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Working Paper

Baseline results from the EU28 EUROMOD: 2016-2019

EUROMOD Working Paper, No. EM 20/20

Provided in Cooperation with:

Institute for Social and Economic Research (ISER), University of Essex

Suggested Citation: Kneeshaw, Jack et al. (2020) : Baseline results from the EU28 EUROMOD: 2016-2019, EUROMOD Working Paper, No. EM 20/20, University of Essex, Institute for Social and Economic Research (ISER), Colchester

This Version is available at:

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EUROMOD WORKING PAPER SERIES

EM 20/20

Baseline Results from the EU28 EUROMOD: 2016-2019

Jack Kneeshaw with
Paola De Agostini, Kakia Chatsiou, Katrin Gasior, Holguer Xavier Jara Tamayo,
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December 2020



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Abstract

This paper presents baseline results from the latest version of EUROMOD (version I2.0+), 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 2016 and 2019. 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 (2019).

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 I2.0+. EUROMOD is maintained, developed and managed by the Institute for Social and Economic Research (ISER) at the University of Essex and the Joint Research Centre of the European Commission, 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 259/2018-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.

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1. Introduction

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

The changes that it can be used to examine might be **actual changes in policy** over time, for example to show the extent to which reforms and other changes to public policies have contributed to reducing (or increasing) income poverty or inequality. Or they might be **alternative scenarios**, for tax-benefit policies and/or for the evolution of employment, hours of work etc. In particular, in the context of **Europe 2020**, EUROMOD provides the capacity for assessing the distributional and budgetary effects of proposed and implemented policy changes in each member state, as well as for exploring the implications of alternative reform strategies or alternative economic or demographic scenarios for risk of poverty at national and EU levels. Furthermore, it can be used to explore the between- as well as within-country distributional implications of potential EU or Eurozone social and fiscal policies.

EUROMOD is unusual in that it is **openly accessible**.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 (I2.0+), being constructed with support from DG-EMPL of the European Commission. It updates and extends the material reported in a 2019 EUROMOD Working Paper (Tammik, 2019).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 2016-2019 tax/benefits policies, based on micro-data from the 2017 EU-SILC. The calculations for 2016 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 2019), (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-2015-2018>

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. 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 2017 for all EU-28 countries except the UK
- (b) Family Resources Survey (FRS) 2016/17 for the UK

2.2 Updating policy systems until 2019

Based on detailed descriptions of policies provided by national teams, 2019 policies have been modelled using the EUROMOD tax-benefit modelling “language” for each country. Together with updating factors, to bring 2016 incomes from 2017 EU-SILC input data up to the level corresponding to the following policy years (2017, 2018, 2019), 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

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, Croatia, 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 2019 policies typically cannot be finalised until late 2020). 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 are intended to simulate situations where 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 Country Reports

Each national team, as shown in Appendix 2, has produced a Country Report conforming to common guidelines in terms of style and content. The intention is to provide comprehensive documentation for EUROMOD users and serve as reference for developers and national teams in the future.⁸

3. Poverty and inequality indicators with EUROMOD

Policy systems for years 2016 to 2019 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 2016 and 2019. 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 2016 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 2016 and 2019 are: Lithuania (10.3%), Romania (9.6%), Hungary (8.3%), Estonia (8.2%), Latvia (7.7%), Czech Republic (7.6%), Bulgaria (7.2%), Latvia (7.7%), Croatia (5.3%), Slovakia (4.5%). A number of countries experienced a slightly lower annual shift in the poverty line of between 2.1% and 3.7%: Austria, Belgium, Germany, France, Ireland, Luxembourg, Malta, Poland, Portugal and Slovenia. On the other hand, the poverty line has not moved substantially in Denmark, Greece, Spain, Finland, Italy and Netherlands where the average annual growth rate remained below 2%, with the threshold moving barely at all in Cyprus and United Kingdom over the 3 years. Finally, the poverty line in one country has dropped in nominal terms: Sweden (by -0.6% on average per year).

Table 1 shows that the highest at risk of poverty rate using the 60% poverty line in the base year 2016 is observed in Bulgaria (23%), followed Latvia, Romania, Lithuania, Spain, Hungary and Estonia (above 20%) and Greece, Croatia, Italy and Malta (above 18%). The lowest poverty rates (below 12%) are registered in Slovakia, Netherlands, Luxembourg, Belgium, Denmark, Finland and Czech Republic (8.6%). 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 30% in the base year, followed by Bulgaria and Spain (both 28%), and Hungary and Greece (both 25%). The lowest child poverty rates (below 12%) are observed in Czech Republic, Poland, Denmark, Finland (8%). Elderly poverty reaches 40% in Estonia, 38% in Latvia, 33% in both Bulgaria and Malta, 32% in Lithuania and 29% in Croatia. At the other end of the spectrum, the countries with the lowest elderly poverty rates (below 8%) are Ireland, Denmark, France, Slovakia, Luxembourg, and Netherlands. However, as we demonstrate in Chapter 4, in the case of Ireland, Luxembourg and Netherlands there is a noticeable 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 2016 – 2019 changes in poverty rates due to changes in tax-benefit policies and income levels tend to be relatively small, though increases in poverty rates were more prevalent than in previous years and reductions, where they occurred, much less marked. The largest increase in poverty rates was registered in Bulgaria, Czech Republic, Luxembourg, Romania and United Kingdom where the poverty rates increased by 1.8, 1.2, 1.6, 2.1 and 2.5 percentage points respectively. Increase in poverty rates in Czech Republic and United Kingdom seems to be mostly associated with an increase in child poverty rates while in Bulgaria and Romania the increase in poverty was mostly seen among the elderly. For Luxembourg, it was a mixture of the two.

The country experiencing the largest poverty reduction due to changes in policy and income levels between 2016 and 2019 according to Table 1 is Slovenia where the poverty rate decreased by around 2.5 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 13% in 2017 to 7% in 2018. A decrease in poverty rates was also seen in Greece with a 1.9 percentage point overall decrease. There, child poverty has significantly decreased (mainly due to the introduction of the GMI in 2017, the provision of the social dividend in 2017-18, and the changes in child benefit in 2018) but remains almost twice as high as elderly poverty. The increase in the latter is mostly related to the gradual abolition of pensioners' social solidarity benefit. The only other country to see a poverty reduction greater than 1 percentage point due to changes in policy and income levels is Lithuania.

Table 1 also shows poverty trends due to changes in policy and income levels between 2016 and 2019 for different population subgroups (children and elderly people). Slovenia – see previous paragraph – has been the country experiencing the strongest reduction also in child poverty (by around 5 percentage points) in the period considered, followed closely by Greece and Lithuania. In contrast, child poverty has increased by over 5 percentage points in United Kingdom. Likewise, in three countries (Bulgaria, Latvia and Romania), elderly poverty jumped by between 5 and 7 percentage points. Only in Cyprus was there a reduction in elderly poverty of a similar magnitude (4.6 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 2017 (based on 2016 incomes). The EUROMOD estimates show the movement in poverty and inequality indicators resulting from policy changes over the period 2016-2019, 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: 2016-2019

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold €/year	Gini
		50%	60%	70%	age <18	age ≥65		
Belgium	2016	5.985	11.126	20.733	13.343	8.523	€ 13,066	0.222
	2017	5.941	10.975	20.660	13.398	7.899	€ 13,331	0.221
	2018	6.226	11.172	20.940	13.652	8.322	€ 13,739	0.221
	2019	6.065	11.191	21.186	13.150	9.478	€ 14,132	0.222
Bulgaria	2016	16.155	23.029	30.017	27.683	33.132	€ 2,194	0.386
	2017	16.810	23.714	30.500	28.293	35.350	€ 2,357	0.390
	2018	17.105	24.400	31.095	28.120	38.549	€ 2,516	0.393
	2019	17.626	24.833	31.491	28.269	40.336	€ 2,700	0.396
Czechia	2016	4.234	8.638	16.630	10.841	8.229	€ 4,877	0.236
	2017	4.526	9.411	17.097	11.969	9.824	€ 5,288	0.240
	2018	5.025	9.573	17.323	12.056	10.410	€ 5,617	0.243
	2019	5.117	9.847	17.344	13.081	9.251	€ 6,076	0.244
Denmark	2016	5.148	11.065	19.203	9.293	6.578	€ 17,452	0.242
	2017	5.375	11.427	19.569	10.178	6.852	€ 17,754	0.244
	2018	5.602	11.528	19.595	10.328	6.978	€ 18,080	0.245
	2019	5.581	11.251	19.147	10.227	6.162	€ 18,313	0.244
Germany	2016	7.990	14.767	22.638	13.774	16.144	€ 13,011	0.271
	2017	8.045	14.764	22.602	13.814	16.253	€ 13,308	0.271
	2018	8.237	14.821	22.704	13.885	16.041	€ 13,673	0.271
	2019	8.459	14.955	22.811	14.421	16.004	€ 14,064	0.272
Estonia	2016	11.422	20.407	28.346	16.169	40.043	€ 5,558	0.302
	2017	11.336	20.706	28.860	16.253	40.035	€ 5,855	0.305
	2018	12.891	20.840	28.943	14.454	43.584	€ 6,633	0.295
	2019	12.009	20.481	28.677	14.403	42.370	€ 7,023	0.294
Ireland	2016	6.682	14.490	24.408	17.903	7.074	€ 12,687	0.296
	2017	6.609	14.358	24.438	17.823	6.943	€ 12,895	0.296
	2018	6.705	14.514	24.857	17.894	7.315	€ 13,316	0.298
	2019	6.668	14.902	25.011	18.035	9.584	€ 13,762	0.300
Greece	2016	13.667	19.346	26.461	24.958	8.226	€ 4,875	0.319
	2017	11.065	17.116	24.745	22.146	8.864	€ 4,896	0.303
	2018	10.038	16.636	24.117	20.297	10.017	€ 4,897	0.301
	2019	11.60	17.492	24.333	21.245	10.737	€ 4,979	0.304
Spain	2016	15.520	21.476	28.832	28.178	13.277	€ 8,462	0.333
	2017	15.432	21.484	28.798	28.262	13.255	€ 8,479	0.333
	2018	15.422	21.435	28.928	28.199	13.217	€ 8,560	0.332
	2019	15.250	21.369	28.805	28.248	13.109	€ 8,685	0.330
France	2016	6.211	12.404	20.972	17.665	7.336	€ 13,049	0.272
	2017	6.119	12.217	21.084	17.289	7.873	€ 13,353	0.271
	2018	6.252	12.187	21.384	16.945	8.639	€ 13,635	0.274
	2019	6.578	12.582	21.613	16.941	10.017	€ 14,182	0.277
Italy	2016	12.069	18.747	26.849	22.343	15.333	€ 9,814	0.318
	2017	12.043	18.950	26.842	22.275	16.281	€ 9,897	0.317
	2018	12.363	19.332	27.034	22.922	16.500	€ 10,032	0.318
	2019	11.933	19.074	27.002	23.271	15.411	€ 10,088	0.311

