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The Use of Hypothetical Household Data for Policy Learning: Comparative Tax–Benefit Indicators Using EUROMOD HHoT

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ABSTRACT   *Tax–benefit microsimulation models are typically used to quantify the effect of specific policy changes on the income distribution based on representative microdata. Such analysis evaluates policies by considering how different tax–benefit elements interact given personal, household and labour market characteristics. Using hypothetical household data instead helps address broader questions of policy design and systemic (cross-national) differences. This article introduces the Hypothetical Household Tool (HHoT) in combination with the microsimulation model EUROMOD to analyse European tax–benefit policies from a comparative perspective. It presents a series of applications from social welfare analysis illustrating how hypothetical data can benefit comparative academic and policy research.*

Introduction

Tax–benefit microsimulation models are typically used to assess the impact of policy changes on the income distribution based on representative microdata. Such analysis assesses the effects of tax–benefit policies by considering their interaction effects and the population structure, which are both important elements for an overall assessment of complex realities. Like clockwork, one element of the tax–benefit system impacts on other elements, for example in cases where one benefit is part of the income test for another benefit. The population structure – individual, household and labour market characteristics of a specific population – on the other hand, conditions to what extent certain elements impact on the overall redistribution of incomes.

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Using hypothetical data instead of representative microdata abstracts from the complexity of the population structure by focusing on well-defined model families. Results illustrate the pure policy effect (Burlacu et al. 2014), which can be a useful method for comparative research that tries to understand how the mechanisms of the systems differ (Immervoll et al. 2004). Hypothetical data capture the complexity of social welfare systems in showing how single policies are linked with each other and how countries differ in their policy designs.

In this paper, we present the Hypothetical Household Tool (HHoT), a novel application (Goedemé et al. 2019) developed at the University of Essex jointly with the University of Antwerp supported by the InGRID project funded by the European Commission's 7th Framework Programme. HHoT is a flexible tool that allows users to generate their own hypothetical household data. This data can be used in EUROMOD, the tax and benefit microsimulation model of the European Union, to analyse current tax–benefit policies as well as the effects of policy changes in a comparative manner.

We show how hypothetical data can be used for both academic research and policy analysis by presenting several examples of scientific applications based on HHoT. We contribute to the existing literature in two ways. First, we provide a comprehensive overview of European welfare systems focusing on the role of cash benefits, taxes and Social insurance contributions (SIC) for the unemployed, inactive and families with children. Second, we enrich the literature on the consequences of tax–benefit policies for various household types by using information on the most recent policy systems as well as by providing an interpretation of current differences in policies across Europe and welfare regimes. Hence, the paper provides a reference point for the various uses of the HHoT tool and a guide for further, novel research.

The remainder is structured as follows: after a brief introduction to HHoT and EUROMOD, we elaborate on the policy learning potential of hypothetical household data showcasing the variety of applications. The fourth section provides an overview of basic indicators in a comparative perspective, an example of how policy learning can be useful at the European level and across welfare regimes. Detailed methodological specifications and single-country profiles are provided as Supplementary Material.

The EUROMOD Hypothetical Household Tool

EUROMOD is the tax–benefit microsimulation model for the EU that enables researchers and policy analysts to calculate, in a comparable manner, the effects of taxes and benefits on household incomes for the population of each country and for the EU as a whole (Sutherland and Figari 2013). EUROMOD uses its own software, developed for its multi-country purpose, offering a high degree of flexibility.

Standard EUROMOD distributional analysis makes use of the European Union Statistics on Income and Living Conditions (EU-SILC) microdata for most countries. HHoT, which is embedded in the EUROMOD interface as an extra application, allows users to generate an alternative dataset with hypothetical households that can be used to calculate the same tax and benefit elements but based on model families. Hufkens et al. (2016) provide an introduction to HHoT and a first validation of the application. Like the EUROMOD software and content, HHOT is freely accessible together with the household specifications[1] and reference table used in this report.

HHoT is comparable to other hypothetical data tools like the tax–benefit model of the OECD[2] or the Social Policy Indicators (SPIN)[3] and CSB-MIPI (Van Mechelen et al. 2011) databases. They all provide comparative information on the institutional design of social policies and their impact on the income situation of various model families. They differ, however, in their country scope, the provided data points as well as in their coverage of policy types. Most importantly, they also differ in their usability for specific research questions (see Table 1).

While the databases provide ready-made indicators on pre-defined households, applications like HHoT or the OECD tax–benefit calculator provide a higher user flexibility in defining the model families. Both models furthermore take interaction effects of different tax–benefit elements into account, a prerequisite for meaningful social policy analysis (at least in the European context with its complex tax–benefit systems and their intertwined effects of tax–benefit elements). HHoT is furthermore embedded into the EUROMOD software. As such, the full model is available to all users while this is currently not the case for the full OECD model. Thus, HHoT is the only tool that offers flexibility in defining (complex) hypothetical households and, more importantly, the only model that allows simulating the effects of policy change. Given the broad scope and opportunities of the tool, even though the current paper focuses on the effects of tax–benefit policies on typical households, it is an important reference point for future research on more complex research questions. HHoT is furthermore the only model that allows calculating results based on hypothetical and microdata for the same tax–benefit model.

Uses of Hypothetical Data for Policy Learning

Hypothetical household data serve various purposes for different types of user (see Table 2). In this paper, we focus on the illustrative and cross-national dimension by showing how such data can be used for policy learning in Europe. Policy learning is an inherent element of policy making, where decisions about policy changes are built on lessons learned from other policies and experiences from the past (Moyson et al. 2017) and potentially also from other countries.

Providing indicators based on hypothetical household data can help to gain a better understanding of policy design and serves as a starting point for further (distributional)

Table 1. Comparative hypothetical household tools and their characteristics

	Type	Cross-country	Latest policy year	Flexible definition households	Policy changes	Detailed output	Complement distributional analysis
SPIN	Database	X	2013*	–	–	–	–
CSB-MIPI	Database	X	2012	–	–	–	–
OECD	Model	X	2014	(X)**	(X)**	X	–
HHoT	Model	X	2017	X	X	X	X

Note: Author's classification. "X" refers to applicable. "–" refers to non-applicable. "(X)" is to some extent applicable. * latest policy year depends on the selected set of indicators. ** The full model is currently not available to users which restricts the use of the model to the pre-defined households and the current policy system.

