.351	0.486	0.392
	2017	0.344	0.347	0.358	0.371	0.355	0.486	0.395
	2018	0.343	0.346	0.358	0.371	0.354	0.485	0.396
Lithuania	2015	0.357	0.369	0.368	0.376	0.367	0.522	0.404
	2016	0.359	0.371	0.370	0.381	0.370	0.522	0.407
	2017	0.361	0.371	0.371	0.384	0.372	0.522	0.409
	2018	0.346	0.359	0.364	0.368	0.358	0.522	0.406
Luxembourg	2015	0.243	0.276	0.282	0.305	0.250	0.476	0.367
	2016	0.242	0.276	0.282	0.305	0.249	0.476	0.367
	2017	0.244	0.279	0.280	0.306	0.251	0.476	0.367
	2018	0.243	0.279	0.279	0.306	0.250	0.476	0.367
Hungary	2015	0.291	0.299	0.323	0.299	0.304	0.497	0.347
	2016	0.293	0.301	0.324	0.301	0.308	0.497	0.349
	2017	0.293	0.300	0.323	0.302	0.308	0.497	0.351
	2018	0.293	0.301	0.323	0.304	0.309	0.497	0.352
Croatia	2015	0.286	0.305	0.298	0.315	0.310	0.498	0.361
	2016	0.286	0.306	0.297	0.315	0.310	0.498	0.361
	2017	0.292	0.310	0.303	0.318	0.315	0.498	0.363
	2018	0.293	0.310	0.305	0.320	0.317	0.498	0.365
Malta	2015	0.278	0.310	0.292	0.312	0.279	0.457	0.354
	2016	0.282	0.311	0.297	0.317	0.283	0.457	0.355
	2017	0.283	0.312	0.297	0.319	0.284	0.457	0.357
	2018	0.285	0.314	0.300	0.322	0.285	0.457	0.358
Netherlands	2015	0.254	0.304	0.291	0.314	0.266	0.420	0.369
	2016	0.254	0.304	0.291	0.312	0.269	0.420	0.369
	2017	0.252	0.302	0.289	0.311	0.266	0.421	0.369
	2018	0.252	0.303	0.289	0.311	0.266	0.421	0.369
Austria	2015	0.247	0.280	0.281	0.307	0.264	0.500	0.367
	2016	0.251	0.282	0.284	0.308	0.266	0.500	0.367
	2017	0.251	0.282	0.284	0.309	0.266	0.500	0.367
	2018	0.251	0.282	0.284	0.309	0.267	0.500	0.367
Poland	2015	0.297	0.308	0.304	0.309	0.299	0.466	0.325
	2016	0.277	0.310	0.284	0.291	0.282	0.467	0.328
	2017	0.277	0.309	0.283	0.292	0.282	0.467	0.328
	2018	0.285	0.313	0.292	0.301	0.291	0.469	0.334
Portugal	2015	0.331	0.348	0.343	0.392	0.341	0.547	0.424
	2016	0.330	0.350	0.342	0.390	0.340	0.547	0.423
	2017	0.332	0.352	0.344	0.390	0.342	0.546	0.423
	2018	0.333	0.354	0.346	0.389	0.343	0.546	0.423
Romania	2015	0.324	0.355	0.342	0.343	0.343	0.545	0.401
	2016	0.328	0.357	0.344	0.347	0.348	0.546	0.404

	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
	2017	0.341	0.369	0.356	0.360	0.362	0.550	0.414
	2018	0.336	0.365	0.351	0.347	0.376	0.552	0.417
Slovenia	2015	0.243	0.271	0.266	0.278	0.266	0.462	0.330
	2016	0.243	0.272	0.266	0.277	0.266	0.462	0.331
	2017	0.244	0.274	0.267	0.277	0.266	0.462	0.330
	2018	0.235	0.275	0.256	0.268	0.259	0.462	0.331
Slovakia	2015	0.217	0.236	0.236	0.238	0.229	0.405	0.277
	2016	0.219	0.238	0.237	0.240	0.231	0.405	0.278
	2017	0.222	0.240	0.241	0.243	0.233	0.405	0.280
	2018	0.225	0.242	0.243	0.247	0.237	0.406	0.282
Finland	2015	0.231	0.274	0.282	0.283	0.245	0.501	0.364
	2016	0.231	0.274	0.282	0.283	0.246	0.501	0.365
	2017	0.232	0.275	0.282	0.282	0.249	0.501	0.365
	2018	0.235	0.276	0.285	0.284	0.253	0.501	0.365
Sweden	2015	0.264	0.287	0.315	0.306	0.268	0.479	0.363
	2016	0.267	0.289	0.318	0.311	0.271	0.483	0.367
	2017	0.267	0.289	0.318	0.311	0.271	0.483	0.366
	2018	0.265	0.287	0.317	0.311	0.269	0.483	0.367
United Kingdom	2015	0.303	0.385	0.335	0.345	0.320	0.508	0.461
	2016	0.304	0.384	0.334	0.345	0.321	0.508	0.461
	2017	0.306	0.385	0.337	0.347	0.324	0.509	0.461
	2018	0.309	0.386	0.339	0.349	0.327	0.509	0.462

Source: EUROMOD version I1.0+
Note: EUROMOD figures for 2015-2018 for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16. For Germany, results for 2014 are based on SILC 2015 (2014 incomes).