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold	Gini
		50%	60%	70%	age <18	age ≥65	€/year	
Cyprus	2016	5.935	15.487	25.948	17.878	20.838	€ 8,952	0.308
	2017	6.134	15.567	25.865	18.039	20.686	€ 9,011	0.310
	2018	6.639	16.089	26.240	18.116	22.622	€ 9,180	0.311
	2019	5.691	14.818	25.796	18.354	16.235	€ 8,955	0.311
Latvia	2016	14.898	22.354	29.977	19.225	37.719	€ 3,786	0.337
	2017	15.334	22.631	30.512	18.274	41.119	€ 3,999	0.340
	2018	15.820	22.802	30.607	16.965	44.533	€ 4,431	0.341
	2019	15.737	22.736	30.684	17.239	43.952	€ 4,730	0.340
Lithuania	2016	15.935	21.654	29.676	23.545	31.528	€ 3,606	0.361
	2017	15.854	21.887	29.956	23.584	33.017	€ 3,898	0.361
	2018	13.934	20.740	29.254	20.165	32.940	€ 4,371	0.351
	2019	13.370	20.473	29.133	19.246	32.931	€ 4,838	0.345
Luxembourg	2016	2.357	11.213	22.875	13.846	4.533	€ 20,663	0.252
	2017	2.547	11.609	23.077	15.036	4.662	€ 21,727	0.253
	2018	2.579	11.278	22.859	14.214	4.662	€ 21,778	0.252
	2019	3.179	12.812	23.150	15.402	6.353	€ 22,321	0.254
Hungary	2016	14.081	21.013	26.786	24.767	17.558	€ 2,756	0.307
	2017	14.059	20.910	26.958	25.188	17.929	€ 3,114	0.307
	2018	14.470	20.773	26.855	24.854	18.561	€ 3,175	0.309
	2019	14.780	20.376	27.105	24.225	18.734	€ 3,487	0.312
Croatia	2016	12.734	19.208	26.126	19.211	28.805	€ 3,740	0.287
	2017	13.618	19.793	26.566	20.176	29.916	€ 3,963	0.293
	2018	13.782	20.006	26.564	20.415	30.119	€ 4,152	0.293
	2019	14.096	20.320	26.854	20.744	30.551	€ 4,367	0.293
Malta	2016	9.289	18.367	26.305	20.555	32.983	€ 8,706	0.286
	2017	9.193	18.401	26.135	20.681	33.502	€ 8,931	0.287
	2018	9.747	18.997	26.630	21.311	35.119	€ 9,260	0.289
	2019	9.724	19.090	26.394	21.311	35.782	€ 9,564	0.290
Netherlands	2016	5.470	11.430	19.938	14.100	4.583	€ 13,897	0.255
	2017	5.275	10.992	19.481	13.900	4.192	€ 14,070	0.253
	2018	5.367	10.998	19.490	13.898	4.031	€ 14,216	0.253
	2019	5.432	11.199	19.755	14.015	4.585	€ 14,717	0.253
Austria	2016	5.868	13.104	21.593	15.496	11.622	€ 14,552	0.258
	2017	5.949	13.362	21.580	16.441	11.782	€ 14,748	0.258
	2018	5.827	13.318	21.550	16.277	11.812	€ 14,938	0.258
	2019	5.996	13.436	21.562	15.587	12.824	€ 15,503	0.255
Poland	2016	8.494	13.860	20.912	9.589	13.762	€ 3,669	0.279
	2017	8.368	13.819	20.919	9.542	13.700	€ 3,731	0.278
	2018	8.712	14.504	21.525	10.431	15.671	€ 3,800	0.286
	2019	8.597	14.550	21.387	11.160	15.034	€ 4,086	0.286
Portugal	2016	11.478	17.646	25.386	19.238	16.485	€ 5,615	0.324
	2017	11.482	17.776	25.591	19.190	16.995	€ 5,705	0.326
	2018	11.447	17.939	25.643	19.114	17.641	€ 5,859	0.327
	2019	11.476	18.088	25.486	18.799	18.466	€ 5,997	0.326
Romania	2016	16.304	22.283	29.194	29.735	19.967	€ 1,687	0.313
	2017	16.932	22.739	29.845	30.062	21.544	€ 1,858	0.322

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold €/year	Gini
		50%	60%	70%	age <18	age ≥65		
Slovenia	2018	17.807	24.352	30.785	33.045	22.492	€ 1,983	0.333
	2019	18.261	24.423	31.206	31.714	24.837	€ 2,200	0.335
	2016	6.964	13.775	21.358	12.614	15.346	€ 7,372	0.238
	2017	7.088	13.939	21.440	12.833	15.605	€ 7,506	0.241
	2018	3.409	10.997	20.748	7.269	15.097	€ 7,717	0.232
Slovakia	2019	3.456	11.180	20.911	7.716	15.027	€ 7,903	0.233
	2016	7.517	11.773	17.679	19.937	4.955	€ 4,269	0.218
	2017	7.914	12.421	18.229	20.312	5.534	€ 4,410	0.221
	2018	8.116	12.613	18.885	20.468	6.201	€ 4,639	0.224
	2019	8.179	12.661	18.978	20.259	7.190	€ 4,876	0.225
Finland	2016	2.638	9.454	17.934	8.008	9.730	€ 14,209	0.231
	2017	2.660	9.692	18.093	8.413	9.851	€ 14,369	0.233
	2018	2.671	9.788	18.307	8.492	10.503	€ 14,519	0.238
	2019	2.879	10.165	18.891	8.823	11.123	€ 14,820	0.237
	2016	7.837	14.997	24.235	18.298	10.990	€ 15,219	0.267
Sweden	2017	8.057	15.265	24.238	18.450	11.512	€ 15,273	0.266
	2018	7.858	14.436	23.363	18.060	11.576	€ 14,595	0.265
	2019	8.064	14.683	23.577	18.182	12.265	€ 14,933	0.267
	2016	8.177	14.847	24.258	17.802	16.993	€ 12,741	0.308
	2017	8.553	15.669	24.810	19.296	18.461	€ 12,296	0.299
United Kingdom	2018	8.858	16.416	25.460	20.707	18.597	€ 12,540	0.304
	2019	9.381	17.329	25.851	23.342	18.948	€ 12,763	0.307

Source: EUROMOD version I2.0+

Note: EUROMOD figures for 2016-2019 for all countries, except for the UK, are based on SILC 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

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 2016, 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 26 percentage points, the largest effect across countries. Other countries where public pensions play a major role in reducing poverty (a reduction greater than 20 percentage points) are Belgium, Czech Republic, Poland and Portugal. 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, Cyprus, Netherlands, Finland, France and Denmark. In these countries, when means-tested benefits are subtracted from disposable income, the poverty rate increases between 7 and 12 percentage points. On the other hand, in many countries, the anti-poverty effect of means-tested benefits remains modest. In fact, in 11 countries the increase is below 3 percentage points; and for Estonia and Latvia, the anti-poverty effect of means-tested benefits is very close to zero.

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 and United Kingdom: in these countries, when non-means tested benefits are subtracted from disposable income, the poverty rate increases between 8 and 10 percentage points. On the other hand, the anti-poverty effect of non-means-tested benefits in the base year remains very modest in Greece - around 1 percentage point only.

Adding back taxes to disposable income has a relatively small poverty-reducing effect. 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 7 and 5 percentage points respectively. Other countries experiencing a noticeable effect above 3 percentage points are Hungary (6.8), Poland (3.7), Latvia (3.4), Finland (3.3) and United Kingdom (3.3). 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 Hungary, Poland, Luxembourg, Slovenia, Greece, Netherlands and Slovakia (around 4-5 percentage points). On the other hand, SICs have a very minor poverty-reducing effect (less than 1 percentage point) in 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 2016 and 2019. In general, the rankings of the countries, in terms of the anti-poverty effectiveness of the single tax/benefits instruments, are largely preserved (though there is a little more variation than in previous years).

With respect to means-tested benefits, whilst for most countries the performance of means-tested benefits remains basically unchanged (between -1 and 1 percentage points), we observe a decline in anti-poverty effectiveness in four countries: United Kingdom (a decrease in the poverty-reducing effect of 2.6 percentage points), Luxembourg (-1.8), Romania (1.3) and Poland (1.2). In contrast, for Slovenia we see an increase in anti-poverty effectiveness (2.5 percentage points over the period).

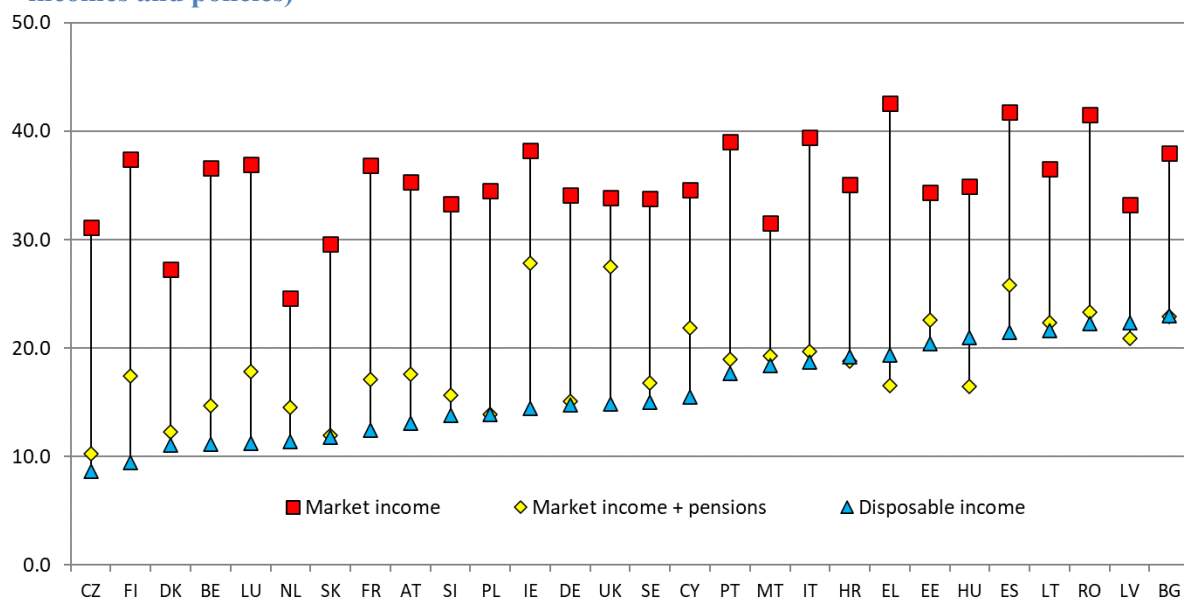
As far as non-means-tested benefits are concerned, again, at the EU level we do not observe large differences in their anti-poverty impact between 2016 and 2019. The effect for most countries stays between -1 and 1 percentage points. There are, however, exceptions: we observe decreases of slightly more than 1 percentage point in anti-poverty effectiveness of non-means-tested benefits for Austria and Luxembourg. Poland moves in the opposite direction with a similar magnitude; notably, for Lithuania, there is a larger increase in anti-poverty reduction (3.2 percentage points).

As far as taxes are concerned, between 2016 and 2019 we observe even less variation in the poverty-reducing effect of adding taxes back to disposable income. Again, the effect for most countries stays in the range -1 to 1 percentage points but there are two countries where this is not the case: for Luxembourg there is a 1.4 percentage point decline in the effectiveness of the anti-poverty impact of taxes; for Hungary, there is an increase (1.1 percentage points).

Similar findings apply to Social Insurance Contributions with the effect size for all but two of the countries remaining between -1 and 1 percentage points. Exceptions are Romania and Lithuania where there is an increase of around percentage points in the effectiveness of the anti-poverty impact of SIC in each case.

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 3 percentage points in Bulgaria, Hungary, Lithuania, Latvia, Poland and Romania.