Table 2. Applications and user groups of hypothetical household tools

	Communication	Illustration	Cross-national comparison	Model validation	Creating data
Wider public	X	**X**	**X**	–	–
Policy analyst	X	**X**	**X**	X	X
Researcher	X	**X**	**X**	X	X

Note: Author's classification. "X" refers to applicable. "–" refers to non-applicable.

analysis. Urban and Pezer (2017) use this approach to learn about the support for children in different countries by varying the number of children and the earnings level of the parents.

Another example is Navicke and Lazutka's (2016) research on work incentives in Lithuania. Their analysis is based on distributional data complemented by model families to show changes in the inactivity, unemployment and low wage trap for specific households. Their results illustrate the difficulties of striking a balance between provision of adequate social support and motivation to work in times of crisis.

In 2015, Atkinson (2015) proposed far-reaching proposals for reducing income inequality through the tax–benefit system. Atkinson et al. (2017) follow up on these ideas and calculate their first-order effects on inequality and poverty. Due to the complexity of the policy changes, model families are used to assess how the reform scenarios affect households and to validate how the proposals need to be implemented to provide the envisaged effects for specified target groups.

Hypothetical household data can furthermore be used to assess the implicit equivalence scale of tax–benefit systems. Disposable household income is usually adjusted by an equivalence scale to account for differences in household composition. This is done by adjusting income in relation to the needs of the household typically based on number and age of household members. A commonly used equivalence scale is the modified OECD scale which assumes that needs increase disproportionally with additional household members. However, this standardised scale might not always capture the implicit judgements underlying the tax–benefit system (e.g. family/child-related allowances may not cover the additional needs of a child). This is especially the case when taking different income levels into account (Van de Ven et al. 2017). The implicit judgements can be tested by adding new household members to see to what extent disposable income changes or by gradually increasing market incomes to analyse implicit judgements for different income levels. Research of this kind can be helpful to assess the consistency of tax–benefit implicit scales and the generosity of welfare systems across countries for different family types.

Policy Learning in the EU Using HHoT Baseline Indicators

Learning from each other is an important element of policy reforms and a causal mechanism of what is known as policy diffusion (Dobbin et al. 2007) and policy transfer (Dolowitz and Marsh 2000) in the public policy literature. Countries systematically respond to other countries' reforms by copying their policies or by reacting to the

pressure resulting from other countries' policy changes (Obinger et al. 2013). Exchange and collaboration within EU countries has strengthened and institutionalised this long history of policy learning and reinforced evidence-based policy making in the EU (Marlier and Atkinson 2010). Many tax–benefit systems in Europe show similar characteristics and are comparable in their design and emphasis on specific target groups. Thus, policy learning can be used to reduce the uncertainty of consequences of policy changes by building on best practice examples from other countries. The scope for learning is, however, restricted to the path dependency of policy making which limits policy change to the preferences of the existing policy paradigm (Immergut and Anderson 2008) and this is even the case for crisis situations like the most recent economic crisis (Kiess et al. 2017). Thus, policy learning may be reduced to learning from other countries within the same paradigm.

We propose a collection of indicators produced with EUROMOD-HHoT in order to provide an up-to-date assessment of European tax–benefit systems with a focus on the mechanics – i.e. the pure policy effects. The selection of indicators is driven by the two main purposes of welfare states (Barr 1992): the "Robin Hood function" (reducing poverty and income inequality through redistribution) vs. the "piggy-bank function" (providing insurance to offset risks over the life cycle). The selected indicators focus on the interplay between redistribution vs. making work pay, contributions vs. support in case of need, contribution-based vs. tax-based financing of welfare states as well as parental support in terms of cash transfers vs. tax relief.

A further selection criterion is based on the underlying tax–benefit microsimulation model and its coverage of policies. EUROMOD (like most tax–benefit microsimulation models) includes cash benefits only. Benefits in kind – services provided for free or below market price like the education system, health-care system or child-care provision – are excluded from the analysis. However, especially in the European context, most social benefits are actually monetary transfers and account for a higher share of GDP than benefits in kind (Matsaganis 2013). The indicator selection is furthermore focused on the working-age population given the complexity of simulating old-age benefits which are often insurance based and require detailed assumptions on the work history.

All results are presented as a percentage of country-specific average gross earnings in order to guarantee comparability and refer to tax–benefit policies as of June 2017. Households are assumed to live in rented accommodation with housing costs of 20 per cent of the country-specific average monthly gross earnings. Households are furthermore assumed to have no market incomes other than earnings. Finally, we assume that benefits are fully taken up by eligible units and that all households report their actual income to tax authorities in order to analyse the intended policy effects. More details are provided in the Supplementary Material.

Progressivity of Tax and Benefit Systems

In very general terms, welfare states are "organisations that extract resources through taxation" (Skocpol and Amenta 1986, p. 131). They differ, however, in the level of taxes they collect on income and in the level of support they finance with the revenues. Beside taxes, welfare states also deduct SIC from gross wages. Different from taxes, SIC are dedicated to fund a specific life-course event like unemployment or retirement (Hall et al.

2013). Historically, contribution-financed schemes have been less affected by crisis measures and tend to be more generous as contributions are collected for a specific purpose (Morel and Palme 2013). It needs to be noted, however, that the distinction between taxes and SIC is not always as straightforward due to cross-subsidies between different public finance budgets and the fact that the provided benefit is not necessarily 1:1 based on the past contributions (Immervoll 2004).

The first part of this section focuses on the progressivity of tax–benefit systems on single-person households by level of earnings. Figure 1 shows the shape of disposable income starting with a single person with 0 per cent of average monthly gross earnings, going up to a single person with 200 per cent on the x-axis and the level of disposable income including social transfers after taxes and SIC on the y-axis. All presented SIC in this paper refer to employees' contributions only. The graph furthermore shows a progressivity index which is defined as the change in disposable income between 100 and 200 per cent of the average wage.[4] A negative index highlights regressive effects while a positive index shows progressive effects and a value of 0 points to a proportional increase.