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, the Atkinson inequality measure is a normative one that allows putting 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 in certain scenarios the Atkinson index and Gini can produce similar results in the rankings of countries. In the base year for disposable income both the Gini and Atkinson with low epsilon values show Lithuania, Bulgaria, Latvia and Spain having the highest income inequality while Finland, Belgium and Slovakia experience lowest inequality. There is some re-ranking taking place when comparing Gini to Atkinson using epsilon value of 1.5 but the changes are relatively subtle. 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, Belgium, Finland, Sweden and Austria – all 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, Romania, 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: 2015-2018

	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	2015	0.042	0.087	0.173	0.223	0.363	0.975	0.098	0.191	0.699
	2016	0.041	0.085	0.173	0.223	0.363	0.976	0.097	0.189	0.705
	2017	0.041	0.085	0.172	0.222	0.363	0.974	0.096	0.188	0.696
	2018	0.042	0.086	0.174	0.222	0.363	0.974	0.096	0.188	0.697
Bulgaria	2015	0.113	0.249	0.298	0.188	0.385	0.601	0.138	0.292	0.415
	2016	0.117	0.257	0.308	0.188	0.384	0.596	0.140	0.298	0.416
	2017	0.121	0.265	0.317	0.187	0.383	0.590	0.142	0.302	0.419
	2018	0.121	0.267	0.316	0.187	0.383	0.594	0.143	0.305	0.421
Czech Republic	2015	0.050	0.110	0.138	0.129	0.245	0.670	0.084	0.174	0.339
	2016	0.051	0.111	0.140	0.129	0.244	0.674	0.085	0.176	0.343
	2017	0.052	0.114	0.147	0.129	0.243	0.678	0.085	0.177	0.346
	2018	0.053	0.116	0.146	0.129	0.242	0.683	0.086	0.178	0.350
Denmark	2015	0.063	0.171	0.152	0.202	0.461	0.901	0.129	0.326	0.672
	2016	0.063	0.172	0.153	0.202	0.461	0.902	0.129	0.325	0.673
	2017	0.064	0.176	0.155	0.203	0.466	0.899	0.129	0.330	0.667
	2018	0.064	0.175	0.156	0.203	0.465	0.899	0.129	0.329	0.668
Germany	2014	0.064	0.134	0.196	0.235	0.410	0.917	0.115	0.229	0.609
	2015	0.063	0.132	0.212	0.230	0.400	0.916	0.113	0.227	0.539
	2016	0.063	0.130	0.212	0.229	0.399	0.915	0.112	0.224	0.536
	2017	0.062	0.130	0.212	0.229	0.398	0.916	0.112	0.223	0.537
	2018	0.063	0.131	0.214	0.229	0.398	0.917	0.112	0.224	0.538
Estonia	2015	0.079	0.161	0.224	0.128	0.242	0.663	0.105	0.210	0.332
	2016	0.077	0.158	0.219	0.128	0.242	0.664	0.105	0.211	0.334
	2017	0.078	0.161	0.221	0.128	0.242	0.672	0.106	0.212	0.335
	2018	0.075	0.151	0.215	0.128	0.242	0.673	0.105	0.211	0.335
Ireland	2015	0.067	0.141	0.207	0.177	0.350	0.681	0.145	0.302	0.461
	2016	0.069	0.144	0.210	0.177	0.350	0.681	0.145	0.302	0.463
	2017	0.069	0.144	0.210	0.177	0.350	0.677	0.145	0.302	0.461
	2018	0.068	0.144	0.210	0.177	0.351	0.678	0.145	0.302	0.460
Greece	2015	0.096	0.207	0.294	0.174	0.377	0.557	0.118	0.260	0.341
	2016	0.091	0.195	0.283	0.175	0.379	0.564	0.118	0.262	0.343
	2017	0.085	0.185	0.243	0.175	0.379	0.563	0.119	0.263	0.343
	2018	0.088	0.192	0.245	0.176	0.380	0.564	0.119	0.263	0.343
Spain	2015	0.097	0.194	0.328	0.218	0.417	0.812	0.144	0.288	0.554
	2016	0.096	0.192	0.332	0.221	0.419	0.838	0.143	0.286	0.564
	2017	0.096	0.191	0.334	0.222	0.420	0.843	0.143	0.286	0.567
	2018	0.096	0.192	0.331	0.221	0.419	0.836	0.143	0.287	0.564
France	2015	0.068	0.156	0.177	0.229	0.453	0.879	0.125	0.276	0.515
	2016	0.068	0.157	0.178	0.229	0.453	0.880	0.125	0.277	0.515

