View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by LSE Research Online

John Hills, Alari Paulus, Holly Sutherland & Iva Tasseva

A lost decade?: decomposing the effect of 2001-11 tax-benefit policy changes on the income distribution in EU countries

Discussion paper

Original citation:
Hills, John, Paulus, Alari, Sutherland, Holly and Tasseva, Iva (2014) *A lost decade?: decomposing the effect of 2001-11 tax-benefit policy changes on the income distribution in EU countries.* ImPRovE working papers, 14/03. ImPRovE, Antwerp, Belgium.

Originally available from the ImPRovE

The process of extending and updating EUROMOD is financially supported by the Directorate General for Employment, Social Affairs and Inclusion of the European Commission [Progress grant no. VS/2011/0445]. The research on which this paper is based is financially supported by the European Union's Seventh Framework Programme (FP7/2012-2016) under grant agreement n. 290613 (project title: ImPRovE).

This version available at: http://eprints.lse.ac.uk/59605/

Available in LSE Research Online: October 2014

© 2014 The Authors

LSE has developed LSE Research Online so that users may access research output of the School. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in LSE Research Online to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain. You may freely distribute the URL (http://eprints.lse.ac.uk) of the LSE Research Online website.

http://eprints.lse.ac.uk

ImPRovE
Poverty, Social Policy and Innovation

WORKING PAPERS

http://improve-research.eu

A lost decade? Decomposing the effect of 2001-11 tax-benefit policy changes on the income distribution in EU countries

John Hills, Alari Paulus, Holly Sutherland & Iva Tasseva

DISCUSSION PAPER No. 14/03
June 2014

Poverty Reduction in Europe:
Social Policy and Innovation

FUNDED BY THE
7TH FRAMEWORK PROGRAMME OF THE EUROPEAN UNION

Acknowledgements
We would like to thank Paola De Agostini, Francesco Figari, Tim Goedemé, Péter Hegedüs, Chrysa Leventi, Péter Szivos, Dieter Vandelannoote and Toon Vanheukelom for their help and comments as well as acknowledge the contribution of all past and current members of the EUROMOD consortium. The process of extending and updating EUROMOD is financially supported by the Directorate General for Employment, Social Affairs and Inclusion of the European Commission [Progress grant no. VS/2011/0445]. The research on which this paper is based is financially supported by the European Union's Seventh Framework Programme (FP7/2012-2016) under grant agreement n. 290613 (project title: ImPRovE). We use microdata from the EU Statistics on Incomes and Living Conditions (EU-SILC) made available by Eurostat under contract EU-SILC/2011/55, national EU-SILC data for Bulgaria, Estonia, Greece and Italy, made available by the respective National Statistical Offices, and (for the UK) the Family Resources Survey data made available by the Department of Work and Pensions via the UK Data Archive. The authors alone are responsible for the analysis reported here.

June 2014
© John Hills, Alari Paulus, Holly Sutherland & Iva Tasseva

Bibliographic Information
Hills, J., A. Paulus, H. Sutherland and I. Tasseva (2014), *A lost decade? Decomposing the effect of 2001-11 tax-benefit policy changes on the income distribution in EU countries.* ImPRovE Discussion Paper No. 14/03. Antwerp.

Information may be quoted provided the source is stated accurately and clearly.
Reproduction for own/internal use is permitted.

This paper can be downloaded from our website: http://improve-research.eu

ImPRovE
Poverty, Social Policy and Innovation

Table of contents

Abstract

This paper examines the extent to which tax and benefit policy changes introduced in the period 2001-11 had a poverty- or inequality-reducing effect. We assess whether the period was indeed a "missed opportunity" for policy changes to make a difference to poverty reduction since the Lisbon Treaty, given the general lack of improvement shown by poverty indicators. Our analysis uses the tax-benefit model EUROMOD and covers seven diverse EU countries: Belgium, Bulgaria, Estonia, Greece, Hungary, Italy and the United Kingdom. We apply the Bargain and Callan (2010) decomposition approach, extending it by separating the effect due to structural policy changes and the indexation effect. We find that the latter was typically more effective in alleviating poverty and inequality than changes to the structure of policies. In fact, most of the structural changes that governments introduced, especially in the 2007-11 crisis-onset period, had poverty and inequality-increasing effects. We find considerable variation between countries in how different policy instruments have been adjusted, and in the effects of these adjustments by income, by age and by household composition, showing the importance of understanding them together, rather than discussing just some in isolation.