Countries are ranked by their level of progressivity, starting with countries with low relative increases at the top and countries with high increases relative to earnings at the bottom. The share of tax/SIC deductions increases not at all or marginally in Bulgaria, Hungary, Lithuania, Latvia, Poland, Estonia and Romania, where high-income earners are taxed only to a minimal higher/or to a similar extent compared to average earners. The opposite is true in Belgium, Italy, Sweden and Ireland, where the difference in disposable income is 30 per cent lower than the difference in earnings. Among the countries with low progressivity are the so-called flat tax countries where the marginal tax rate is independent from the level of earnings.

While the shape of the right-hand side provides information on tax and social insurance deductions, the shape of the disposable income on the very left gives insights on the income support for low earners, the availability of minimum income benefits and extent of support. It shows that countries like Germany, Luxembourg, Denmark, Finland, France, Slovenia and Sweden provide a relatively high level of support. In these countries, minimum income benefits are available as a top-up to low earnings and gradually decrease at a certain level of income. The exception among these countries is Denmark, where relatively high support is available for people with up to 15 per cent of the average monthly gross earnings and limited support for people above this threshold. The social assistance benefit in Denmark is furthermore not designed as a top-up to low household income.

In Cyprus, the drop in disposable income of earners with more than 35 per cent of average earnings can be explained by assumptions in the EM model rather than the actual situation. The Guaranteed Minimum Income benefit in Cyprus consists of two parts, a top-up benefit and a housing allowance, which is a supplement for recipients who pay rent or cannot afford to repay their mortgage loans. The applied asset test for the housing allowance in the EUROMOD baseline is simplified due to the lack of information in the usually used micro-data. Thus, everyone eligible for the top-up benefit also receives the housing allowance in the hypothetical scenario. While the top-up benefit gradually decreases with increasing earnings, the housing allowance remains the same for all beneficiaries, which leads to the drop in disposable income once the model family reaches earnings above the means-test.

Figure 1. Net disposable income by level of gross earnings and index of progressivity, 2017 policy system

Note: The x-axis shows the level of earnings in percentages of average earnings starting from 0 and going up to 200 per cent. The y-axis shows the disposable income in percentages of average earnings. Countries are ranked in ascending order by the level of progressivity (white number in right corner) measured by changes in disposable income comparing 200 per cent and 100 per cent of average wage (index displayed in the graph). See Supplementary Material for more detailed graphs.
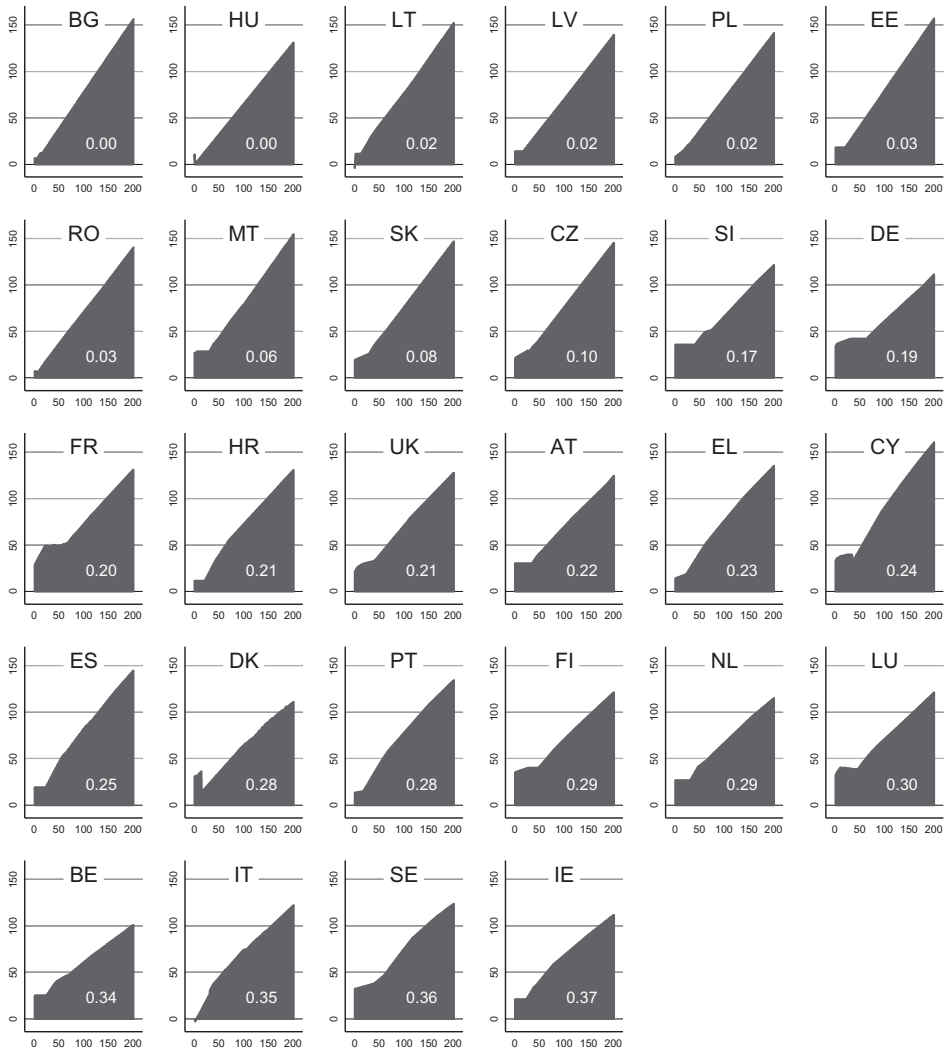
Other countries provide no or very little support. See for example Bulgaria, Poland, Hungary and Croatia. In some countries, social assistance is only provided