	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)
	2017	0.068	0.158	0.180	0.229	0.453	0.880	0.125	0.277	0.516
	2018	0.067	0.155	0.178	0.229	0.452	0.881	0.125	0.277	0.516
Italy	2015	0.085	0.169	0.302	0.208	0.393	0.829	0.127	0.260	0.446
	2016	0.084	0.168	0.312	0.208	0.393	0.829	0.127	0.260	0.446
	2017	0.084	0.167	0.314	0.210	0.394	0.842	0.127	0.259	0.450
	2018	0.086	0.171	0.297	0.208	0.393	0.831	0.126	0.258	0.445
Cyprus	2015	0.080	0.181	0.201	0.156	0.329	0.534	0.121	0.272	0.323
	2016	0.080	0.181	0.200	0.156	0.329	0.533	0.121	0.272	0.322
	2017	0.081	0.184	0.202	0.156	0.329	0.547	0.121	0.272	0.322
	2018	0.081	0.184	0.202	0.157	0.330	0.537	0.121	0.272	0.320
Latvia	2015	0.093	0.196	0.264	0.162	0.308	0.869	0.123	0.254	0.378
	2016	0.095	0.199	0.284	0.161	0.307	0.873	0.124	0.257	0.382
	2017	0.096	0.202	0.272	0.161	0.307	0.877	0.126	0.260	0.387
	2018	0.096	0.200	0.279	0.161	0.307	0.881	0.127	0.262	0.390
Lithuania	2015	0.100	0.212	0.285	0.162	0.318	0.579	0.129	0.266	0.410
	2016	0.102	0.215	0.287	0.162	0.318	0.582	0.130	0.269	0.414
	2017	0.103	0.217	0.295	0.162	0.318	0.584	0.131	0.271	0.416
	2018	0.095	0.200	0.292	0.162	0.318	0.585	0.129	0.267	0.413
Luxembourg	2015	0.051	0.116	0.129	0.182	0.348	0.881	0.115	0.251	0.505
	2016	0.050	0.116	0.128	0.182	0.348	0.881	0.115	0.251	0.505
	2017	0.051	0.116	0.130	0.182	0.348	0.882	0.115	0.250	0.504
	2018	0.050	0.115	0.130	0.182	0.348	0.882	0.115	0.251	0.503
Hungary	2015	0.070	0.141	0.221	0.140	0.266	0.559	0.102	0.202	0.360
	2016	0.071	0.143	0.224	0.140	0.266	0.561	0.103	0.204	0.361
	2017	0.071	0.144	0.246	0.140	0.266	0.560	0.104	0.205	0.362
	2018	0.072	0.144	0.229	0.140	0.266	0.560	0.105	0.207	0.363
Croatia	2015	0.068	0.136	0.212	0.139	0.269	0.532	0.104	0.210	0.342
	2016	0.067	0.135	0.207	0.139	0.269	0.531	0.104	0.211	0.343
	2017	0.070	0.141	0.214	0.139	0.269	0.532	0.105	0.212	0.344
	2018	0.070	0.142	0.216	0.139	0.269	0.531	0.106	0.215	0.347
Malta	2015	0.063	0.134	0.171	0.222	0.375	0.980	0.112	0.218	0.901
	2016	0.065	0.137	0.179	0.222	0.376	0.980	0.113	0.220	0.903
	2017	0.065	0.138	0.180	0.221	0.375	0.980	0.114	0.221	0.905
	2018	0.066	0.140	0.183	0.221	0.375	0.979	0.114	0.223	0.898
Netherlands	2015	0.056	0.121	0.159	0.155	0.298	0.762	0.119	0.234	0.694
	2016	0.056	0.121	0.161	0.155	0.298	0.763	0.119	0.234	0.695
	2017	0.055	0.118	0.158	0.155	0.299	0.760	0.119	0.234	0.691
	2018	0.055	0.118	0.159	0.155	0.299	0.760	0.119	0.234	0.691
Austria	2015	0.051	0.113	0.135	0.215	0.388	0.926	0.113	0.233	0.495
	2016	0.053	0.115	0.139	0.215	0.388	0.927	0.113	0.233	0.496
	2017	0.053	0.115	0.139	0.216	0.388	0.928	0.113	0.233	0.496
	2018	0.053	0.115	0.139	0.216	0.388	0.928	0.113	0.234	0.498
Poland	2015	0.072	0.148	0.230	0.123	0.243	0.442	0.087	0.177	0.270
	2016	0.063	0.130	0.197	0.124	0.245	0.445	0.088	0.179	0.274
	2017	0.063	0.129	0.188	0.124	0.245	0.444	0.088	0.180	0.274
	2018	0.066	0.137	0.204	0.125	0.248	0.453	0.091	0.187	0.284
Portugal	2015	0.089	0.188	0.239	0.174	0.358	0.565	0.138	0.301	0.371

	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)
	2016	0.088	0.187	0.233	0.174	0.357	0.566	0.138	0.301	0.369
	2017	0.088	0.190	0.235	0.173	0.357	0.562	0.138	0.301	0.369
	2018	0.090	0.193	0.237	0.173	0.357	0.560	0.138	0.300	0.368
Romania	2015	0.086	0.175	0.255	0.159	0.310	0.516	0.128	0.253	0.420
	2016	0.088	0.179	0.261	0.160	0.312	0.520	0.130	0.256	0.424
	2017	0.095	0.194	0.283	0.165	0.320	0.543	0.138	0.271	0.446
	2018	0.093	0.188	0.280	0.168	0.324	0.553	0.140	0.275	0.454
Slovenia	2015	0.050	0.104	0.145	0.172	0.305	0.811	0.090	0.183	0.308
	2016	0.049	0.103	0.140	0.172	0.305	0.814	0.090	0.182	0.308
	2017	0.050	0.104	0.142	0.172	0.305	0.814	0.089	0.182	0.308
	2018	0.045	0.097	0.123	0.172	0.305	0.815	0.090	0.183	0.309
Slovakia	2015	0.040	0.083	0.117	0.108	0.194	0.672	0.063	0.127	0.248
	2016	0.041	0.085	0.119	0.108	0.195	0.705	0.063	0.128	0.256
	2017	0.042	0.087	0.123	0.109	0.195	0.751	0.064	0.129	0.269
	2018	0.043	0.089	0.128	0.110	0.195	0.774	0.065	0.131	0.278
Finland	2015	0.045	0.096	0.121	0.236	0.405	0.967	0.118	0.228	0.775
	2016	0.045	0.095	0.121	0.236	0.405	0.967	0.118	0.228	0.775
	2017	0.045	0.096	0.122	0.236	0.405	0.967	0.118	0.228	0.775
	2018	0.046	0.098	0.125	0.236	0.405	0.967	0.119	0.229	0.774
Sweden	2015	0.063	0.142	0.284	0.211	0.396	0.950	0.116	0.245	0.760
	2016	0.066	0.154	0.277	0.214	0.411	0.943	0.119	0.257	0.746
	2017	0.066	0.153	0.279	0.214	0.411	0.944	0.118	0.256	0.745
	2018	0.065	0.153	0.277	0.214	0.413	0.943	0.119	0.258	0.743
United Kingdom	2015	0.077	0.164	0.247	0.192	0.378	0.896	0.159	0.322	0.833
	2016	0.077	0.163	0.250	0.193	0.378	0.913	0.159	0.321	0.857
	2017	0.078	0.165	0.267	0.194	0.378	0.931	0.159	0.321	0.885
	2018	0.079	0.167	0.270	0.194	0.378	0.940	0.160	0.322	0.897