Figure 1. Poverty risk and the role of public pensions and non-pension benefits and taxes (2016 incomes and policies)



Source: EUROMOD version I2.0+

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 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

Table 2. Effects of tax-benefit components on poverty risk: 2016-2019

	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	2016	11.126	16.421	15.087	10.427	9.854	36.598	14.666
	2017	10.975	16.372	15.034	10.313	9.677	36.690	14.709
	2018	11.172	16.365	15.202	10.534	9.910	36.848	14.917
	2019	11.191	16.332	15.057	10.850	10.014	36.920	15.198
Bulgaria	2016	23.029	25.121	25.533	21.168	20.423	38.013	22.917
	2017	23.714	25.617	26.242	21.772	21.031	37.560	23.209
	2018	24.400	26.278	26.983	22.571	21.561	37.461	23.731
	2019	24.833	26.704	27.302	23.125	22.011	37.372	23.998
Czechia	2016	8.638	10.919	11.468	8.290	6.544	31.119	10.280
	2017	9.411	11.424	11.966	9.096	7.020	30.813	10.680
	2018	9.573	11.608	11.984	9.264	7.322	30.520	10.724
	2019	9.847	11.528	12.143	9.293	7.405	30.455	10.308
Denmark	2016	11.065	18.447	18.223	3.950	10.632	27.305	12.249
	2017	11.427	18.319	18.440	3.993	11.028	27.338	12.249
	2018	11.528	18.271	18.501	4.046	11.112	27.393	12.249
	2019	11.251	18.106	18.309	4.002	10.824	27.473	12.249
Germany	2016	14.767	16.942	20.557	13.622	11.718	34.160	15.066
	2017	14.764	17.004	20.445	13.624	11.725	34.097	14.998
	2018	14.821	16.933	20.636	13.681	11.782	34.143	14.942
	2019	14.955	16.877	20.587	13.849	12.027	34.141	14.890
Estonia	2016	20.407	20.426	27.153	18.866	19.817	34.362	22.612
	2017	20.706	20.813	27.278	18.687	20.272	34.169	22.549

	Policy year	Disposable income (DPI)	DPI less means-tested benefits	DPI less non means-tested benefits	DPI plus direct taxes	DPI plus Social Insurance Contrib.	Original Income	Original Income plus pensions
Ireland	2018	20.840	20.903	27.866	20.123	20.198	35.622	24.524
	2019	20.481	20.530	27.744	19.594	19.933	35.212	23.872
	2016	14.490	25.072	20.146	13.920	13.961	38.215	27.816
	2017	14.358	24.852	19.925	13.762	13.892	38.152	27.683
	2018	14.514	25.094	20.042	13.997	14.044	38.046	27.751
Greece	2019	14.902	25.274	21.193	14.229	14.416	37.945	27.720
	2016	19.346	23.338	20.232	16.394	15.380	42.621	16.561
	2017	17.116	22.625	18.072	14.180	13.451	42.127	16.215
	2018	16.636	22.442	17.618	13.548	12.797	41.852	15.991
	2019	17.492	21.881	18.326	14.719	13.750	42.287	15.955
Spain	2016	21.476	26.438	24.193	21.175	19.075	41.786	25.840
	2017	21.484	26.526	24.156	21.139	18.851	41.846	25.877
	2018	21.435	26.558	24.149	21.147	18.839	41.912	25.903
	2019	21.369	26.673	23.994	21.047	18.595	41.822	25.868
	2016	12.404	19.252	18.778	9.831	9.222	36.868	17.146
France	2017	12.217	19.201	18.478	9.742	9.162	36.687	17.124
	2018	12.187	19.109	18.221	9.550	9.617	36.493	17.212
	2019	12.582	19.372	18.406	10.014	10.201	36.815	17.718
	2016	18.747	21.983	22.094	17.162	16.086	39.403	19.664
	2017	18.950	21.890	22.306	17.019	16.268	39.289	19.473
Cyprus	2018	19.332	22.232	22.642	16.977	16.594	39.099	19.363
	2019	19.074	22.153	22.430	16.863	16.197	39.015	19.259
	2016	15.138	23.554	17.870	14.584	12.859	35.898	22.164
	2017	15.124	23.518	17.856	14.584	12.827	35.858	22.060
	2018	15.342	23.721	17.847	14.878	12.900	36.059	22.299
Latvia	2019	14.993	23.486	17.773	14.625	12.668	36.321	22.338
	2016	22.354	22.364	27.161	18.965	19.892	33.255	20.917
	2017	22.631	22.667	27.563	19.553	20.359	32.637	21.195
	2018	22.802	22.812	28.374	20.254	20.654	32.960	22.326
	2019	22.736	22.762	28.110	20.308	20.651	33.076	22.340
Lithuania	2016	21.654	22.868	25.173	20.906	19.770	36.533	22.392
	2017	21.887	23.060	25.473	21.168	20.197	36.528	22.962
	2018	20.740	22.474	26.412	19.889	19.146	37.134	23.786
	2019	20.473	21.779	27.181	18.976	17.035	32.454	19.890
	2016	11.213	17.461	21.073	9.710	5.790	36.904	17.806
Luxembourg	2017	11.609	17.318	21.112	11.399	6.218	37.208	18.028
	2018	11.278	17.337	20.668	11.267	6.062	37.110	18.028
	2019	12.812	17.237	21.518	12.698	6.423	36.951	17.872
	2016	21.013	21.731	26.216	14.228	15.697	34.891	16.492
	2017	20.910	21.607	25.679	14.351	15.800	34.076	16.107
Hungary	2018	20.773	21.640	25.061	14.599	16.033	33.556	15.998
	2019	20.376	21.079	24.607	14.659	15.955	33.007	15.847
	2016	19.208	21.592	21.434	19.041	15.601	35.073	18.803
	2017	19.793	21.931	21.940	19.666	16.228	35.166	19.246
	2018	20.006	21.695	22.278	19.852	16.370	35.073	19.260
Croatia	2019	20.320	22.145	22.389	20.177	16.658	35.144	19.467

	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	2016	18.367	21.104	19.873	17.772	16.147	31.538	19.284
	2017	18.401	21.437	19.957	17.794	16.145	31.304	19.277
	2018	18.997	21.612	20.322	18.395	16.573	31.220	19.467
	2019	19.090	21.531	20.500	18.435	16.710	31.141	19.565
Netherlands	2016	11.430	19.211	18.135	9.418	7.486	24.643	14.549
	2017	10.992	19.275	17.918	9.096	7.347	24.779	14.661
	2018	10.998	19.530	17.923	9.070	7.297	24.760	14.689
	2019	11.199	19.666	18.109	9.310	7.550	25.098	14.821
Austria	2016	12.233	16.675	21.922	11.291	8.779	35.883	17.534
	2017	13.179	16.883	22.300	12.795	9.994	36.460	18.254
	2018	13.218	16.928	22.330	12.923	10.083	36.447	18.225
	2019	13.248	16.877	22.354	12.706	10.016	36.309	18.153
Poland	2016	13.860	21.189	15.885	10.118	10.186	34.520	13.928
	2017	13.819	21.095	15.847	10.152	10.004	34.497	13.851
	2018	14.504	20.943	16.670	10.686	10.496	33.522	13.640
	2019	14.550	20.633	17.841	10.565	10.654	33.434	14.333
Portugal	2016	17.646	20.191	19.887	16.783	15.847	39.027	18.977
	2017	17.776	20.295	19.937	16.810	15.934	38.848	19.000
	2018	17.939	20.366	20.035	16.912	15.994	38.783	19.074
	2019	18.088	20.437	20.108	16.869	15.887	38.668	19.134
Romania	2016	22.283	25.350	25.463	20.907	19.837	41.519	23.324
	2017	22.739	25.415	25.689	21.237	20.369	40.892	23.386
	2018	24.352	26.425	26.587	22.778	19.354	37.771	22.063
	2019	24.423	26.227	28.063	23.063	19.834	37.805	22.511
Slovenia	2016	13.775	17.347	20.408	13.132	9.344	33.326	15.640
	2017	13.939	17.433	20.455	13.212	9.433	33.212	15.607
	2018	10.997	17.335	18.371	10.290	7.011	33.066	15.469
	2019	11.180	17.285	18.633	10.353	7.032	32.979	15.367
Slovakia	2016	11.773	13.391	15.305	11.303	8.304	29.578	11.929
	2017	12.421	13.767	15.850	11.815	8.399	29.315	11.943
	2018	12.613	13.906	15.954	11.927	8.613	29.051	11.913
	2019	12.661	14.015	15.909	12.099	8.826	28.723	12.070
Finland	2016	9.454	16.987	19.502	6.201	8.253	37.399	17.455
	2017	9.692	17.077	19.480	6.416	8.414	37.597	17.627
	2018	9.788	17.212	19.589	6.387	8.535	37.388	17.511
	2019	10.165	17.368	19.774	6.629	8.901	37.369	17.557
Sweden	2016	14.997	18.236	24.538	9.600	13.106	33.782	16.796
	2017	15.265	18.232	24.701	9.693	13.406	33.813	16.633
	2018	14.436	17.655	24.194	9.764	12.683	34.108	17.005
	2019	14.683	17.767	24.445	9.921	12.919	34.274	17.201
United Kingdom	2016	14.847	27.074	22.948	11.571	13.908	33.917	27.506
	2017	15.669	26.828	23.898	12.186	14.340	33.455	26.911
	2018	16.416	26.942	24.579	12.631	15.016	33.278	26.884
	2019	17.329	26.986	24.977	13.286	15.847	33.250	26.904

Source: EUROMOD version I2.0+

Note: EUROMOD figures for 2016-2019 for all countries, except for the UK, are based on SILC 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

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 33% in Romania and also reaches or exceeds 28% in each of Bulgaria, Greece, Spain, Hungary, Italy and Lithuania. The countries with the lowest poverty gap in the base year are Finland (10%), and Luxembourg (8%). Comparing the 2019 results with the base year, we do not observe substantial differences or re-rankings, save for Slovenia, Greece and Lithuania where the poverty gap reduces substantially between 2017 and 2018 (for reasons noted above and below).

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 46 percentage points when added to market incomes in the base year (2016). This effect varies widely across countries, however, reaching 75 percentage points in Czech Republic and reaching or exceeding 60 in Estonia, Greece, Croatia, Hungary, Slovenia and Slovakia. 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 10 percentage points, and up to 39 and 24 percentage points in Ireland, and United Kingdom, respectively. On the other hand, they have very modest effects (below 2 percentage points) in Hungary, Estonia, Lithuania and Latvia. Non-means tested benefits have a smaller impact on average, helping to close the gap by around 5 percentage points. The poverty gap reduction effect is strongest in Denmark (15 percentage points), Belgium, Luxembourg, Finland, Sweden and Netherlands (between 13 and 10 percentage points), while only modest effects (below 1% point) can be found in Bulgaria, Greece and Malta. 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 2016 and 2019. Few exceptions are represented by a stronger effectiveness of means-tested benefits in Slovenia and Greece.

Table 3. Effects of tax-benefit components on poverty gap: 2016-2019

	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	2016	18.397	22.945	29.438	20.335	19.509	99.847	48.976
	2017	18.589	23.048	28.324	20.358	19.684	99.833	48.914
	2018	19.129	23.352	28.460	20.361	19.129	99.828	48.053
	2019	18.241	23.909	27.843	19.699	18.356	99.819	47.772
Bulgaria	2016	28.714	34.416	29.242	28.371	28.773	80.840	36.306
	2017	29.717	34.588	30.510	29.409	29.870	80.061	36.294
	2018	28.029	33.050	29.041	27.809	28.006	82.461	35.130
	2019	27.981	32.444	29.251	27.746	27.884	82.933	34.723
Czechia	2016	16.189	22.223	18.975	16.303	15.900	99.988	25.093
	2017	16.130	21.406	18.997	16.115	16.603	100.000	24.710
	2018	17.596	21.607	19.814	17.395	17.529	100.000	24.505
	2019	18.629	23.686	20.880	19.241	17.964	100.000	26.248
Denmark	2016	16.014	26.810	30.843	27.197	15.593	81.058	74.989
	2017	15.973	26.955	30.908	27.065	15.821	81.071	75.005
	2018	15.987	27.177	30.947	27.454	15.859	81.037	75.006
	2019	16.541	27.771	31.666	27.718	16.447	81.037	75.067
Germany	2016	18.652	31.622	24.532	19.725	21.298	96.926	44.152
	2017	18.720	31.501	24.982	19.935	21.618	96.964	44.148
	2018	19.291	31.842	25.256	20.413	22.047	97.001	44.312
	2019	19.664	31.728	25.466	20.842	22.494	97.031	44.264
Estonia	2016	18.472	19.857	23.884	18.880	18.024	84.648	24.975
	2017	17.993	20.587	23.971	18.077	17.281	85.151	24.584
	2018	20.888	22.044	24.908	21.265	20.605	81.128	25.685
	2019	20.028	21.188	24.165	20.503	19.634	82.114	25.191
Ireland	2016	15.152	54.450	20.910	15.152	15.551	90.111	56.358
	2017	15.079	54.765	21.017	15.125	15.079	90.138	56.409
	2018	15.274	54.452	21.290	15.076	15.683	90.496	56.288
	2019	15.269	53.523	19.673	15.269	15.324	90.566	55.859
Greece	2016	29.476	32.892	30.340	28.206	27.330	91.795	31.542
	2017	23.633	31.078	24.385	22.115	21.926	93.742	30.724
	2018	23.014	30.919	23.809	21.756	21.838	94.445	31.088
	2019	24.006	31.271	25.031	23.264	22.385	93.121	30.642
Spain	2016	30.709	41.502	32.563	31.164	30.065	74.726	43.007
	2017	30.502	41.510	32.631	31.126	30.063	75.031	42.977
	2018	30.676	41.392	32.782	31.501	30.297	75.058	42.616
	2019	30.669	42.091	32.885	31.147	30.241	75.820	42.783
France	2016	16.696	28.837	21.811	19.059	18.488	79.769	37.851
	2017	16.870	28.858	21.740	18.427	18.120	79.991	37.435
	2018	17.260	28.981	22.032	18.262	18.038	80.217	36.879
	2019	17.653	28.846	22.678	18.140	18.429	80.150	36.235
Italy	2016	27.861	30.132	29.148	30.149	29.876	86.204	37.194
	2017	26.959	29.788	27.984	29.840	29.194	85.069	37.194
	2018	27.494	30.136	28.557	29.608	28.982	83.301	37.356
	2019	25.044	30.166	27.800	26.817	26.370	83.575	37.449