Figure 2. Gross vs. net income of average earners, 2017 policy system
Note: Countries are ranked by the level of disposable income. Benefits include means-tested benefits only.
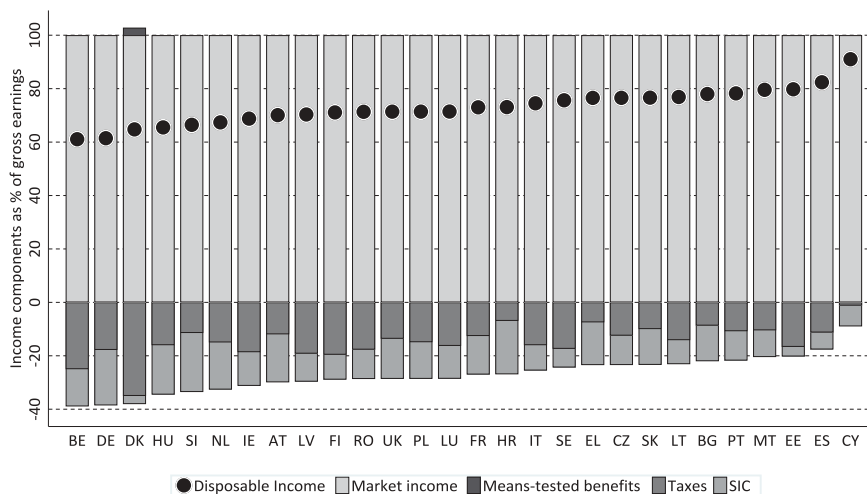
on the regional level, which is not always simulated in the country models (see for example Italy).

Figure 2 shows the disposable income and the contribution of different tax–benefit components of an average earning single-person household. The household disposable income ranges from 60 to 90 per cent of gross earnings. Income taxes and SIC are highest in Belgium, followed by Germany and Denmark and lowest in Cyprus, Spain and Malta. In most countries, direct taxes and SIC of average earners vary between 25 and 35 per cent of their earnings, which leaves them with an income of 65–75 per cent of their gross earnings.

Countries differ in the emphasis they put on direct taxes vs. SIC. While deductions are mostly based on taxes in Denmark, the social insurance system plays a fairly important role in Croatia, Slovenia, Austria, Germany and Cyprus. In addition, Denmark is the only country where average earners are eligible for means-tested benefits.

Figure 3 shows taxes and SIC as percentage of gross earnings for a single person earning 50 per cent, 100 per cent, 150 per cent and 200 per cent of average monthly gross earnings. In the already mentioned "flat tax" countries, Hungary and Bulgaria, the percentage of taxes and SIC remains the same across earnings levels. Deduction rates are very similar across earnings levels in Estonia, Poland, Romania and Latvia. To some extent this is also the case in Malta, Lithuania, Slovakia and the Czech Republic except for significantly lower rates for those earning 50 per cent of average earnings. Like Hungary and Bulgaria, the income tax in most of these countries (the Baltics, Romania, Slovakia and the Czech Republic) consists of only one tax bracket.

Deduction levels are especially low for low earners in France and Spain. Cyprus stands out with a comparably low, yet progressive, deduction rate across income levels. Other countries with higher but overall progressive tax and SIC deductions are Spain,

Figure 3. Taxes and SIC at different levels of gross earnings, 2017 policy system
Note: Countries are ranked by the level of taxes and SIC of high-income earners (200 per cent of average earnings).
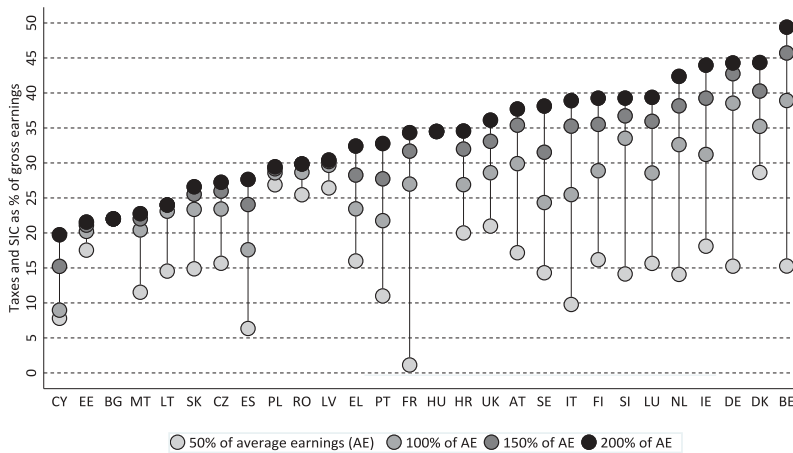
Greece, Portugal, France, Croatia and the UK. The same is true for Italy, Slovenia, Finland, Luxembourg, the Netherlands, Ireland, Denmark and Belgium, where high earners pay more than 40 per cent of their gross earnings in taxes and SIC. In Germany and Austria, the relative tax and SIC burden of those earning 150 per cent and 200 per cent of average earnings is almost the same.

Work Incentives

Another area where hypothetical data can be of use is the analysis of work incentives. Work incentives at the intensive margin show the incentive to work and/or earn more, measured as marginal effective tax rates (METRs). Work incentives at the extensive margin measure the incentive to work at all. Expressed as replacement rate, they also measure to what extent tax–benefit systems cushion the effect of job loss. Welfare states need to strike a balance between adequacy of social support and maintaining work incentives. High replacement rates provide the ability to maintain the standard of living in case of unemployment while they also point to relatively low incentives for being in employment (O'Donoghue 2011).

It is quite common to calculate work incentive indicators based on hypothetical households (see for example Carone et al. 2009; OECD 2016), while others argue that these results do not provide a full representation of the distribution of work incentives in the population and focus on microdata (Immervoll and O'Donoghue 2002; Adam et al. 2006; Jara and Tumino 2013; Jara et al. 2016). Nevertheless, work incentives based on concrete examples allow us to understand differences in incentives and to analyse which tax–benefit elements contribute to them. As such, they are another piece of the puzzle helping us to compare policy effects of European tax–benefit systems.