Source: EUROMOD version I1.0+
Note: EUROMOD figures for 2015-2018 for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16. For Germany, results for 2014 are based on SILC 2015 (2014 incomes).

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 2015 policies and incomes are compared to Eurostat figures based on EU-SILC 2016. Given that EUROMOD uses SILC as its input data, one would expect the estimates for the base year 2015 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 EU-SILC 2016 (when available) 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 2015/2016. 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).[9] 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.
- 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.

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

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 2015. In comparison with Eurostat figures, poverty rates are underestimated further in Luxembourg (9.2 percentage points), and to a lesser extent in Belgium, Ireland, Finland and Netherlands (between 2.4 and 3.6 percentage points of difference). In Hungary, on the contrary, poverty rates are over-estimated by 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 over 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 being underestimated in Luxembourg (13.7 percentage point difference), Malta (5.5 percentage point difference) and Belgium (3.8 percentage point difference) and being overestimated in Hungary by 8.5 percentage points. 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 and 3 percentage points only in Belgium and Denmark.

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.
- 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 Ireland, Italy, Latvia, Belgium, Greece and Cyprus in the 2015 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

[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.

[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 2015.

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 (2015 incomes and policies) vs. Eurostat EU-SILC estimates

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age>=65	€/year	
Belgium	EUROMOD	6.5	11.9	19.2	14.0	8.5	12,583	0.224
	Eurostat	8.6	15.5	24.6	17.8	15.4	13,377	0.263
Bulgaria	EUROMOD	15.1	22.6	29.5	29.8	25.5	1,919	0.369
	Eurostat	16.5	22.9	29.6	31.9	24.3	1,891	0.377
Czech Republic	EUROMOD	4.7	9.3	16.7	13.6	7.1	4,623	0.241
	Eurostat	5.3	9.7	16.9	14.1	8.1	4,703	0.251
Denmark	EUROMOD	4.6	9.9	17.6	8.6	5.3	17,045	0.245
	Eurostat	6.8	11.9	20.3	9.4	8.5	17,199	0.277
Germany (2014)	EUROMOD	8.6	15.9	23.9	14.9	14.7	12,183	0.277
	Eurostat	10.2	16.7	24.5	14.6	16.5	12,401	0.301
Germany (2015)	EUROMOD	8.5	15.7	23.3	15.3	16.4	12,576	0.273
	Eurostat	9.7	16.5	24.3	15.4	17.6	12,765	0.295
Estonia	EUROMOD	11.1	20.8	28.2	16.8	38.9	5,104	0.316
	Eurostat	13.1	21.7	29.3	18.6	40.2	5,187	0.327
Ireland	EUROMOD	6.2	14.1	23.9	18.8	6.0	12,118	0.289
	Eurostat	9.0	16.6	25.6	18.9	16.0	13,444	0.295
Greece	EUROMOD	14.7	20.9	28.3	27.1	10.0	4,808	0.335
	Eurostat	15.3	21.2	28.1	26.3	12.4	4,500	0.343
Spain	EUROMOD	16.0	22.7	30.5	30.4	12.4	8,319	0.340
	Eurostat	15.5	22.3	29.9	29.7	13.0	8,209	0.345
France	EUROMOD	6.3	13.1	21.2	18.7	7.8	12,793	0.277
	Eurostat	6.8	13.6	21.4	19.1	8.2	13,028	0.293
Italy	EUROMOD	13.7	19.6	26.7	24.7	12.5	9,112	0.319
	Eurostat	14.2	20.6	28.3	26.7	15.3	9,748	0.331
Cyprus	EUROMOD	7.2	15.1	25.3	16.3	20.7	8,874	0.309
	Eurostat	8.3	16.1	24.9	17.1	19.5	8,412	0.321
Latvia	EUROMOD	13.3	20.6	27.8	17.1	34.5	3,589	0.338
	Eurostat	14.4	21.8	29.2	18.6	38.1	3,819	0.345
Lithuania	EUROMOD	15.2	21.7	29.1	25.9	25.9	3,326	0.357
	Eurostat	15.9	21.9	29.2	25.6	27.7	3,387	0.37
Luxembourg	EUROMOD	1.0	7.3	21.8	8.1	3.4	19,310	0.243
	Eurostat	10.3	16.5	24.2	21.8	9.0	20,291	0.31
Hungary	EUROMOD	13.5	19.6	26.4	28.4	11.0	2,622	0.291
	Eurostat	7.8	14.5	22.2	19.9	6.8	2,861	0.282
Croatia	EUROMOD	12.3	18.7	25.3	18.7	26.2	3,425	0.286
	Eurostat	13.5	19.5	26.9	20.4	26.5	3,435	0.298
Malta	EUROMOD	6.4	15.0	23.8	15.5	23.8	8,250	0.278
	Eurostat	7.7	16.5	25.8	21.0	24.2	8,143	0.285
Netherlands	EUROMOD	5.1	10.3	18.8	13.8	3.0	13,335	0.254
	Eurostat	6.6	12.7	21.2	14.8	9.0	13,640	0.269
Austria	EUROMOD	3.6	12.2	21.5	14.1	9.6	13,802	0.247
	Eurostat	8.1	14.1	22.9	16.5	13.2	14,217	0.272
Poland	EUROMOD	11.4	17.9	26.0	21.5	12.7	3,431	0.297
	Eurostat	11.1	17.3	25.1	21.1	12.8	3,530	0.298
Portugal	EUROMOD	12.1	18.3	26.2	21.6	16.9	5,424	0.331
	Eurostat	13.0	19.0	26.4	22.4	18.3	5,269	0.339
Romania	EUROMOD	16.7	23.7	29.9	33.9	18.9	1,510	0.324
	Eurostat	19.2	25.3	30.7	37.2	19.1	1,469	0.347
Slovenia	EUROMOD	7.8	14.3	21.8	11.7	17.1	7,164	0.243
	Eurostat	8.2	13.9	21.4	11.9	17.6	7,396	0.244
Slovakia	EUROMOD	6.7	11.2	18.3	17.5	4.5	4,134	0.217