JEL: D31, H23, H53, I32

Keywords: tax-benefit policies, European Union, income distribution, income poverty, microsimulation.

1 Introduction

A wide range of factors influence poverty and the overall income distribution. Many of these, such as demographic change or the distribution of work across households, are not under the direct control of policy makers or amenable to short-term public policy intervention, although of course active labour market policy and in-work benefits aimed at making work pay do have influences on labour market behaviour (Cantillon and Vandenbroucke, 2014: 321). In assessing the performance of government policy in terms of (income) poverty or inequality reduction it is important to isolate the impact of the most relevant factors that policy makers are able to control. In this paper we assess how changes to the structure and generosity of the system of cash income protection and the structure and parameters of direct personal taxes and social contributions over the period 2001-11 have had an impact on poverty and income inequality.

This period is particularly salient because, at its starting point, the Lisbon Strategy in 2000 set about achieving sustainable economic growth and increased social cohesion in the EU by 2010. There was a particular emphasis on reducing poverty and social exclusion and the Open Method of Coordination was established to improve national policy making towards this common goal (Cantillon and Vandenbroucke, 2014). However, what is known about the period since the early 2000s shows a mixed experience across EU countries in terms of changes to the risk of poverty rate and levels of income inequality.[1] The hoped for comprehensive "decisive impact on the eradication of poverty" (European Council, 2000) has not occurred and poverty and inequality levels in some countries have risen, not fallen. The explanations for this are many and various (Nolan et al., 2014). One common factor is the Great Recession in the second half of the period we consider. This paper addresses the question whether policy changes made by EU Member State governments in the period since Lisbon did in fact have a poverty-reducing effect, even if other factors were pushing in the other direction and the overall results were disappointing. In addition, it considers separately the pre-crisis period and that including its onset. To our knowledge, there is no comparative study that looks at the effect of policy changes in EU countries over this period, which allows an exploration of the changes to the welfare state contrasting those introduced during a period of economic growth with those made during economic recession.

A study for an earlier period, 1998-2001, by Bargain and Callan (2010) estimated the effects of tax-benefit policy changes on income distribution for the EU-15 countries. Among more recent cross-country evidence is the study by Avram et al. (2013) that assesses distributional effects of fiscal consolidation measures in 2008-2012 in nine EU countries. However, the focus of the study is mainly on austerity measures rather than all policy reforms in that period. Jenkins et al. (2013) present seven country case studies which examine changes in the income distribution at the beginning of the Great Recession, shedding light on changes in factors such as hours worked, the employment rate, GDP, poverty and inequality, but saying little about the role of tax-benefit policies in changing the income distribution. Bargain et al. (2013a) focus specifically on the period 2008-2010 and conclude that policies in that period helped to stabilise (or even decrease) inequality and poverty (measured

[1] For the period since the mid 2000s see the Eurostat database for indicators based on EU-SILC: At-risk-of-poverty rate by poverty threshold, age and sex (indicator: ilc_li02) and Gini coefficient of equivalised disposable income (ilc_di12). Prior to this there are no comparable sources of income distribution data. Appendix 1 summarises the available estimates for the countries covered in this paper. See Tóth (2014) for a state-of-the art synthesis of knowledge about the evolution of income inequality in EU and OECD countries up to 2010.

against a floating relative poverty line) in three out of four EU countries considered (France, Germany, the UK and Ireland).[2]