METRs measure the incentive to work/earn more, expressed as the share of an earnings increase that is taxed away due to higher SIC, higher taxes, or the loss of benefit entitlement. We assume a 3 per cent earnings increase in our calculations using the methodological approach suggested by Jara and Tumino (2013). METRs take values between 0 (individuals keep all the earnings increase = high incentive) and 100 (individuals lose all the earnings increase = high disincentive). They are calculated by first simulating the original household disposable income and, in a second step, the revised household disposable income based on a 3 per cent earnings increase. METR are defined as the change in household disposable income divided by the change in individual earnings.

Figure 4 shows average METRs for a single person earning between 80 and 120 per cent of average earnings. The average is based on 41 hypothetical households where we increase the earnings from 80 per cent up to 120 per cent average earnings in 1 per cent steps. The reason for averaging the results for 80–120 per cent of average wage instead of using the example of an average earner is based on the sensitivity of METRs, which can differ a lot between an average earner and someone earning slightly above or below average earnings. This is due to kinks in the tax schedule, where an earnings increase can lead to a significant increase in taxes/SIC or the loss of tax credits. Thus, using the average METR of a certain earnings range produces results that are more in line with the actual situation.

Across countries, net earnings increases are lower than gross increases due to higher taxes and SIC. The incentive to earn more is very high in Cyprus, Bulgaria and Estonia, where only about 20 per cent of the earnings increase is lost due to higher taxes and SIC. Belgium and Ireland are the countries with the highest work disincentives.

Denmark is the only EU country where average earners are still eligible for means-tested benefits, which are reduced when their earnings increase. On the other hand, SIC

Figure 4. Decomposition of average METRs at earnings levels from 80 to 120 per cent of average earnings by income component, 2017 policy system
Note: Countries are ranked by the percentage of marginal earnings increase taxed away. Benefits include means-tested benefits only.
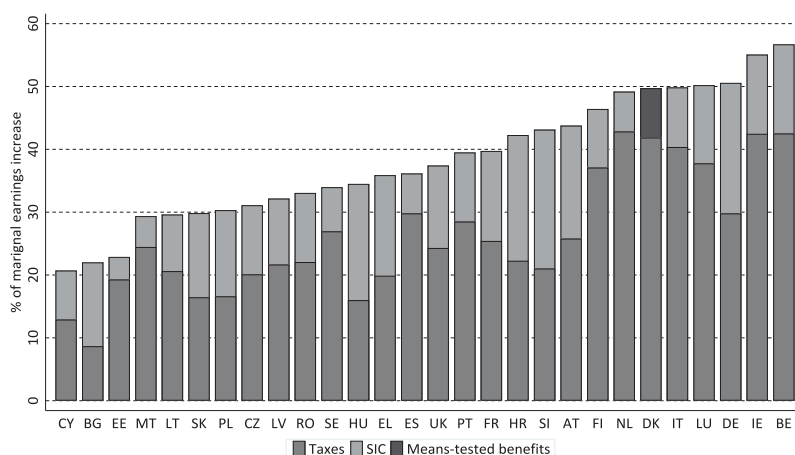
do not change with higher earnings due to the small role of SIC in Denmark. Countries with a high contribution of SIC are Hungary, Greece, Croatia, Slovenia, Austria and Germany. The only country where SIC are the main contributor to work disincentives is Bulgaria, while it is usually the income tax in other countries.

Turning to work incentives on the extensive margin, Figure 5 focuses on replacement rates, comparing the disposable income of an average single earner to the replacement income in case of unemployment or inactivity. We assume a work history of 10 years to make sure that the unemployed person fulfils the eligibility condition for the unemployment insurance benefit and average earnings prior to the spell of unemployment. The inactive person is no longer eligible for unemployment benefits due to an extended period of unemployment but might be eligible for social assistance benefits. The inactive person is furthermore not registered with the job centre and not actively looking for a job. The results are compared to the poverty line (defined as 60% of median income), showing to what extent provided support levels are high enough to sustain a sufficient living standard . Please note that results refer to the actual income level in one month rather than the average monthly value of the year. This is to show the actual replacement income in countries where entitlement to unemployment benefits is less than 12 months.[5]

Replacement incomes for the unemployed are quite different across EU countries. Germany, Luxembourg, Italy, Bulgaria and Portugal provide relatively high benefits. Note, however, that the benefit is only available for nine months in Bulgaria, with very little support afterwards. The unemployed person has almost the same disposable income as the employed average earner in Germany. This is due to the high

Figure 5. The disposable income of unemployed and inactive compared to employed people and the level of the 60 per cent at-risk-of poverty threshold, 2017 policy system
Note: The calculation of the poverty threshold is based on the simulated disposable income using EUROMOD. Countries are ranked by the disposable income of the employed person. The employed and unemployed individuals are assumed to have a work history of 10 years in full-time employment with previous earnings of 100 per cent of average earnings. Values refer to monthly values rather than monthly averages.
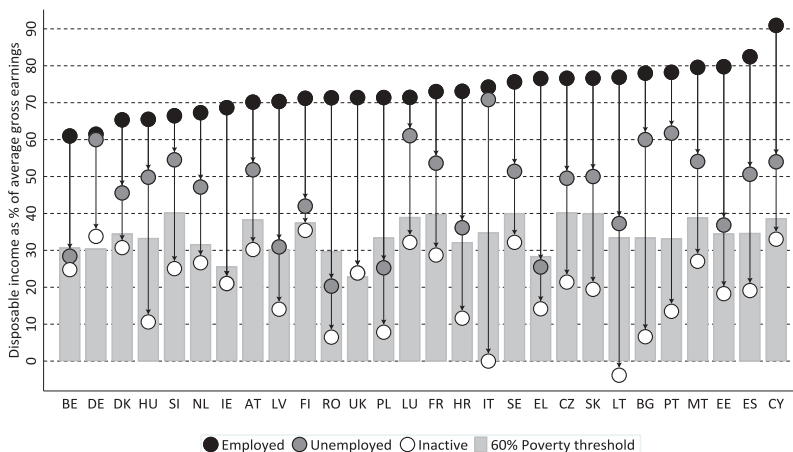
replacement rate but also the high contribution level for the employed person. Other countries like Romania and Poland provide very low levels of support clearly below the poverty line. Especially in Poland, this can lead to a quite precarious situation as unemployment benefit is only paid for six months and financial support is very low for those no longer eligible for the benefit.