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age>=65	€/year	
	Eurostat	8.1	12.7	19.5	20.8	5.7	4,171	0.243
Finland	EUROMOD	3.0	9.1	17.8	7.1	9.5	14,045	0.231
	Eurostat	4.9	11.6	20.4	9.3	12.3	14,190	0.254
Sweden	EUROMOD	8.8	15.2	24.4	17.9	10.8	15,174	0.264
	Eurostat	9.4	16.2	24.4	18.7	16.8	15,098	0.276
United Kingdom	EUROMOD	7.9	14.3	23.1	14.9	14.5	13,472	0.303
	Eurostat	9.9	15.9	24.6	18.5	17.1	12,682	0.315

Source: EUROMOD version I1.0+
Note: EUROMOD figures for all countries, except for the UK, are based on SILC 2016 (2015 incomes) and also on SILC 2015 (2014 incomes) in the case of Germany. For the UK, results are based on FRS 2015/16.

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 2016 data for 4 policy years (from 2015 to 2018) 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.

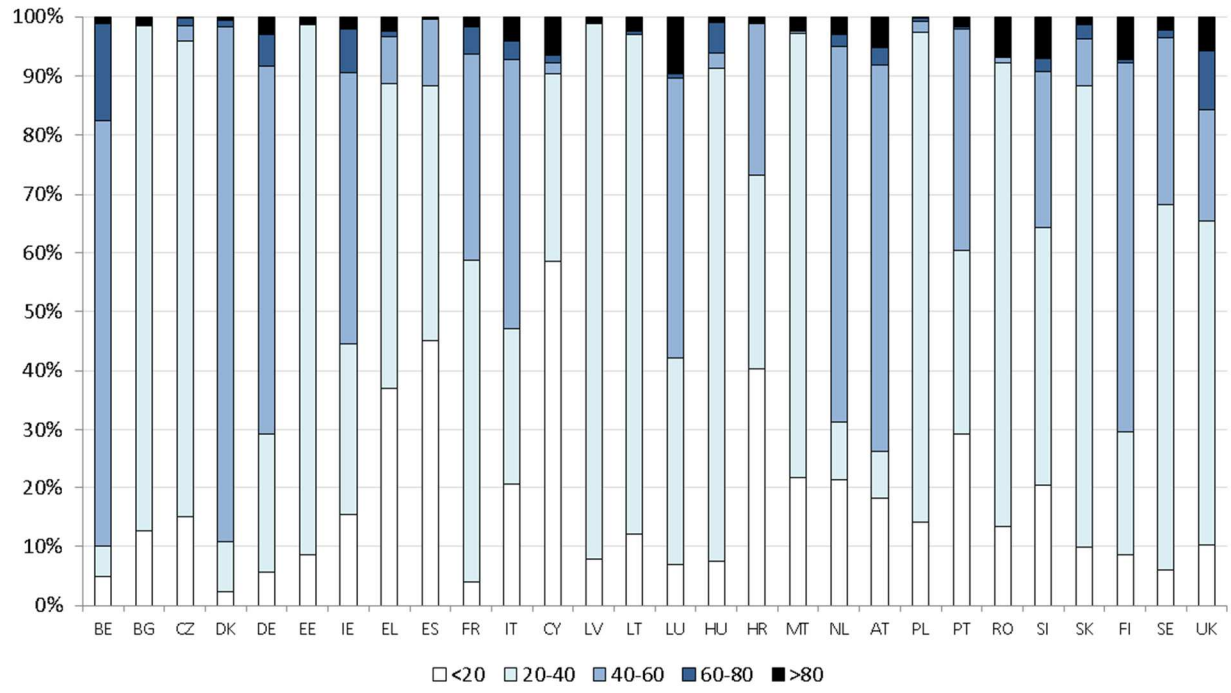
Table 7 shows that Belgium exhibits by far the highest mean METR (53%), followed by Denmark, Luxembourg, Germany, Finland, and Austria, where METRs range between 43% and 46%. The lowest mean METRs are observed in Malta, Cyprus, Estonia, Bulgaria and Spain (below 25%). The ranking of countries remains largely the same 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 2015 and 2018 (15 percentage points), followed by Romania (11 percentage points) and Slovenia (6 percentage points). All three countries also saw a similar size reduction in median METR. The main reason for such a large increase in disincentives in Greece is mainly the result of introducing a guaranteed income policy in 2017. On the other hand, reductions in mean METRs over

time can be observed in Malta (6 percentage points), however there was no change in median METR. When looking at median METRs, the only 2 countries with large changes without a corresponding change in the mean were Croatia and Portugal (10 percentage points decrease in METR and 9 percentage points increase in METR respectively)