	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	2016	13.174	23.181	16.535	13.128	12.174	68.083	25.803
	2017	13.310	23.135	16.773	13.442	12.419	67.938	25.894
	2018	13.776	23.262	17.180	13.784	13.321	67.958	26.028
	2019	13.018	22.917	16.986	13.128	11.640	69.890	26.487
Latvia	2016	23.577	23.732	26.811	24.925	24.339	84.152	28.411
	2017	25.789	25.882	27.656	25.603	25.927	85.602	29.255
	2018	27.681	28.017	29.218	27.974	27.787	84.794	30.343
	2019	27.620	27.800	29.145	27.887	27.800	84.435	30.245
Lithuania	2016	28.343	29.560	30.003	28.143	27.302	91.086	32.319
	2017	27.716	29.144	29.331	28.343	28.470	91.048	30.910
	2018	23.797	27.599	27.431	24.410	23.477	90.090	30.759
	2019	23.057	26.594	27.133	24.260	24.690	98.204	29.493
Luxembourg	2016	7.664	24.287	18.852	8.144	7.773	71.143	33.563
	2017	8.511	25.317	18.803	8.811	8.713	71.298	33.750
	2018	8.439	25.475	18.108	8.660	8.840	71.520	33.905
	2019	8.077	25.289	18.255	8.636	9.764	71.522	33.686
Hungary	2016	30.280	32.080	34.626	30.784	34.074	97.727	37.246
	2017	31.871	32.366	34.642	33.738	36.060	98.177	39.132
	2018	33.136	32.998	35.905	35.526	37.322	98.390	40.840
	2019	34.278	34.768	36.736	37.549	38.485	98.646	42.566
Croatia	2016	24.717	29.788	25.762	25.133	26.097	98.104	33.941
	2017	25.068	30.063	26.376	25.068	26.337	97.959	33.393
	2018	25.843	30.653	26.667	25.843	26.461	98.105	34.083
	2019	26.245	30.579	27.779	26.525	27.664	97.992	34.269
Malta	2016	17.003	27.302	17.441	16.510	15.993	84.481	28.736
	2017	16.657	26.888	17.169	16.141	15.616	84.627	28.593
	2018	17.138	26.672	17.855	16.353	16.322	84.230	28.656
	2019	16.864	26.587	17.471	16.612	16.191	84.117	28.425
Netherlands	2016	15.398	34.361	26.756	17.544	18.736	63.137	64.929
	2017	15.632	34.439	26.466	17.319	18.940	63.083	64.409
	2018	15.504	34.373	27.145	17.811	19.696	63.210	64.068
	2019	15.776	34.396	26.919	17.868	19.818	63.521	63.885
Austria	2016	14.697	29.437	22.286	15.020	13.494	96.040	42.436
	2017	14.090	28.956	22.430	15.228	13.582	96.166	42.028
	2018	14.532	29.383	22.094	14.978	13.478	96.245	42.284
	2019	14.721	29.264	21.975	15.723	13.967	96.080	42.283
Poland	2016	22.548	27.985	23.643	22.266	20.818	77.196	29.027
	2017	22.214	27.651	23.142	21.780	20.511	77.191	29.080
	2018	21.799	27.525	23.106	22.500	20.987	79.997	29.594
	2019	21.616	27.494	23.795	21.566	20.108	80.677	29.432
Portugal	2016	25.140	30.306	27.235	25.253	24.029	88.128	31.514
	2017	25.162	30.325	27.064	25.291	23.808	88.935	31.883
	2018	25.216	30.242	27.138	25.328	23.650	89.211	31.904
	2019	24.024	30.290	26.615	24.693	23.272	89.128	32.035
Romania	2016	32.557	37.779	35.074	32.039	33.897	92.137	45.861
	2017	32.630	39.037	35.554	33.404	34.639	93.240	46.870

	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
Slovenia	2018	33.711	39.675	36.547	35.147	37.423	100.000	49.382
	2019	32.944	40.301	37.017	33.921	36.746	100.000	51.687
	2016	16.986	25.329	21.626	16.805	17.525	88.606	28.561
	2017	17.179	25.221	21.445	17.162	17.690	88.751	28.566
	2018	10.776	25.233	14.980	10.415	12.783	88.999	28.562
Slovakia	2019	10.994	24.581	15.008	10.544	12.873	89.195	28.360
	2016	23.840	28.887	27.605	23.991	24.817	97.036	35.170
	2017	24.737	29.628	27.926	25.340	25.921	98.177	34.774
	2018	25.891	29.630	28.372	26.573	27.467	98.827	35.562
	2019	25.561	29.250	28.349	26.426	27.093	99.483	34.055
Finland	2016	10.253	26.640	21.447	8.869	10.550	90.030	42.550
	2017	10.143	26.654	21.504	9.152	10.683	89.687	42.865
	2018	9.984	26.382	21.423	9.255	10.172	89.951	42.906
	2019	10.242	26.118	21.245	9.525	10.558	89.976	42.529
	2016	17.615	29.137	31.009	20.945	17.583	86.708	46.734
Sweden	2017	18.062	29.146	30.999	21.282	17.872	86.695	47.427
	2018	19.376	28.830	32.053	21.369	18.169	86.572	47.207
	2019	19.365	29.307	32.246	21.943	19.044	86.529	46.698
	2016	19.244	43.639	21.209	18.487	19.678	67.080	53.040
	2017	18.439	40.260	21.794	16.853	19.283	67.537	49.662
United Kingdom	2018	18.615	40.418	22.449	16.816	19.326	67.194	49.861
	2019	18.301	40.478	23.257	16.975	19.171	67.259	49.774

Source: EUROMOD version I2.0+

Note: EUROMOD figures for 2016-2019 for all countries, except for the UK, are based on SILC 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

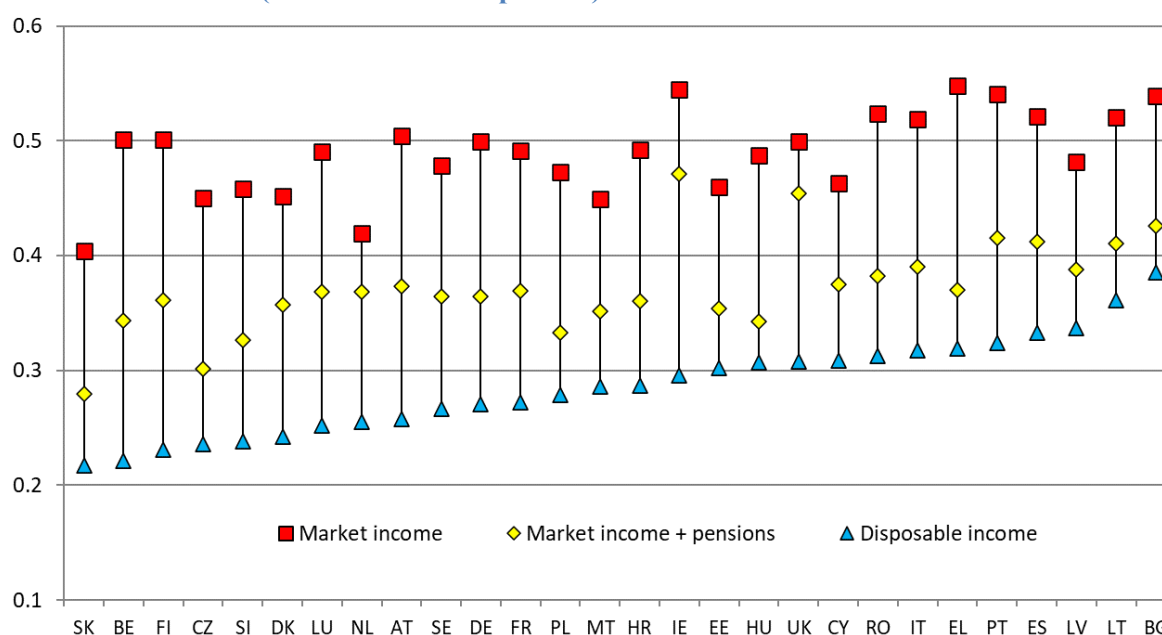
3.4. The effect of taxes and benefits on inequality

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 0.14 percentage points), followed by Croatia, Finland, Germany, Austria and Slovenia (0.13 percentage points). At the other extreme of the spectrum, in Netherlands and United Kingdom the Gini coefficient drops only by around 0.05 percentage points, 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 Netherlands and United Kingdom (means-tested benefits).

Figure 2. Income inequality (Gini coefficient) and the role of public pensions and non-pension benefits and taxes (2016 incomes and policies)



Source: EUROMOD version I2.0+

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 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

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 - where the Gini increases by around 0.08 percentage points when means-tested benefits are removed from disposable income - followed by United Kingdom (0.065). The other countries where means-tested benefits have a large effect on the Gini are Netherlands, Denmark and Finland (between 0.04 and 0.05 percentage points). On the other hand, the countries where means-tested benefits have the smallest inequality reducing effect are Hungary, Estonia, Lithuania and Latvia. In these countries, the increase in the Gini index is no more than 0.01 percentage point 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 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 0.04 percentage points). On the other hand, in countries such as Poland, Malta, Italy, Greece, Croatia, Bulgaria and Cyprus, non-means tested have the smallest anti-inequality effect just below 0.01 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 0.06 percentage points when direct taxes are added back to disposable income. These countries are characterized by progressive tax systems, which could explain the equalising effect of direct taxes on the income distribution. On the contrary, in Bulgaria and Hungary direct taxes do not substantially affect inequality, 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 0.02 percentage points) inequality reducing effect, while they have a negligible effect in the majority of other countries.

Looking at changes between 2016 and 2019, the effects of taxes and benefits instruments in reducing income inequality seem to have remained largely stable over time. The exceptions to note would be Romania and Lithuania where changes to SIC policies in 2018 and 2019 respectively had large inequality reducing effects.