This paper assesses how the changes in taxes (direct taxes and social insurance contributions) and transfers (social security benefits and public pensions) in the 2000s affected the evolution of poverty and inequality, and the overall income distribution in selected EU countries. Many things – not least the initial period of growth and then the effects of the crisis itself – affected incomes and employment, and hence inequality and poverty, over this decade. But our aim is to abstract from these wider (and in some cases, very large) economic changes, and those arising from demographic and other population changes, and to focus on the direct redistributive effects of *policy*. Overall, our analysis should help to understand the different routes taken by countries since the Lisbon Treaty, and why in a period of growth, progress in poverty reduction was often disappointing, but also how some countries have been able to counter increases in poverty (on some definitions) since the onset of the crisis. In turn, these experiences may provide some lessons that suggest the relative importance of different instruments in their potential contribution (helpful or otherwise) to achieving the European Union's ambitions for poverty reduction by 2020.

We estimate the effect of policy changes on income distribution using microsimulation techniques, following the decomposition framework formalised in Bargain and Callan (2010) and also applied in Bargain (2012, 2012) and Bargain et al. (2013a, 2013b). The decomposition method separates the (direct) policy effect from other effects, i.e. changes in population characteristics such as the employment rate, fertility and household structure. We apply this method using the tax-benefit microsimulation model EUROMOD to seven EU countries in 2001-2011. The countries that we cover are Belgium, Bulgaria, Estonia, Greece, Hungary, Italy and the UK, which not only vary in the size and the type of welfare state but have also experienced very different kinds of economic change and policy reforms in the period considered.[3] We consider separately the period before the economic crisis (2001-07) and the years covering its start (2007-11), simulating the effects of the policy systems that each country had in place in 2001, 2007 and 2011 on a fixed population, with the characteristics and distribution of market incomes as they were in 2007.[4] We look in detail at the separate components of tax and transfer systems and at how they changed over the decade. This allows us to say not only whether policy changes as a whole tended to reduce or increase poverty or inequality, but also to identify which parts of the systems contributed to that.

In comparing policy systems from different points in time, decisions must be made about the adjustment of monetary levels of policy parameters (e.g. benefit payments or tax thresholds) to allow for changes in prices and incomes. We discuss the issue of how to index the counterfactual

[2] In addition, there are individual country studies including a long-standing body of literature focusing on the redistributive effect of tax-benefit policies in the UK context (see Clark and Leicester 2004, Sefton et al. 2009, Adam and Browne 2010 and Brewer and Wren-Lewis 2012).

[3] Examples of policy reforms in this period are the replacement of progressive income taxation with a flat income tax in Bulgaria and Hungary; introduction of contributory maternity and unemployment benefits in Estonia, the complete revision of the income tax schedules in Greece, the reforms to in-work benefits and tax credits in the UK and to income tax and family allowances in Italy. This list is for illustration only and is by no means comprehensive.

[4] It must be stressed here that the effect of policy changes is conditional on population characteristics and market incomes and thus, the analysis could yield different results if the population sample were different. This point is further explained in section 2.

policy systems and make use of three alternative options in our analysis, each with their distinct interpretations.

Our paper extends the literature in several ways. We extend the decomposition framework of Bargain and Callan (2010) by distinguishing between structural policy changes and indexation effects. We define *structural changes* as changes in the design of the tax-benefit system (e.g. introduction of a new benefit, change in the tax regime or social insurance contribution rate), which are usually presented explicitly as policy reforms, and *indexation effects* as changes to the policy parameters with monetary values (e.g. benefit amounts and tax thresholds), which are often less visible.[5] The indexation effect is derived from a comparison with a counterfactual based on a standardised indexation assumption and provides us with a measure of the effect of fiscal drag and benefit erosion. To our knowledge, this is the first paper measuring *actual* fiscal drag and benefit erosion for tax-benefit systems as a whole, while previous studies, e.g. Immervoll (2005), Immervoll et al. (2006) and Sutherland et al. (2008), have assessed it for the special case where policies are assumed to remain constant or adjusted only according to statutory rules (while incomes or prices increase).