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 2015 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 (45%), Croatia (40%) and Greece (37%) and On the other hand, the distribution of METR is very concentrated at higher levels (e.g. between 40% and 60%) in Denmark (87% of the working population has METR between 40% and 60%), Belgium (72%), Austria (65%) and Netherlands (64%). 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 small 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 6% or more in Luxembourg, Finland Romania, Slovenia and, Cyprus.

Figure 3. Marginal effective tax rates 2015: share of population in paid work (%) by range of METR



Source: EUROMOD version I1.0+
Note: EUROMOD figures for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16.

Table 7. Mean and median Marginal effective tax rates: 2015-2018

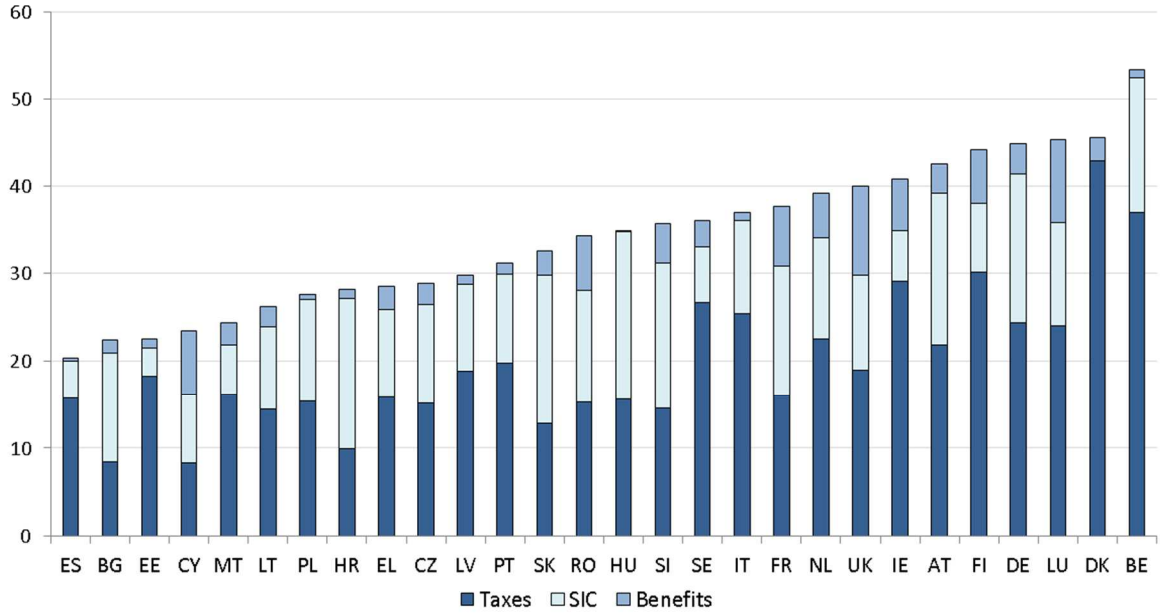
		2015	2016	2017	2018
Belgium	Mean	53.33	53.52	53.60	52.82
	Median	54.99	55.40	55.40	56.14
Bulgaria	Mean	22.42	22.26	22.39	23.07
	Median	21.61	21.61	22.01	22.40
Czech Republic	Mean	28.92	28.98	28.99	28.92
	Median	31.10	31.10	31.10	31.10
Denmark	Mean	45.60	45.61	45.33	45.05
	Median	42.83	42.83	42.82	42.88
Germany	Mean	44.77	43.83	43.93	43.77
	Median	44.45	44.45	44.45	44.45
Estonia	Mean	22.57	24.55	23.04	23.45
	Median	22.88	22.88	22.88	22.88
Ireland	Mean	40.72	39.68	39.57	39.33
	Median	51.00	49.50	49.00	48.75
Greece	Mean	28.54	29.99	49.51	43.85
	Median	26.70	24.20	36.05	34.48
Spain	Mean	20.35	20.20	20.11	20.16
	Median	20.40	20.40	20.40	20.40
France	Mean	37.62	39.43	39.65	41.10
	Median	36.39	33.29	35.80	37.41
Italy	Mean	36.74	37.01	37.13	37.78
	Median	41.03	41.24	41.34	42.30
Cyprus	Mean	23.42	23.34	22.82	22.89
	Median	10.98	11.16	9.81	9.41
Latvia	Mean	29.82	30.12	30.50	30.06
	Median	31.08	31.09	31.09	28.80
Lithuania	Mean	26.21	25.97	25.40	26.75
	Median	27.90	29.10	25.98	30.66
Luxembourg	Mean	45.38	45.28	43.55	43.56
	Median	44.26	44.15	42.43	42.53
Hungary	Mean	34.94	34.04	34.52	34.53
	Median	34.50	33.50	34.50	34.50
Croatia	Mean	28.18	28.32	27.26	27.74
	Median	30.18	30.18	20.00	20.00
Malta	Mean	24.34	20.50	19.20	18.38
	Median	25.00	25.00	25.00	25.00
Netherlands	Mean	39.52	38.94	39.05	38.97
	Median	44.32	45.35	48.20	48.28
Austria	Mean	42.55	39.92	41.55	40.27
	Median	44.36	43.25	43.25	43.25
Poland	Mean	27.66	28.78	28.95	28.79
	Median	30.32	30.32	30.32	30.32
Portugal	Mean	31.23	31.70	31.90	30.52
	Median	25.50	35.21	38.08	34.00
Romania	Mean	34.26	34.37	34.64	45.61
	Median	31.86	29.86	33.06	41.50
Slovenia	Mean	35.74	36.04	35.67	41.95
	Median	34.56	34.56	34.56	40.07
Slovakia	Mean	32.61	32.28	32.65	32.33
	Median	29.85	29.85	29.85	29.85
Finland	Mean	44.24	44.25	44.09	44.57
	Median	45.18	45.77	45.65	45.80
Sweden	Mean	36.02	36.82	37.13	36.25
	Median	28.73	30.81	32.34	32.35
United Kingdom	Mean	39.94	39.84	39.40	39.05
	Median	34.43	34.89	34.76	34.63