The income situation is rather precarious for the inactive in general. In most countries, income support is relatively low and below the poverty threshold. No support for the inactive model family is available in Lithuania. Even though Lithuania provides a social assistance benefit to those with no or low income, it is only available for people registered with the "state territorial labour exchange" (a condition that the hypothetical case does not fulfil). There is no national social assistance scheme in Italy and the (limited) schemes at the local level are not part of the simulations in EUROMOD. The level of support is the same for unemployed and inactive people with previous average earnings in the UK and Ireland (and almost the same in Belgium). Compared to other EU countries, the UK offers very low cash transfers in case of unemployment due to its flat rate which is not linked to previous earnings (Figari et al. 2010).

Support for Families with Children

Historically, welfare states have been created to protect the male working class from loss of earnings in case of unemployment (Kränzl-Nagl et al. 2003), in combination with an orientation to the traditional family role model (Oelkers 2009). Thus, the policy field family is less strongly embedded into the welfare system (Blum 2012) but gained more interest since the 1990s as an all-in-one solution for the sustainability of welfare systems (Olk 2010). Saraceno (2013) highlights the growing convergence in explicit goals of family policies due to the active role of the EU and the OECD. The following section, however, shows that the implementation of these goals differs across country.

Support for families with children is usually provided through a mix of direct family/child-related benefits, income replacement for child care, tax reliefs for employed parents or child-care provision. The focus of this section is on the tax elements and direct cash benefits of tax–benefit systems. As mentioned above, child-care provision is outside the focus of this paper due to its character as benefits in kind. Nevertheless, child-care provision is an important social policy instrument for promoting women's labour market participation (Esping-Andersen 2009). Matsaganis and Verbist (2009) show that if publicly funded child care is treated as an additional cash benefit, it reduces poverty (especially for children) and income inequality.

Figure 6 gives an overview of simulated family/child-related benefits differentiating lone parents and dual parents as well as the activity status of the second adult in the dual-parent household. It shows to what extent family/child-related support depends on the household composition and the income level of the parents. Apart from additional adults, households are also extended by two children aged four and six. The chosen age reflects an age where most children are attending kindergarten or school and parental leave benefits after birth are exhausted.

Many countries provide the same support across family types (see Latvia, Malta, the UK, Slovakia, Sweden, Ireland, Estonia, Belgium, Germany, Austria and Luxembourg), mostly through universal family/child-related benefits. In addition, some countries also

Figure 6. Family/child-related benefits per child by household types in percentage of average gross earnings, 2017 policy system
Note: Countries are ranked by the benefit level of "Dual earner". The children are assumed to be four and six years old. The employed and unemployed individuals are assumed to have a work history of 10 years in full-time employment with previous earnings of 100 per cent of average earnings. All employed parents are assumed to earn average earnings.
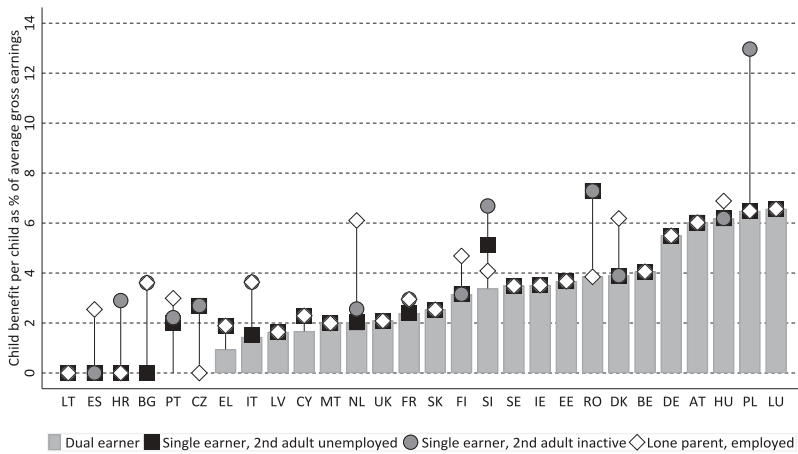
provide a (smaller) means-tested benefit for large families or lone parents but the selected model families do not fulfil the requirements for these benefits (due to the number of children or the income level).

Lithuania stands out with no family/child-related benefit for the specified model families. Across household types, earnings are too high to fulfil the income test of the family/child-related benefit. The situation is similar for selected households in Spain, Croatia, Bulgaria, Portugal and the Czech Republic.

While the support of households with children through benefits is crucial, many systems also provide a parental premium in the form of tax allowances and credits (Figari et al. 2005). Bradshaw and Mayhew (2003) identify a growing importance of supporting specific subpopulation groups through the tax system, not only as an instrument for releasing the tax burden but also to encourage labour force participation of mothers (Esping-Andersen 2009).

Figure 7 compares the share of direct taxes and SIC of a lone parent to that of a single person. The difference between the income deductions is the parental premium, i.e. a more favourable tax treatment of lone parents compared to single-adult households without children. Results show that lone parents with average earnings pay substantially less taxes and SIC than single-person households in many countries. This is especially the case in Spain, Latvia, Croatia, Portugal and Czech Republic. Other countries provide only very small or no tax relief. This is for example the case for Denmark and Germany, two countries with very high overall share of deductions, as well as Cyprus, Estonia, Malta, Bulgaria, Greece, Sweden, the UK, Romania and Finland.