Table 4. Effects of tax-benefit components on Gini coefficient: 2016-2019

	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	2016	0.222	0.246	0.246	0.293	0.247	0.501	0.343
	2017	0.221	0.246	0.246	0.293	0.247	0.501	0.342
	2018	0.221	0.246	0.246	0.292	0.246	0.501	0.342
	2019	0.222	0.247	0.245	0.293	0.247	0.501	0.343
Bulgaria	2016	0.386	0.405	0.393	0.394	0.395	0.539	0.426
	2017	0.390	0.409	0.398	0.398	0.399	0.538	0.429
	2018	0.393	0.412	0.400	0.401	0.401	0.540	0.432
	2019	0.396	0.414	0.403	0.405	0.405	0.540	0.435
Czechia	2016	0.236	0.251	0.247	0.265	0.252	0.451	0.302
	2017	0.240	0.253	0.251	0.270	0.255	0.450	0.304
	2018	0.243	0.256	0.253	0.273	0.258	0.450	0.306
	2019	0.244	0.256	0.254	0.275	0.258	0.450	0.305
Denmark	2016	0.242	0.289	0.288	0.295	0.243	0.452	0.357
	2017	0.244	0.289	0.290	0.297	0.245	0.452	0.358
	2018	0.245	0.289	0.291	0.297	0.247	0.452	0.358
	2019	0.244	0.288	0.289	0.294	0.245	0.452	0.356
Germany	2016	0.271	0.295	0.291	0.329	0.286	0.500	0.364
	2017	0.271	0.295	0.291	0.329	0.286	0.499	0.364
	2018	0.271	0.294	0.291	0.329	0.285	0.499	0.363
	2019	0.272	0.294	0.291	0.329	0.286	0.499	0.363
Estonia	2016	0.302	0.309	0.324	0.327	0.305	0.460	0.354
	2017	0.305	0.312	0.327	0.328	0.308	0.460	0.354
	2018	0.295	0.300	0.319	0.327	0.298	0.460	0.354
	2019	0.294	0.299	0.318	0.326	0.297	0.460	0.353
Ireland	2016	0.296	0.373	0.315	0.374	0.316	0.545	0.471
	2017	0.296	0.373	0.316	0.375	0.316	0.545	0.471
	2018	0.298	0.375	0.317	0.377	0.318	0.545	0.472
	2019	0.300	0.376	0.318	0.379	0.319	0.545	0.473
Greece	2016	0.319	0.342	0.324	0.347	0.323	0.548	0.370
	2017	0.303	0.337	0.308	0.332	0.316	0.547	0.371
	2018	0.301	0.338	0.306	0.331	0.315	0.548	0.372
	2019	0.304	0.334	0.309	0.334	0.315	0.548	0.368
Spain	2016	0.333	0.366	0.343	0.378	0.331	0.521	0.412
	2017	0.333	0.365	0.343	0.377	0.330	0.521	0.412
	2018	0.332	0.365	0.343	0.377	0.330	0.522	0.412
	2019	0.330	0.365	0.340	0.376	0.328	0.522	0.412
France	2016	0.272	0.309	0.297	0.313	0.284	0.492	0.370
	2017	0.271	0.308	0.295	0.313	0.284	0.492	0.370
	2018	0.274	0.311	0.298	0.314	0.285	0.492	0.370
	2019	0.277	0.314	0.300	0.317	0.286	0.492	0.371
Italy	2016	0.318	0.333	0.326	0.368	0.325	0.519	0.390
	2017	0.317	0.332	0.325	0.368	0.325	0.518	0.390
	2018	0.318	0.334	0.326	0.367	0.326	0.517	0.390
	2019	0.311	0.334	0.319	0.362	0.320	0.517	0.390

	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	2016	0.308	0.345	0.310	0.338	0.309	0.463	0.375
	2017	0.310	0.346	0.312	0.339	0.311	0.463	0.375
	2018	0.311	0.345	0.312	0.340	0.312	0.462	0.374
	2019	0.311	0.348	0.312	0.338	0.312	0.462	0.374
Latvia	2016	0.337	0.340	0.352	0.364	0.347	0.482	0.388
	2017	0.340	0.344	0.355	0.367	0.351	0.482	0.391
	2018	0.341	0.344	0.356	0.369	0.352	0.482	0.394
	2019	0.340	0.343	0.355	0.368	0.352	0.481	0.393
Lithuania	2016	0.361	0.371	0.374	0.383	0.372	0.521	0.411
	2017	0.361	0.371	0.374	0.385	0.373	0.521	0.412
	2018	0.351	0.363	0.372	0.373	0.363	0.521	0.410
	2019	0.345	0.355	0.369	0.376	0.372	0.517	0.420
Luxembourg	2016	0.252	0.283	0.286	0.317	0.258	0.491	0.368
	2017	0.253	0.283	0.285	0.318	0.258	0.491	0.368
	2018	0.252	0.283	0.284	0.318	0.258	0.491	0.368
	2019	0.254	0.283	0.285	0.320	0.260	0.491	0.368
Hungary	2016	0.307	0.316	0.335	0.301	0.314	0.488	0.343
	2017	0.307	0.315	0.332	0.305	0.316	0.487	0.346
	2018	0.309	0.316	0.332	0.311	0.321	0.486	0.350
	2019	0.312	0.318	0.333	0.316	0.326	0.486	0.354
Croatia	2016	0.287	0.305	0.296	0.320	0.310	0.492	0.360
	2017	0.293	0.310	0.302	0.323	0.315	0.492	0.362
	2018	0.293	0.309	0.303	0.324	0.315	0.492	0.363
	2019	0.293	0.309	0.303	0.324	0.316	0.492	0.364
Malta	2016	0.286	0.316	0.291	0.321	0.289	0.449	0.351
	2017	0.287	0.316	0.292	0.322	0.289	0.449	0.352
	2018	0.289	0.317	0.294	0.324	0.291	0.449	0.354
	2019	0.290	0.318	0.295	0.326	0.292	0.449	0.355
Netherlands	2016	0.255	0.305	0.290	0.315	0.270	0.419	0.369
	2017	0.253	0.304	0.287	0.313	0.267	0.420	0.369
	2018	0.253	0.305	0.288	0.314	0.267	0.420	0.369
	2019	0.253	0.305	0.287	0.312	0.268	0.421	0.369
Austria	2016	0.258	0.290	0.288	0.318	0.272	0.504	0.374
	2017	0.258	0.290	0.288	0.318	0.272	0.504	0.374
	2018	0.258	0.290	0.289	0.319	0.273	0.504	0.374
	2019	0.255	0.287	0.284	0.319	0.271	0.505	0.375
Poland	2016	0.279	0.313	0.286	0.294	0.283	0.473	0.333
	2017	0.278	0.312	0.286	0.295	0.282	0.473	0.334
	2018	0.286	0.317	0.294	0.304	0.291	0.475	0.340
	2019	0.286	0.315	0.299	0.304	0.292	0.475	0.344
Portugal	2016	0.324	0.344	0.335	0.385	0.334	0.540	0.415
	2017	0.326	0.346	0.336	0.384	0.335	0.540	0.415
	2018	0.327	0.347	0.338	0.384	0.337	0.540	0.415
	2019	0.326	0.347	0.337	0.384	0.336	0.540	0.415
Romania	2016	0.313	0.338	0.329	0.332	0.332	0.524	0.382
	2017	0.322	0.345	0.335	0.339	0.340	0.525	0.388

	2018	0.333	0.354	0.346	0.344	0.375	0.532	0.408
	2019	0.335	0.353	0.354	0.346	0.378	0.535	0.414
Slovenia	2016	0.238	0.264	0.263	0.273	0.262	0.458	0.326
	2017	0.241	0.267	0.266	0.274	0.265	0.458	0.327
	2018	0.232	0.267	0.256	0.266	0.258	0.458	0.327
	2019	0.233	0.267	0.257	0.267	0.258	0.458	0.327
Slovakia	2016	0.218	0.236	0.235	0.237	0.233	0.404	0.279
	2017	0.221	0.238	0.238	0.241	0.236	0.404	0.281
	2018	0.224	0.240	0.241	0.244	0.239	0.404	0.282
	2019	0.225	0.242	0.241	0.246	0.241	0.404	0.285
Finland	2016	0.231	0.273	0.279	0.283	0.245	0.501	0.361
	2017	0.233	0.275	0.280	0.283	0.249	0.501	0.362
	2018	0.235	0.276	0.281	0.283	0.252	0.501	0.362
	2019	0.237	0.277	0.282	0.285	0.254	0.501	0.363
Sweden	2016	0.267	0.287	0.320	0.308	0.270	0.479	0.364
	2017	0.266	0.286	0.320	0.308	0.270	0.478	0.363
	2018	0.265	0.285	0.319	0.308	0.268	0.480	0.364
	2019	0.267	0.287	0.321	0.309	0.270	0.480	0.365
United Kingdom	2016	0.308	0.376	0.338	0.356	0.323	0.499	0.455
	2017	0.299	0.362	0.330	0.343	0.316	0.486	0.440
	2018	0.304	0.364	0.334	0.348	0.320	0.486	0.441
	2019	0.307	0.366	0.338	0.350	0.324	0.487	0.442

Source: EUROMOD version I2.0+

Note: EUROMOD figures for 2016-2019 for all countries, except for the UK, are based on SILC 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

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, Slovenia 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 the very highest income inequality are Malta, Belgium and Finland – 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: 2016-2019

	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	2016	0.043	0.088	0.168	0.223	0.364	0.976	0.097	0.189	0.675
	2017	0.043	0.088	0.166	0.223	0.364	0.974	0.097	0.189	0.666
	2018	0.043	0.088	0.168	0.223	0.364	0.974	0.096	0.188	0.669
	2019	0.043	0.088	0.169	0.224	0.365	0.976	0.097	0.189	0.676
Bulgaria	2016	0.127	0.291	0.319	0.202	0.426	0.629	0.153	0.337	0.458
	2017	0.130	0.298	0.327	0.200	0.424	0.621	0.155	0.341	0.460
	2018	0.132	0.302	0.328	0.204	0.429	0.643	0.157	0.346	0.464
	2019	0.134	0.307	0.334	0.204	0.429	0.646	0.159	0.350	0.465
Czechia	2016	0.047	0.103	0.130	0.120	0.225	0.666	0.076	0.160	0.264
	2017	0.049	0.105	0.133	0.120	0.225	0.671	0.077	0.162	0.268
	2018	0.050	0.107	0.137	0.120	0.224	0.677	0.078	0.163	0.272
	2019	0.050	0.108	0.141	0.120	0.224	0.682	0.078	0.162	0.274
Denmark	2016	0.056	0.131	0.154	0.195	0.390	0.912	0.123	0.267	0.732
	2017	0.057	0.134	0.156	0.195	0.393	0.910	0.124	0.269	0.726
	2018	0.057	0.134	0.158	0.195	0.393	0.910	0.124	0.269	0.726
	2019	0.056	0.132	0.156	0.195	0.391	0.914	0.123	0.266	0.734
Germany	2016	0.061	0.129	0.182	0.226	0.391	0.938	0.109	0.219	0.630
	2017	0.061	0.128	0.182	0.226	0.391	0.939	0.109	0.218	0.632
	2018	0.061	0.128	0.187	0.226	0.390	0.939	0.108	0.217	0.630
	2019	0.062	0.129	0.188	0.226	0.389	0.940	0.108	0.216	0.632
Estonia	2016	0.071	0.145	0.209	0.128	0.234	0.862	0.099	0.196	0.349
	2017	0.073	0.147	0.208	0.128	0.234	0.870	0.100	0.197	0.350
	2018	0.069	0.138	0.202	0.128	0.234	0.871	0.100	0.196	0.350
	2019	0.068	0.137	0.200	0.128	0.234	0.875	0.099	0.195	0.348
Ireland	2016	0.071	0.151	0.205	0.187	0.377	0.711	0.155	0.325	0.516
	2017	0.071	0.151	0.206	0.187	0.377	0.709	0.155	0.325	0.516
	2018	0.072	0.154	0.207	0.187	0.379	0.707	0.156	0.329	0.517
	2019	0.073	0.156	0.209	0.187	0.379	0.709	0.156	0.330	0.517
Greece	2016	0.087	0.190	0.256	0.165	0.365	0.495	0.114	0.257	0.324
	2017	0.078	0.174	0.217	0.165	0.365	0.501	0.115	0.258	0.325
	2018	0.078	0.173	0.215	0.164	0.364	0.520	0.115	0.259	0.325
	2019	0.079	0.175	0.217	0.165	0.365	0.520	0.113	0.254	0.322
Spain	2016	0.094	0.187	0.369	0.214	0.402	0.823	0.138	0.275	0.505
	2017	0.094	0.186	0.378	0.214	0.403	0.829	0.138	0.274	0.508
	2018	0.093	0.185	0.328	0.215	0.403	0.837	0.137	0.274	0.510
	2019	0.092	0.183	0.324	0.216	0.404	0.848	0.137	0.273	0.515
France	2016	0.065	0.148	0.171	0.223	0.434	0.880	0.120	0.264	0.509
	2017	0.064	0.147	0.170	0.223	0.434	0.881	0.120	0.265	0.509