Source: EUROMOD version I1.0+

Note: EUROMOD figures for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16.

Figure 4 presents the decomposition by components of average METR for each country in the base year 2015. 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 2015-2018 are reported in Table 8.

Figure 4. Marginal effective tax rates (%) by income component, 2015



Source: EUROMOD version I1.0+
Note: Countries have been ranked according to the total (mean) marginal effective tax rate. EUROMOD figures for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16.

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 Cyprus, Bulgaria and Croatia, to relatively high values in Denmark, Belgium, Finland and Ireland.

In Denmark, almost all of average METR is accounted for by taxes. While in Belgium, Finland and Ireland 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, Bulgaria and Cyprus, 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, Austria, Croatia, Germany, Slovenia, Slovakia and Belgium in all cases above 15%. At the other end of the spectrum, in Ireland, 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, Luxembourg, Cyprus and France.

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 out using EUROMOD.

Table 8. Marginal effective tax rates by income component: 2015-2018

	Policy year	Taxes	SIC	Benefits	Total (mean)
Belgium	2015	36.982	15.432	0.915	53.329
	2016	36.877	15.662	0.979	53.517
	2017	36.977	15.618	1.008	53.603
	2018	36.154	15.621	1.047	52.821
Bulgaria	2015	8.448	12.479	1.497	22.424
	2016	8.457	12.407	1.395	22.259
	2017	8.430	12.738	1.223	22.391
	2018	8.399	13.060	1.607	23.067
Czech Republic	2015	15.153	11.250	2.514	28.917
	2016	15.300	11.191	2.487	28.978
	2017	15.599	11.138	2.252	28.988
	2018	15.908	11.058	1.951	28.918
Denmark	2015	42.841	0.000	2.759	45.599
	2016	42.863	0.000	2.752	45.615
	2017	42.754	0.000	2.578	45.332
	2018	42.520	0.000	2.527	45.047
Germany	2014	24.272	16.725	4.155	45.070
	2015	24.347	16.983	3.632	44.962
	2016	24.034	15.685	4.116	43.835
	2017	24.196	15.696	4.065	43.957
	2018	24.259	15.440	4.098	43.797
Estonia	2015	18.223	3.239	1.113	22.575
	2016	19.513	3.235	1.806	24.553
	2017	18.187	3.243	1.614	23.044
	2018	18.862	3.097	1.495	23.453
Ireland	2015	29.095	5.813	5.814	40.722
	2016	28.173	5.783	5.723	39.679
	2017	28.021	5.725	5.828	39.574
	2018	27.840	5.752	5.735	39.327
Greece	2015	15.889	9.998	2.648	28.536
	2016	15.771	10.312	3.894	29.977
	2017	14.813	14.277	20.540	49.629
	2018	14.902	13.969	15.099	43.970
Spain	2015	15.689	4.308	0.348	20.345
	2016	15.543	4.295	0.363	20.201
	2017	15.554	4.189	0.363	20.106
	2018	15.689	4.137	0.329	20.155
France	2015	16.030	14.786	6.802	37.618
	2016	20.428	14.749	4.247	39.425
	2017	20.110	14.739	4.802	39.652
	2018	22.579	13.379	5.142	41.100

	Policy year	Taxes	SIC	Benefits	Total (mean)
Italy	2015	25.335	10.459	0.944	36.738
	2016	25.439	10.567	1.002	37.009
	2017	25.457	10.669	1.005	37.131
	2018	25.555	10.770	1.455	37.779
Cyprus	2015	8.366	7.801	7.251	23.418
	2016	8.335	7.796	7.210	23.341
	2017	7.904	7.789	7.126	22.820
	2018	7.685	7.836	7.372	22.893
Latvia	2015	18.876	9.861	1.083	29.820
	2016	19.260	9.849	1.008	30.117
	2017	19.634	9.851	1.018	30.503
	2018	18.522	10.599	0.941	30.063
Lithuania	2015	14.466	9.481	2.261	26.208
	2016	14.355	9.465	2.149	25.969
	2017	14.292	9.488	1.620	25.400
	2018	15.077	9.453	2.217	26.747
Luxembourg	2015	24.001	11.824	9.607	45.431
	2016	23.958	11.823	9.549	45.330
	2017	22.504	11.820	9.279	43.603
	2018	22.601	11.819	9.198	43.618
Hungary	2015	15.559	19.270	0.109	34.939
	2016	14.563	19.391	0.090	34.044
	2017	15.461	18.950	0.105	34.516
	2018	15.459	18.972	0.098	34.529
Croatia	2015	9.934	17.165	1.077	28.177
	2016	10.198	17.187	0.934	28.320
	2017	9.328	16.861	1.067	27.255
	2018	9.922	16.865	0.953	27.740
Malta	2015	16.209	5.576	2.558	24.343
	2016	17.333	5.605	-2.439	20.498
	2017	17.832	5.680	-4.311	19.200
	2018	18.323	5.615	-5.558	18.379
Netherlands	2015	22.525	11.536	5.073	39.135
	2016	21.591	11.972	4.938	38.502
	2017	22.120	11.427	5.065	38.611
	2018	22.170	11.265	5.079	38.514
Austria	2015	21.842	17.295	3.415	42.552
	2016	19.572	16.324	4.023	39.919
	2017	21.164	16.567	3.816	41.547
	2018	19.867	16.638	3.766	40.271
Poland	2015	15.374	11.654	0.634	27.662
	2016	15.459	11.643	1.678	28.780
	2017	15.746	11.664	1.537	28.947
	2018	16.117	11.616	1.060	28.793
Portugal	2015	19.778	10.125	1.325	31.228
	2016	19.427	10.130	2.145	31.702