Apart from lone parents, tax instruments may also provide preferential treatment for couples with children. We compare the tax and SIC contribution levels of childless

Figure 7. Taxes and SIC of lone parents compared to single persons without children, 2017 policy system

Note: Countries are ranked by the level of taxes and SIC of single persons. The lone parent is assumed to have to children aged four and six. The single person and the lone parent are assumed to be average earners.
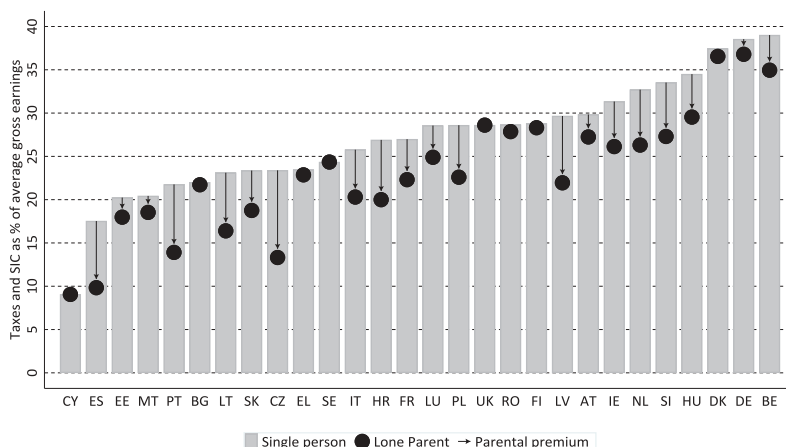
couple households to households with two adults and two children aged four and six. While both adults of the childless household are in employment, we vary the employment status of the parent households in order to analyse differences in tax burden for single- vs. dual-earner parents.

Figure 8 shows the heterogeneity of countries. Cyprus, Estonia, Bulgaria, Greece, Sweden, the UK, Romania, Finland and Denmark provide no or only minor tax premiums to average-earning couples with children (as for lone parents). Other countries provide tax reliefs for one group of parents but not the other. Single-earner families are clearly advantaged by the tax system in Spain, Portugal, Czech Republic, Italy, Luxembourg, Ireland, Slovenia, Germany and Belgium. Dual-earner families receive tax allowances/credits in some countries but often to a lesser extent. The Netherlands and Slovakia stand out because of their higher deductions for single-earner households. In both cases, the parent staying at home is still liable to health insurance contributions.

Synthesis of Indicators

The final section on baseline indicator focuses on a welfare regime perspective. It combines results from previous sections to show the extent countries belonging to the same welfare family comprise similar policy effects (detailed graphs are provided in the Supplementary Material). This reconnects to the idea that policy learning is more feasible if it is within the same policy paradigm given the path dependency of social policy.

We base the analysis on Esping-Andersen's typology of welfare states (1990), extended by Castles and Obinger (2008) and focus on the following country groups: Northern Conservative countries (Austria, Belgium, France, Germany, Luxembourg and

Figure 8. Tax and contribution levels of single-earner compared to dual-earner households, 2017 policy system
Note: Countries are ranked by the level of taxes and SIC of dual-earner households without children. The households with children are assumed to have two children aged four and six. All employed parents are assumed to be average earners. The second adult in the single-earner household is assumed to be inactive.
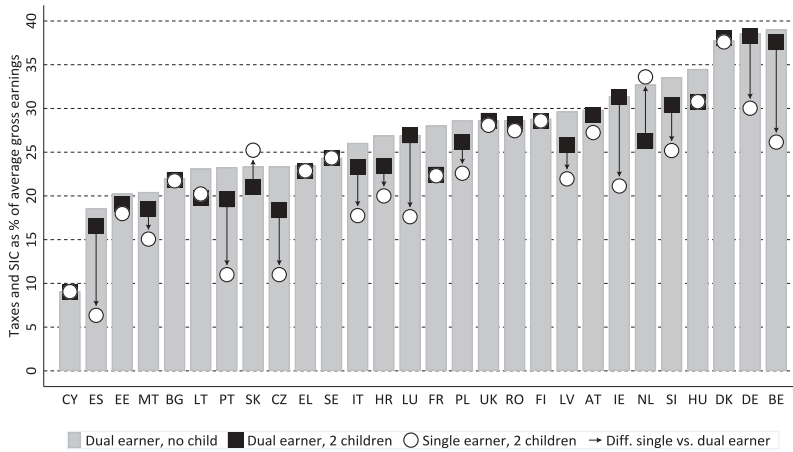

the Netherlands), Southern Conservative countries (Greece, Italy, Spain, Portugal), Southern Democratic countries (Denmark, Finland and Sweden), Liberal countries (Ireland and the UK) and New Member States (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia). New Member States (NMS) not included in their analysis are Croatia, Cyprus, Bulgaria, Malta and Romania. We add them to the group of NMS.

The first graph in Figure 9 (top-left corner) compares the level of taxes vs. the level of SIC paid by an average earner. While SIC are often collected for a specific benefit, taxes are not per se attributed to a specific support measure. It shows that SIC are higher in Northern Conservative and Liberal countries. To some extent this is also true for NMS except for the Baltic countries as well as Cyprus, the Czech Republic and Romania. The mixed results for NMS show that having a flat-tax system does not necessarily lead to a similar tax rate. SIC are comparably low in Social Democratic countries but this comes with higher deductions through the tax system. Southern Conservative countries show a less coherent picture.

The second graph (top-right corner) compares the extent average earners contribute from their gross earnings and the extent they are supported in case of unemployment. Most Northern Conservative countries comprise high tax/SIC deductions and the high level of contributions is also translated into high unemployment benefits, apart from in Belgium. Southern Conservative countries comprise higher net earnings and high replacement rates in case of unemployment, except for Greece. Greece (low deductions and low support) is in a group together with Liberal countries. Sweden and Finland are concentrated around the