	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)
Italy	2018	0.066	0.153	0.173	0.224	0.434	0.882	0.121	0.265	0.510
	2019	0.067	0.154	0.176	0.224	0.434	0.883	0.121	0.265	0.511
	2016	0.085	0.176	0.307	0.208	0.395	0.852	0.125	0.261	0.471
	2017	0.085	0.176	0.301	0.206	0.394	0.835	0.125	0.261	0.460
	2018	0.087	0.181	0.284	0.202	0.390	0.796	0.125	0.261	0.441
Cyprus	2019	0.081	0.172	0.250	0.202	0.390	0.797	0.125	0.261	0.442
	2016	0.079	0.178	0.197	0.145	0.298	0.522	0.113	0.249	0.310
	2017	0.080	0.180	0.200	0.146	0.299	0.547	0.113	0.249	0.310
	2018	0.080	0.181	0.201	0.145	0.298	0.528	0.113	0.249	0.309
	2019	0.080	0.181	0.200	0.145	0.298	0.528	0.113	0.249	0.309
Latvia	2016	0.092	0.189	0.276	0.158	0.294	0.913	0.120	0.244	0.586
	2017	0.094	0.192	0.282	0.158	0.294	0.917	0.123	0.248	0.594
	2018	0.094	0.192	0.285	0.158	0.294	0.922	0.124	0.251	0.603
	2019	0.094	0.192	0.286	0.158	0.294	0.923	0.124	0.250	0.607
	2016	0.105	0.225	0.296	0.164	0.329	0.629	0.134	0.281	0.429
Lithuania	2017	0.106	0.226	0.303	0.164	0.329	0.630	0.134	0.282	0.430
	2018	0.099	0.213	0.274	0.164	0.328	0.633	0.133	0.279	0.428
	2019	0.096	0.205	0.267	0.163	0.321	0.646	0.139	0.290	0.442
	2016	0.053	0.114	0.141	0.194	0.359	0.926	0.114	0.236	0.613
	2017	0.053	0.114	0.142	0.194	0.358	0.928	0.114	0.235	0.616
Luxembourg	2018	0.052	0.113	0.141	0.194	0.358	0.927	0.114	0.236	0.614
	2019	0.053	0.115	0.144	0.194	0.358	0.927	0.114	0.235	0.614
	2016	0.081	0.165	0.290	0.161	0.292	0.739	0.097	0.193	0.391
	2017	0.081	0.164	0.284	0.161	0.290	0.750	0.099	0.195	0.396
	2018	0.082	0.166	0.301	0.161	0.288	0.754	0.101	0.199	0.403
Hungary	2019	0.084	0.169	0.296	0.161	0.287	0.759	0.103	0.202	0.409
	2016	0.068	0.137	0.205	0.136	0.265	0.525	0.106	0.215	0.360
	2017	0.071	0.143	0.212	0.136	0.265	0.524	0.107	0.217	0.361
	2018	0.071	0.144	0.213	0.136	0.265	0.524	0.107	0.218	0.363
	2019	0.071	0.145	0.215	0.136	0.265	0.524	0.108	0.219	0.364
Croatia	2016	0.065	0.136	0.179	0.210	0.358	0.950	0.108	0.210	0.752
	2017	0.065	0.137	0.180	0.209	0.358	0.949	0.108	0.211	0.751
	2018	0.066	0.138	0.182	0.209	0.357	0.947	0.109	0.212	0.742
	2019	0.067	0.139	0.183	0.209	0.357	0.948	0.109	0.213	0.744
	2016	0.056	0.118	0.166	0.154	0.295	0.744	0.118	0.232	0.657
Malta	2017	0.054	0.115	0.166	0.154	0.296	0.764	0.118	0.232	0.689
	2018	0.055	0.115	0.163	0.155	0.296	0.764	0.118	0.232	0.689
	2019	0.054	0.115	0.163	0.155	0.297	0.752	0.118	0.232	0.669
	2016	0.056	0.123	0.146	0.209	0.384	0.923	0.116	0.243	0.515
	2017	0.056	0.123	0.146	0.209	0.384	0.924	0.116	0.243	0.515
Netherlands	2018	0.056	0.124	0.146	0.209	0.384	0.925	0.116	0.243	0.517
	2019	0.055	0.121	0.144	0.209	0.385	0.926	0.117	0.245	0.518
	2016	0.065	0.136	0.200	0.132	0.264	0.453	0.092	0.191	0.285
	2017	0.065	0.135	0.201	0.132	0.265	0.453	0.092	0.191	0.285
	2018	0.068	0.142	0.208	0.133	0.267	0.460	0.096	0.199	0.294
Poland	2019	0.068	0.142	0.208	0.134	0.268	0.464	0.098	0.202	0.299
	2016	0.086	0.185	0.228	0.173	0.359	0.583	0.135	0.297	0.359
	2017	0.086	0.185	0.228	0.173	0.359	0.583	0.135	0.297	0.359
Portugal	2018	0.086	0.185	0.228	0.173	0.359	0.583	0.135	0.297	0.359
	2019	0.086	0.185	0.228	0.173	0.359	0.583	0.135	0.297	0.359
	2016	0.086	0.185	0.228	0.173	0.359	0.583	0.135	0.297	0.359

	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)
Romania	2017	0.087	0.187	0.229	0.173	0.359	0.592	0.135	0.297	0.378
	2018	0.088	0.189	0.231	0.173	0.359	0.585	0.135	0.297	0.369
	2019	0.087	0.188	0.231	0.173	0.359	0.584	0.135	0.296	0.366
	2016	0.080	0.160	0.245	0.151	0.284	0.536	0.121	0.232	0.425
	2017	0.085	0.169	0.259	0.152	0.286	0.541	0.124	0.238	0.432
Slovenia	2018	0.092	0.182	0.286	0.161	0.300	0.582	0.138	0.264	0.473
	2019	0.092	0.183	0.288	0.166	0.306	0.601	0.142	0.272	0.490
	2016	0.046	0.094	0.137	0.164	0.287	0.809	0.086	0.172	0.288
	2017	0.048	0.097	0.140	0.164	0.287	0.809	0.086	0.173	0.289
	2018	0.043	0.089	0.121	0.164	0.287	0.809	0.086	0.173	0.289
Slovakia	2019	0.043	0.089	0.121	0.164	0.287	0.809	0.086	0.173	0.289
	2016	0.040	0.079	0.120	0.100	0.180	0.606	0.059	0.117	0.208
	2017	0.041	0.082	0.124	0.101	0.180	0.657	0.060	0.118	0.212
	2018	0.042	0.084	0.128	0.101	0.180	0.690	0.060	0.120	0.217
	2019	0.042	0.085	0.130	0.101	0.180	0.713	0.061	0.122	0.221
Finland	2016	0.045	0.098	0.120	0.228	0.397	0.958	0.113	0.223	0.723
	2017	0.046	0.100	0.122	0.228	0.399	0.957	0.114	0.224	0.720
	2018	0.046	0.101	0.123	0.228	0.398	0.957	0.114	0.224	0.720
	2019	0.047	0.102	0.125	0.228	0.398	0.958	0.114	0.224	0.722
	2016	0.068	0.168	0.192	0.212	0.423	0.928	0.122	0.273	0.722
Sweden	2017	0.068	0.167	0.192	0.212	0.422	0.929	0.121	0.271	0.723
	2018	0.068	0.168	0.190	0.213	0.428	0.927	0.122	0.276	0.719
	2019	0.069	0.172	0.193	0.214	0.431	0.926	0.123	0.279	0.720
	2016	0.080	0.174	0.239	0.187	0.383	0.888	0.155	0.328	0.812
	2017	0.074	0.155	0.225	0.176	0.345	0.855	0.143	0.292	0.692
United Kingdom	2018	0.076	0.160	0.234	0.176	0.346	0.824	0.144	0.295	0.652
	2019	0.078	0.163	0.238	0.176	0.347	0.817	0.145	0.296	0.651

Source: EUROMOD version I2.0+

Note: EUROMOD figures for 2016-2019 for all countries, except for the UK, are based on SILC 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

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 2016 policies and incomes are compared to Eurostat figures based on EU-SILC 2017. Given that EUROMOD uses SILC as its input data, one would expect the estimates for the base year 2016 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 2017 (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 2016/2017. Although from the 2012-18 data the FRS was 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 24 out of 28 countries in the base year 2016. In comparison with Eurostat figures, poverty rates are underestimated most in Luxembourg (7.5 percentage points), and to a lesser extent in Belgium (-4.8) and United Kingdom (-2.2). In Hungary, on the contrary, poverty rates are overestimated by 7.6 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 (9 percentage point difference), Belgium (-5.2), Poland (-4.4) and Italy (-4.1), and being overestimated in Hungary by 10 percentage points. As far as elderly poverty is concerned, instead, EUROMOD underestimates Eurostat poverty rates by between 7 and 8 percentage points in Belgium, Ireland and Luxembourg and around 4 percentage points in Greece. For Malta and Hungary, EUROMOD overestimates elderly poverty by a little over 8 percentage points in each case.

The difference with Eurostat in the estimation of the Gini coefficient seem much less sizeable: the underestimation exceeds 5 percentage points 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 over-simulation 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 2016 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 2016.

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 (2016 incomes and policies) vs. Eurostat EU-SILC estimates