	Policy year	Taxes	SIC	Benefits	Total (mean)
	2017	19.794	10.000	2.103	31.897
	2018	18.350	10.000	2.169	30.519
Romania	2015	15.293	12.803	6.164	34.261
	2016	15.033	12.791	6.550	34.373
	2017	15.361	12.760	6.523	34.644
	2018	6.931	26.775	11.903	45.609
Slovenia	2015	14.583	16.650	4.509	35.741
	2016	14.683	16.669	4.692	36.044
	2017	14.132	16.646	4.888	35.666
	2018	16.012	16.622	9.312	41.946
Slovakia	2015	12.831	16.931	2.849	32.611
	2016	13.004	16.686	2.592	32.282
	2017	13.174	16.897	2.574	32.645
	2018	13.352	16.653	2.325	32.330
Finland	2015	30.202	7.818	6.220	44.239
	2016	29.661	8.316	6.269	44.246
	2017	27.646	9.902	6.538	44.087
	2018	27.136	10.363	7.069	44.568
Sweden	2015	26.728	6.350	2.944	36.021
	2016	27.658	6.211	2.952	36.822
	2017	27.891	6.345	2.891	37.126
	2018	27.122	6.226	2.902	36.249
United Kingdom	2015	18.957	10.834	10.150	39.940
	2016	18.910	11.126	9.809	39.844
	2017	18.636	11.284	9.480	39.400
	2018	18.612	11.257	9.183	39.053

Source: EUROMOD version I1.0+
Note: EUROMOD figures for 2015-2018 for all countries, except for the UK, are based on SILC 2016 (2015 incomes). For the UK, results are based on FRS 2015/16. For Germany, results for 2014 are based on SILC 2015 (2014 incomes)

6. Conclusions

The results from EUROMOD shown above are limited to some key statistical indicators of the baselines for 2015-2018 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 an impact on. 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.

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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	
	2015	**2016**
Belgium		EU-SILC 2016-2
Bulgaria		EU-SILC 2016-2
Czech Republic		EU-SILC 2016-2
Denmark		EU-SILC 2016-2
Germany	EU-SILC 2015-3	EU-SILC 2016-2
Estonia		EU-SILC 2016-2 and national SILC variables
Ireland		EU-SILC 2016-2
Greece		National SILC (UDB & PDB versions)
Spain		EU-SILC 2016-2
France		EU-SILC 2016-2
Croatia		EU-SILC 2016-2
Italy		National SILC 2016
Cyprus		EU-SILC 2016-2
Latvia		EU-SILC 2016-2
Lithuania		EU-SILC 2016-2 and national SILC variables
Luxembourg		EU-SILC 2016-2 and national SILC variables
Hungary		EU-SILC 2016-1
Malta		EU-SILC 2016-2
Netherlands		EU-SILC 2016-2
Austria		National SILC 2016-2
Poland		EU-SILC 2016-2
Portugal		EU-SILC 2016-2
Romania		EU-SILC 2016-2
Slovenia		EU-SILC 2016-2
Slovakia		National SILC (27/04/2017)
Finland		EU-SILC 2016-2
Sweden		EU-SILC 2016-2
United Kingdom		Family Resources Survey 2015/16

Appendix 2. National teams contributing to EUROMOD I1.0+

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 and Annica Wallera
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.

Appendix 4. Country notes: Full year adjustments

It is possible to use full year adjustment in the following countries:

For **Estonia** in **2007** for child allowance and allowance for families with 3+ children. In **2009** for unemployment insurance benefit, employer social insurance contribution, credited social insurance contribution, employee social insurance contribution and self-employed social insurance contribution. In **2013** for child allowance and needs based family benefit. In **2017** for parental allowance for families with 7+ children / many children.

For **Greece** in **2010** for pensioners' solidarity contributions. In **2011** for pensioners' solidarity contributions, temporary pension reduction, SIC: private sector employers and SIC: self-employed liberal professions. In **2013** for SIC: banking employees, SIC: public enterprise employees and SIC: civil servants. In **2014** for SIC: private sector employers and SIC: banking employees (ETE). In **2016** temporary pension reduction, supplementary pension recalculation and SIC: pensioners. In **2017** for gross pensions cap.

For **Lithuania** in **2017** for unemployment insurance benefit.

For **Netherlands** in **2015** for Social Assistance Benefit (net).

For **Portugal** in **2012** for Social insertion income.