Figure 9. Synthesis of indicators based on welfare regimes, 2017 policy system
Note: Households with children are assumed to have two children aged four and six. All employed parents are assumed to be average earners. The level of progressivity measures changes in disposable income comparing 200 per cent and 100 per cent of average. See Supplementary Material single graphs with country labels. Dotted line refers to unweighted EU average.
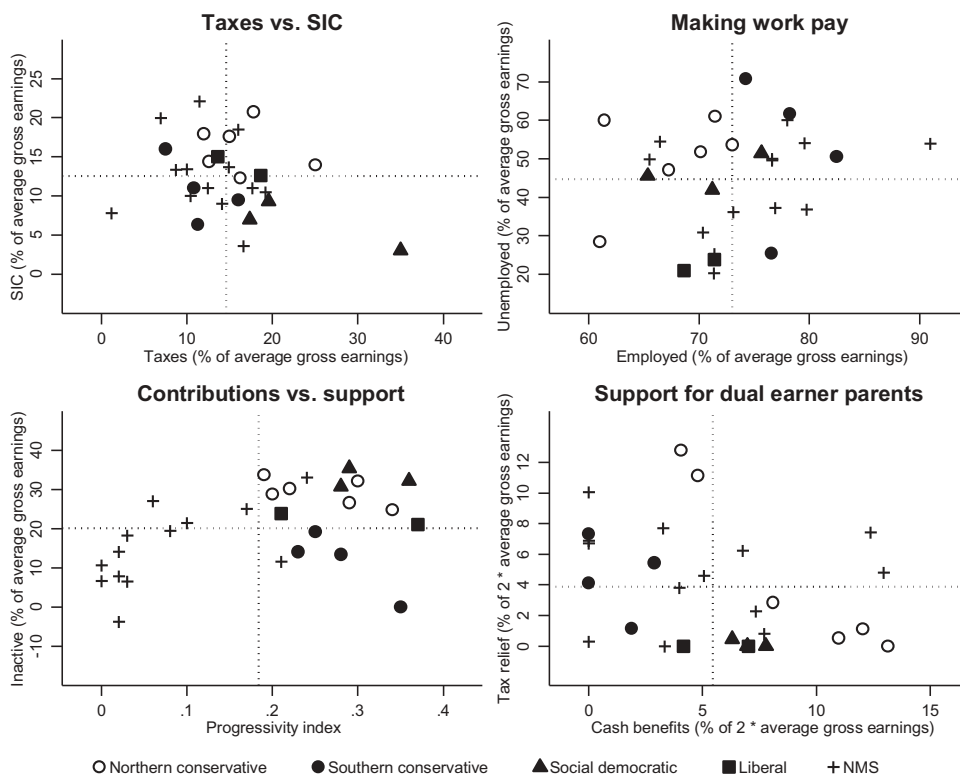
EU mean while Denmark shows lower disposable income of the employed than the other two Social Democratic countries. New Member States are again quite mixed.

The clearest difference by welfare regime is shown when comparing the level of progressivity and the income support when unemployment benefits are exhausted (bottom-left corner). The graph shows to what extent progressivity at the top of the income distribution is translated into support of last resort for the inactive. In terms of progressivity, European countries can be split into two groups: NMS with relatively low levels and other welfare regimes with relatively high levels. This high level is translated into high levels of support for inactive households in Northern Conservative, Social Democratic and Liberal countries and less generous support in Southern Conservative countries. The progressivity level is in general quite low for NMS apart from Croatia and Cyprus (and to a lesser extent Slovenia). While the support for inactive households is relatively high in Cyprus, the opposite is true in Croatia. Support is especially low in the flat-tax countries.

The last graph (bottom-right corner) shows the support provided to dual-earner parents with two children through the tax–benefit instrument. Countries differ in the level of support and in their focus on cash benefits vs. tax relief. The Northern Conservative countries are split into two groups: high tax relief/low cash benefits in France and the Netherlands and lower tax relief/high cash benefits in the other countries of this regime. Relatively high tax reliefs are also to be found in Portugal, Italy and Spain, while Greece is the outlier in this group. Tax reliefs are very low or not available in Social Democratic and Liberal countries while the level of cash benefits differs.

Conclusion

The paper provides insights into the design of tax and benefit policies across the EU. It makes a case for the usefulness of hypothetical households in visualising how single policies are linked to each other while leaving the additional complexity of the population structure aside. The indicators compare countries by the progressivity of their tax and benefit systems, the extent they provide incentives to work and to work more and the extent they support families with children. All results presented make use of HHoT and the microsimulation model EUROMOD.

The synthesis of the indicators by welfare regimes shows that countries belonging to the same welfare regimes generally exhibit similarities in the mechanisms of their tax–benefit systems but there are exceptions to the rule depending on the group of indicators in focus. Especially the New Member States are diverse in terms of their policy effects. The results also suggest that it is possible to learn from countries that follow an alternative policy paradigm with similar policy effects but different mechanisms. This, however, requires bringing the complexity of the population structure back into the equation as similar policy instruments might lead to very different results based on differences in demographics and labour market.

Although all examples are based on relatively simple household characteristics, HHoT also allows for more complicated household structures such as multi-generational households or hard-to-reach target groups (groups that are typically underrepresented in income surveys such as ethnic minorities, refugees but also very high-income groups). The paper offers a starting point for such analysis and a reference point for further uses of HHoT.

The flexibility of HHoT and EUROMOD also allows for an ex ante evaluation of policy reforms and their impact on the income situation of the specified households. Two examples of rather complex policy reform proposals are described in the paper (Atkinson's proposal and the implementation of other countries family/child-related benefits in Croatia) and there is potential for further analysis.

Another characteristic of the use of hypothetical household data is to bypass the lack of information in available microdata or lack of access to suitable microdata. This of course requires careful thinking and assumptions about the specification of households. HHoT can include additional information (e.g. on work history) not part of EU-SILC data which are used for distributional analysis in most countries. However, these variables are not yet considered in the models themselves.[6]

The use of hypothetical household data clearly offers opportunities for a simplified presentation of complex realities and an expansion of research questions where no microdata are available. Nevertheless, a discussion of the results needs to emphasise

the abstraction from population structure especially (but not only) in cross-national analysis. Keeping this trade-off in mind, the use of hypothetical data makes complex tax–benefit systems accessible, allowing us to learn from other countries' policy designs.

Notes

1. https://www.euromod.ac.uk/using-euromod/user-resources/hhotmanual-households.
2. http://www.oecd.org/els/social/workincentives.
3. http://www.sofi.su.se/spin.
4. Progressivity $=1 - \frac{Disposable\ household\ income_{200} - Disposable\ household\ income_{100}}{Disposable\ household\ income_{100}}$.
5. Benefit entitlement is 6 months in IE, MT, LT, CY, SK, SI, PL; 3 months in NL, HU; 11 months in CZ; 9 months in BG.
6. The University of Essex together with the University of Antwerp is working on expanding the country models by providing enhanced simulations of various benefits (unemployment, housing/heating and parental leave benefits). Further plans include the visualisation of results.

Supplemental data

Supplemental data for this article can be accessed here.

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