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold €/year	Gini
		50%	60%	70%	age <18	age ≥65		
Belgium	EUROMOD	6.0	11.1	20.7	13.3	8.5	13,066	0.222
	Eurostat	8.3	15.9	25.4	18.4	15.8	13,640	0.261
Bulgaria	EUROMOD	16.2	23.0	30.0	27.7	33.1	2,194	0.386
	Eurostat	16.0	23.4	30.1	29.2	32.0	2,154	0.402
Czech Republic	EUROMOD	4.2	8.6	16.6	10.8	8.2	4,877	0.236
	Eurostat	4.5	9.1	16.9	11.6	10.7	4,969	0.245
Denmark	EUROMOD	5.1	11.1	19.2	9.3	6.6	17,452	0.242
	Eurostat	7.2	12.4	20.5	10.0	8.8	17,630	0.276
Germany	EUROMOD	8.0	14.8	22.6	13.8	16.1	13,011	0.271
	Eurostat	9.4	16.1	23.7	15.2	17.0	13,152	0.291
Estonia	EUROMOD	11.4	20.4	28.3	16.2	40.0	5,558	0.302
	Eurostat	13.0	21.0	28.9	16.5	41.2	5,631	0.316
Ireland	EUROMOD	6.7	14.5	24.4	17.9	7.1	12,687	0.296
	Eurostat	8.2	15.6	24.6	17.0	14.8	13,727	0.306
Greece	EUROMOD	13.7	19.3	26.5	25.0	8.2	4,875	0.319
	Eurostat	14.5	20.2	26.5	24.5	12.4	4,560	0.334
Spain	EUROMOD	15.5	21.5	28.8	28.2	13.3	8,462	0.333
	Eurostat	15.7	21.6	29.2	28.3	14.8	8,522	0.341
France	EUROMOD	6.2	12.4	21.0	17.7	7.3	13,049	0.272
	Eurostat	6.6	13.2	20.8	19.0	7.9	13,176	0.288
Italy	EUROMOD	12.1	18.7	26.8	22.3	15.3	9,832	0.318
	Eurostat	13.4	20.3	27.7	26.4	15.6	9,925	0.327
Cyprus	EUROMOD	5.9	15.5	25.9	17.9	20.8	8,952	0.308
	Eurostat	7.1	15.7	24.8	16.5	21.6	8,698	0.308
Latvia	EUROMOD	14.9	22.4	30.0	19.2	37.7	3,786	0.337
	Eurostat	15.4	22.1	30.1	18.4	39.9	3,964	0.345
Lithuania	EUROMOD	15.9	21.7	29.7	23.5	31.5	3,606	0.361
	Eurostat	16.1	22.9	30.8	25.7	33.4	3,681	0.376
Luxembourg	EUROMOD	2.4	11.2	22.9	13.8	4.5	20,663	0.252
	Eurostat	11.0	18.7	26.3	22.8	11.8	21,645	0.309
Hungary	EUROMOD	14.1	21.0	26.8	24.8	17.6	2,756	0.307
	Eurostat	6.7	13.4	22.1	14.8	9.1	2,993	0.281
Croatia	EUROMOD	12.7	19.2	26.1	19.2	28.8	3,740	0.287
	Eurostat	13.4	20.0	27.4	21.4	28.6	3,726	0.299
Malta	EUROMOD	9.3	18.4	26.3	20.6	33.0	8,706	0.286
	Eurostat	8.6	16.7	24.4	21.2	24.9	8,713	0.282
Netherlands	EUROMOD	5.5	11.4	19.9	14.1	4.6	13,897	0.255
	Eurostat	6.9	13.2	21.5	14.4	10.0	14,137	0.271
Austria	EUROMOD	5.9	13.1	21.6	15.5	11.6	14,552	0.258
	Eurostat	8.8	14.4	21.8	19.1	12.9	14,851	0.279
Poland	EUROMOD	8.5	13.9	20.9	9.6	13.8	3,669	0.279
	Eurostat	9.5	15.0	22.4	14.0	13.8	3,567	0.292
Portugal	EUROMOD	11.5	17.6	25.4	19.2	16.5	5,615	0.324
	Eurostat	12.3	18.3	25.4	20.7	17.0	5,443	0.335
Romania	EUROMOD	16.3	22.3	29.2	29.7	20.0	1,687	0.313
	Eurostat	17.6	23.6	29.8	32.2	20.0	1,645	0.331
Slovenia	EUROMOD	7.0	13.8	21.4	12.6	15.3	7,372	0.238
	Eurostat	7.6	13.3	20.8	12.8	16.4	7,628	0.237
Slovakia	EUROMOD	7.5	11.8	17.7	19.9	5.0	4,269	0.218

	Policy year	Poverty risk			Poverty risk (60%)		Poverty threshold €/year	Gini
		50%	60%	70%	age <18	age ≥65		
	Eurostat	7.8	12.4	18.3	19.9	6.9	4,310	0.232
Finland	EUROMOD	2.6	9.5	17.9	8.0	9.7	14,209	0.231
	Eurostat	4.9	11.5	20.0	10.2	12.3	14,392	0.253
Sweden	EUROMOD	7.8	15.0	24.2	18.3	11.0	15,219	0.267
	Eurostat	9.3	15.8	24.6	18.6	15.8	15,225	0.280
United Kingdom	EUROMOD	8.2	14.8	24.3	17.8	17.0	12,741	0.308
	Eurostat	9.7	17.0	25.8	21.3	16.9	12,597	0.331

Source: EUROMOD version I2.0+

Note: EUROMOD figures for all countries, except for the UK, are based on SILC 2017 (2016 incomes). For the UK, results are based on FRS 2016/17 (2016 incomes).

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 2017 data for 4 policy years (from 2016 to 2019) 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, Romania 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.

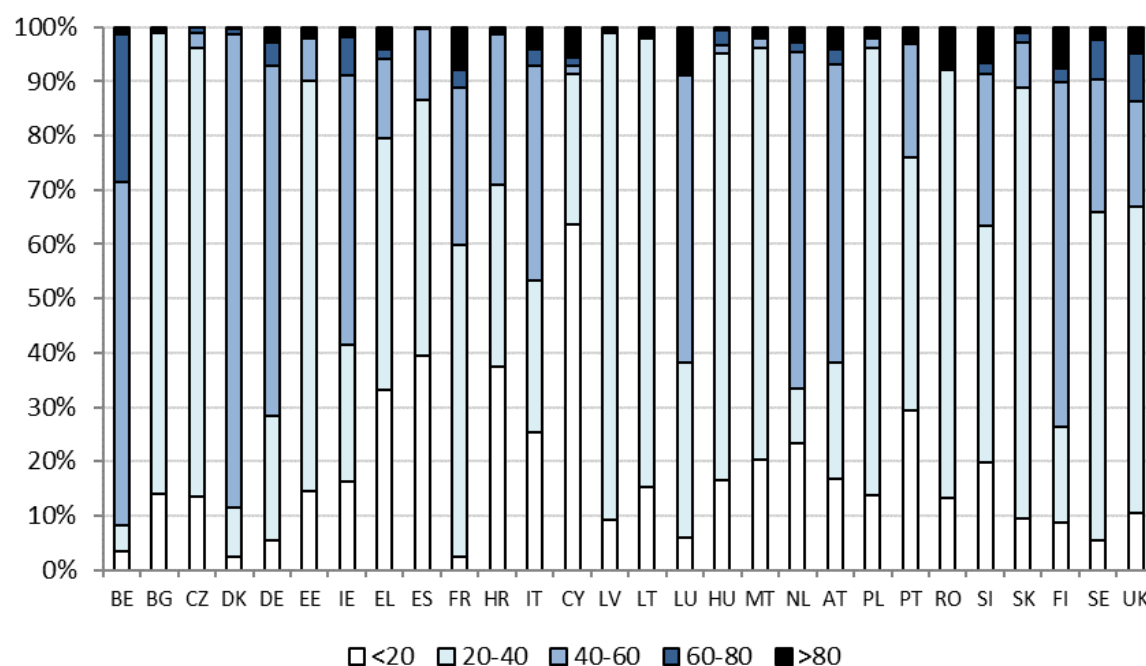
Table 7 shows that Belgium exhibits by far the highest mean METR (56%), followed by Denmark, Luxembourg, Germany and Finland, where METRs range between 44% and 46%. The lowest mean METRs are observed in Malta, Cyprus, Estonia and Bulgaria (below 25%). The ranking of countries remains largely the same 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 2016 and 2019 (26 percentage points), followed by Lithuania (+14) and Romania (+11). 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. For Lithuania and Romania, increases are generated by reforms to SICs. For Lithuania, a recalculation of SICs in

2019, which resulted in recalculation of all the gross wages in Lithuania, cause this jump. These reforms resulted in substantially higher gross original income; nevertheless, the change was absorbed by the changes in PIT and SIC. For Romania, the large increase in METRs generated by SICs is due to a reform in 2018 that transferred all SICs paid by the employer onto the employee (the total SIC payable by employer and employee has not increased and even fallen in some cases). The same reform lowered the personal income tax rate from 16% to 10% which is behind the large fall in METRs coming from taxes. When looking at median METRs, aside from the three countries just listed, none had large changes.

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 2016 policy system.

In a few countries, an important share of the working population show low METRs (below 20%). This is the case in Cyprus (64%), Spain (39%), Croatia (38%) and Greece (33%). 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%), Germany (64%), Belgium (63%), Finland (63%), Netherlands (62%) and Austria (55%). 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 Ireland). 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 France.

Figure 3. Marginal effective tax rates 2016: share of population in paid work (%) by range of METR



Source: EUROMOD version I2.0+

Note: EUROMOD figures for all countries, except for the UK, are based on SILC 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

Table 7. Mean and median Marginal effective tax rates: 2016-2019

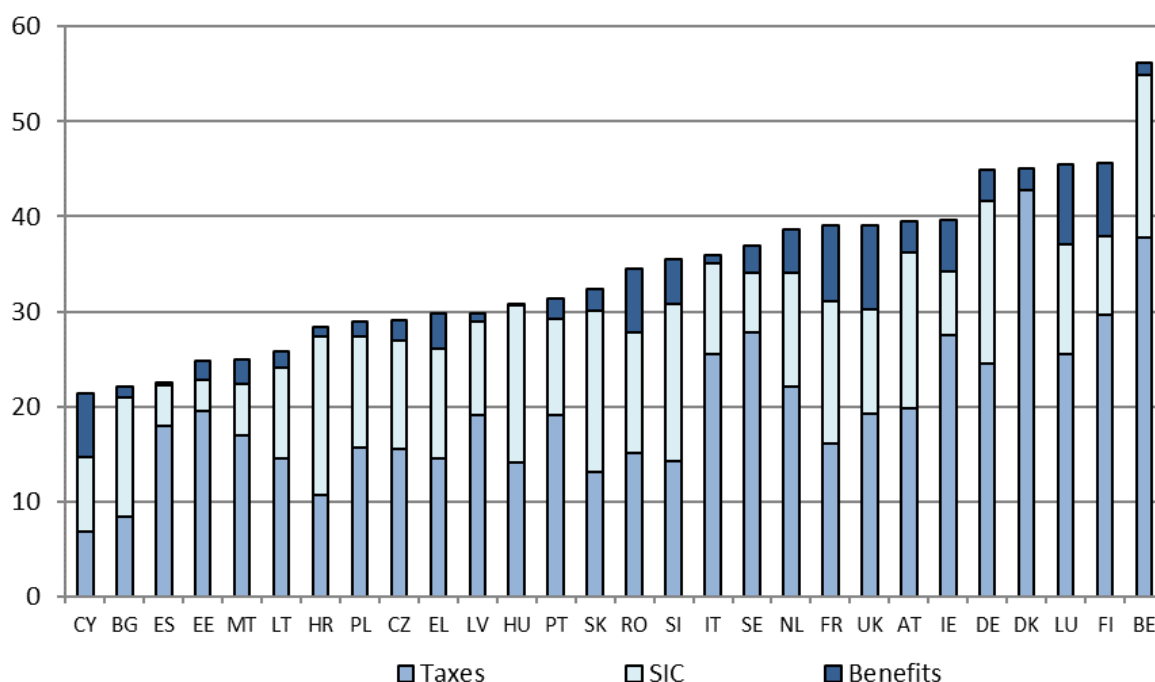
		2016	2017	2018	2019
Belgium	Mean	56.12	56.05	55.64	55.51
	Median	56.62	56.51	56.41	56.32
Bulgaria	Mean	22.11	22.32	22.92	23.00
	Median	21.61	22.01	22.40	22.40
Czechia	Mean	29.08	29.02	28.99	28.94
	Median	31.10	31.10	31.10	31.10
Denmark	Mean	45.23	44.77	44.47	44.48
	Median	42.83	42.02	42.07	42.10
Germany	Mean	44.72	43.81	43.67	43.36
	Median	44.45	44.45	44.45	44.31
Estonia	Mean	24.79	23.28	23.94	24.50
	Median	22.88	22.88	22.88	22.88
Ireland	Mean	40.18	39.72	39.83	39.83
	Median	49.50	49.00	48.75	48.50
Greece	Mean	31.66	52.05	55.93	57.58
	Median	25.76	36.05	36.33	36.33
Spain	Mean	22.45	22.31	22.38	22.30
	Median	28.73	28.59	28.67	28.83
France	Mean	37.62	39.43	39.65	41.10
	Median	36.39	33.29	35.80	37.41
Italy	Mean	35.91	36.42	37.12	38.76
	Median	39.39	39.62	40.77	41.09
Cyprus	Mean	21.37	20.81	20.73	22.31
	Median	9.18	8.95	8.95	10.66
Latvia	Mean	29.85	30.30	30.04	29.93
	Median	31.09	31.09	28.80	31.80
Lithuania	Mean	25.83	25.69	26.58	40.26
	Median	29.10	29.85	31.08	44.30
Luxembourg	Mean	45.47	44.35	44.62	44.56
	Median	44.88	43.92	43.92	44.38
Hungary	Mean	30.82	31.72	31.79	31.84
	Median	33.50	34.50	34.50	34.50
Croatia	Mean	28.42	27.19	27.77	28.32
	Median	30.18	20.00	20.00	26.88
Malta	Mean	24.87	25.30	25.82	26.56
	Median	25.00	25.00	25.00	25.00
Netherlands	Mean	39.20	39.26	39.22	38.73
	Median	46.09	48.32	48.41	48.89
Austria	Mean	39.52	41.23	39.92	39.58
	Median	43.25	43.25	43.25	43.25
Poland	Mean	28.94	29.20	29.04	29.20
	Median	30.32	30.32	30.32	30.32
Portugal	Mean	31.32	31.85	30.42	32.39
	Median	35.06	37.88	34.00	34.00
Romania	Mean	34.44	34.42	44.98	45.01
	Median	29.86	32.03	44.59	44.59
Slovenia	Mean	35.48	35.18	40.11	40.10
	Median	34.76	36.23	39.94	39.98
Slovakia	Mean	32.33	32.49	32.39	32.26
	Median	29.85	29.85	29.85	29.85
Finland	Mean	45.60	45.15	45.44	45.24
	Median	45.77	45.66	45.80	45.90
Sweden	Mean	36.96	37.07	36.39	35.32
	Median	30.37	31.82	31.53	31.27
United Kingdom	Mean	39.11	38.74	38.37	38.01
	Median	34.40	34.36	34.29	34.07

Source: EUROMOD version I2.0+

Note: EUROMOD figures for all countries, except for the UK, are based on SILC 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

Figure 4 presents the decomposition by components of average METR for each country in the base year 2016. 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 2016-2019 are reported in Table 8.

Figure 4. Marginal effective tax rates (%) by income component, 2016



Source: EUROMOD version I2.0+

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 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

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 27%), while taxes seem to offer less disincentive to work at the margin in Cyprus, Bulgaria and Croatia, 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 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, Finland 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: 2016-2019

	Policy year	Taxes	SIC	Benefits	Total (mean)
Belgium	2016	37.725	17.230	1.161	56.116
	2017	37.716	17.183	1.153	56.053
	2018	37.595	16.935	1.110	55.639
	2019	37.501	16.845	1.166	55.512
Bulgaria	2016	8.387	12.546	1.179	22.112
	2017	8.361	12.844	1.112	22.316
	2018	8.332	13.166	1.423	22.921
	2019	8.324	13.261	1.414	22.998
Czechia	2016	15.519	11.352	2.204	29.075
	2017	15.748	11.298	1.970	29.016
	2018	16.035	11.189	1.769	28.993
	2019	16.335	11.000	1.607	28.942
Denmark	2016	42.820	0.000	2.239	45.228
	2017	42.722	0.000	1.883	44.774
	2018	42.526	0.000	1.777	44.473
	2019	42.285	0.000	2.062	44.484
Germany	2016	24.462	17.174	3.280	44.721
	2017	24.362	15.822	3.630	43.812
	2018	24.480	15.800	3.386	43.665
	2019	24.509	15.481	3.377	43.362
Estonia	2016	19.477	3.373	1.942	24.792
	2017	18.247	3.374	1.653	23.275
	2018	19.104	3.229	1.603	23.936
	2019	19.693	3.231	1.579	24.503
Ireland	2016	27.459	6.748	5.447	40.178
	2017	27.332	6.713	5.208	39.721
	2018	27.486	6.797	5.088	39.829
	2019	27.834	6.739	4.803	39.827
Greece	2016	14.542	11.504	3.689	31.664
	2017	13.053	16.354	18.794	52.050
	2018	13.505	15.912	22.724	55.930
	2019	13.692	15.379	24.524	57.583
Spain	2016	17.891	4.283	0.280	22.454
	2017	17.868	4.197	0.249	22.314
	2018	17.987	4.143	0.252	22.383
	2019	18.288	3.790	0.225	22.302
France	2016	16.113	14.891	8.016	39.021
	2017	16.381	14.902	7.810	39.095
	2018	18.414	12.739	7.926	39.081
	2019	18.415	11.254	8.014	37.684

	Policyyear	Taxes	SIC	Benefits	Total (mean)
Italy	2016	25.545	9.521	0.840	35.905
	2017	25.844	9.621	0.863	36.421
	2018	26.091	9.701	1.248	37.123
	2019	26.198	9.699	2.779	38.759
Cyprus	2016	6.842	7.856	6.670	21.368
	2017	6.452	7.848	6.512	20.812
	2018	6.683	7.814	6.236	20.733
	2019	5.794	10.126	6.390	22.311
Latvia	2016	19.020	9.901	0.925	29.846
	2017	19.447	9.911	0.940	30.297
	2018	18.549	10.614	0.875	30.038
	2019	18.516	10.638	0.777	29.931
Lithuania	2016	14.535	9.567	1.729	25.831
	2017	14.622	9.562	1.510	25.694
	2018	14.948	9.477	2.153	26.579
	2019	17.903	20.983	1.378	40.264
Luxembourg	2016	25.476	11.546	8.507	45.471
	2017	24.292	11.554	8.565	44.352
	2018	24.264	11.554	8.857	44.616
	2019	24.904	11.580	8.131	44.561
Hungary	2016	14.126	16.502	0.195	30.823
	2017	15.091	16.440	0.187	31.719
	2018	15.136	16.436	0.220	31.793
	2019	15.144	16.548	0.150	31.842
Croatia	2016	10.606	16.699	1.118	28.423
	2017	9.558	16.384	1.246	27.188
	2018	10.284	16.388	1.097	27.769
	2019	10.879	16.414	1.028	28.321
Malta	2016	16.953	5.486	2.428	24.867
	2017	17.308	5.580	2.410	25.298
	2018	17.724	5.602	2.490	25.816
	2019	18.181	5.455	2.921	26.557
Netherlands	2016	22.115	11.958	4.577	39.196
	2017	22.594	11.447	4.712	39.264
	2018	22.708	11.256	4.767	39.222
	2019	21.810	11.596	4.846	38.730
Austria	2016	19.855	16.314	3.348	39.515
	2017	21.232	16.646	3.357	41.232
	2018	20.258	16.366	3.293	39.916
	2019	20.010	16.530	3.042	39.580
Poland	2016	15.728	11.645	1.567	28.940
	2017	16.105	11.663	1.437	29.204
	2018	16.244	11.628	1.164	29.036
	2019	16.555	11.583	1.058	29.196
Portugal	2016	19.105	10.119	2.092	31.316
	2017	19.659	10.126	2.065	31.850

	Policy year	Taxes	SIC	Benefits	Total (mean)
Romania	2018	18.409	10.038	1.975	30.422
	2019	19.466	11.048	1.878	32.391
	2016	15.128	12.690	6.618	34.436
	2017	15.294	12.705	6.421	34.419
	2018	7.587	26.530	10.867	44.984
Slovenia	2019	7.522	26.554	10.935	45.011
	2016	14.169	16.612	4.703	35.483
	2017	13.977	16.620	4.578	35.176
	2018	14.924	16.611	8.571	40.106
	2019	15.048	16.616	8.435	40.099
Slovakia	2016	13.042	16.994	2.290	32.326
	2017	13.159	17.146	2.182	32.488
	2018	13.452	16.958	1.979	32.389
	2019	13.429	16.843	1.984	32.257
	2016	29.607	8.267	7.726	45.600
Finland	2017	27.556	9.739	7.852	45.146
	2018	27.039	10.153	8.247	45.439
	2019	27.037	10.163	8.042	45.243
	2016	27.721	6.322	2.915	36.958
	2017	27.828	6.301	2.940	37.069
Sweden	2018	27.133	6.288	2.965	36.386
	2019	26.160	6.292	2.871	35.323
	2016	19.290	10.982	8.833	39.105
	2017	19.100	11.414	8.226	38.740
	2018	19.210	11.307	7.854	38.370
United Kingdom	2019	18.933	11.586	7.488	38.008

Source: EUROMOD version I2.0+

Note: EUROMOD figures for 2016-2019 for all countries, except for the UK, are based on SILC 2017 (2016 incomes). For the UK, results are based on FRS 2016/17.

6. Conclusions

The results from EUROMOD shown above are limited to some key statistical indicators of the baselines for 2016-2019 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	Base Dataset for EUROMOD	Year of collection	Income reference period	Simulated policy years
Belgium	EU-SILC 2017-1	2017	2016	2016-2019
Bulgaria	EU-SILC 2017-1	2017	2016	2016-2019
Czechia	EU-SILC 2017-1 & national SILC (Životní podmínky) variables	2017	2016	2016-2019
Denmark	EU-SILC 2017-1	2017	2016	2016-2019
Germany	EU-SILC 2017-1	2017	2016	2016-2019
Estonia	EU-SILC 2017-1	2017	2016	2016-2019
Ireland	EU-SILC 2017-2	2017	2016	2016-2019
Greece	EU-SILC 2017-1	2017	2016	2016-2019
Spain	EU-SILC 2017-1	2017	2016	2016-2019
France	EU-SILC 2017-1	2017	2016	2016-2019
Croatia	EU-SILC 2017-1	2017	2016	2016-2019
Italy	Special release of 2017 National SILC	2017	2016	2016-2019
Cyprus	EU-SILC 2017-1	2017	2016	2016-2019
Latvia	EU-SILC 2017-1	2017	2016	2016-2019
Lithuania	EU-SILC 2017-1	2017	2016	2016-2019
Luxembourg	EU-SILC 2017-1	2017	2016	2016-2019
Hungary	EU-SILC 2017-1	2017	2016	2016-2019
Malta	EU-SILC 2017-2	2017	2016	2016-2019
Netherlands	EU-SILC 2017-1	2017	2016	2016-2019
Austria	National data base, version August 2018 + variables from EU-SILC 2017-1	2017	2016	2016-2019
Poland	EU-SILC 2017-1	2017	2016	2016-2019
Portugal	EU-SILC 2017-1	2017	2016	2016-2019
Romania	EU-SILC 2017-1	2017	2016	2016-2019
Slovenia	EU-SILC 2017-1	2017	2016	2016-2019
Slovakia	National SILC version 23/10/2018	2017	2016	2016-2019
Finland	EU-SILC 2017-1	2017	2016	2016-2019
Sweden	EU-SILC 2017-1	2017	2016	2016-2019
United Kingdom	Family Resources Survey 2016/17	2016/2017	2016/2017	2016-2019

Appendix 2. National teams contributing to EUROMOD I2.0+

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
Czechia	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	Economic and Social Research Institute (ESRI) – Claire Keane
Greece	Athens University of Economics and Business (AUEB) – Panos Tsakloglou
Spain	Instituto de Estudios Fiscales (IEF) – Noemí Villazán and María Navas
France	Université de la Méditerranée, Marseille – Laurence Bouvard
Croatia	Institute of Public Finance – Ivica Urban
Italy	Bocconi University – Carlo Fiorio
Cyprus	University of Cyprus – Panayiota Lyssiotou
Latvia	Baltic International Centre for Economic Policy Studies (BICEPS) Anna Zasova
Lithuania	Vilnius University – Jekaterina Navicke
Luxembourg	LISER – Nizamul Islam
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 – Martin Miklos and Dusan Paur
Finland	Research Department of the Social Insurance Institution of Finland (KELA) – Tapio Räsänen
Sweden	Ministry of Health and Social Affairs – Mattias Ossowicki and Statistics Sweden - Gunnar Holm 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 **Bulgaria** in **2015** for the value of the minimum wage. In **2016** for the income-test threshold to calculate entitlements to the means-tested child benefit, child benefit for education and non-contributory benefit for raising a child under the age of 1.

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 **Croatia**, non take-up is simulated for subsistence benefit on the assumption that small entitlements (i.e. smaller than 3% of the average net wage) are not claimed. 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 **2015** for pensioners' SIC, food stamps and rent allowance. In **2016** for temporary pension reduction and supplementary pension recalculation. In **2017** for gross pensions cap and guaranteed minimum income. In **2019** for employees' and employers' social insurance contribution for supplementary pensions.

For **Spain** in **2015** for Personal Income Tax. In **2018** for self-employed SIC.

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.