We provide the empirical evidence on the effects of tax-benefit policy changes on the income distribution for a variety of EU countries over a time period covering an episode of growth as well as a period of economic crisis. We find that the effect of policy changes on both poverty and inequality often depends on the choice of counterfactual indexation against which policies are assessed, and on whether the poverty line is anchored to a fixed level of income (as under the 2007 system) or allowed to float with changes in income levels due to policy changes. Nevertheless, our robust findings are that compared to the 2001 system, the 2011 policy system is more effective in reducing the risk of poverty in Belgium, Estonia and the UK. However, policy changes have clearly resulted in increased poverty against an anchored line in Greece and against a floating line in Hungary. Irrespective of the indexation comparison, policy reforms contributed to income inequality reduction in Estonia and the UK both before and after 2007, but in the other countries the results vary by time period and the specific comparative system used.

Exploring the nature of the reforms, we find that – aside from structural changes – benefit amounts and tax thresholds were mostly increased by more than growth in prices and, during the crisis, also stayed ahead of growth in average market incomes (as it lagged behind price increases). Hence, the 'indexation effect' was typically more effective in alleviating poverty and inequality than changes to the structure of policies. In fact, most of the structural changes that governments introduced, especially in the 2007-11 crisis-onset period, had a poverty and inequality-increasing effect.

The paper is structured as follows. Section 2 describes the decomposition approach, building on Bargain and Callan (2010). Section 3 discusses the counterfactual indexation against which changes in the policy parameters are assessed. Section 4 explains the tax-benefit microsimulation model EUROMOD and the data used in the analysis. In section 5, we present our findings for poverty and inequality and detailed results on changes in the income distribution and in disposable income for different socio-economic groups, including by age. Section 6 concludes.

[5] These are distinct from non-monetary parameters such as percentage rates (e.g. income tax rates). Note also that we are not referring to (macro-level) monetary policies. On the other hand, structural changes could also involve changes in monetary parameters. However, they are to be distinguished from indexation effects if the change is not related to statutory or discretionary indexation, or if the government planned not only change in the amounts but effectively a change in the tax-benefit rules. For examples of structural changes and indexation effects, see Appendix 2.

2 Decomposition method

We use the decomposition approach which relies on counterfactual scenarios obtained with microsimulation techniques, and formalised by Bargain and Callan (2010) – BC hereafter. This method decomposes changes in the income distribution into (direct) policy, other and nominal effects, and we extend it further by decomposing the policy effect into structural change and indexation effect.[6] This allows us to gain a deeper understanding of the nature of the policy changes governments have undertaken.

Following the BC notation, we define *y* a matrix which contains information on market incomes and socio-economic and demographic characteristics of the households, and $d(p, y)$ a function that derives disposable incomes on the basis of y, distinguishing between the structure of the tax-benefit system (d) and policy parameters with monetary values (p). Let us also define I as a summary indicator for a part or the whole distribution of disposable income. This could be for example, average income for a specific group of households, an income inequality or a poverty measure.

The overall change in the distribution of disposable income between two periods (0 and 1) is[7]

$$\Delta I = I[d_1(p_1, y_1)] - I[d_0(p_0, y_0)] \quad (1)$$

This can be decomposed into the policy effect, other effect and nominal effect, by introducing counterfactual income distributions[8] where attributes (p, y, d) in one period are replaced sequentially with those from another period, one at the time. The counterfactuals also involve indexing incomes and monetary parameters (denoted with α) so that nominal units would be comparable over time. The choice of counterfactual indexation is important and we discuss it in detail in section 3. The *policy effect* shows the direct impact of tax-benefit policy changes ($d_0, p_0 \rightarrow d_1, p_1$) on the income distribution. The *other effect* is the impact on the income distribution from changes in market incomes and the characteristics of the population ($y_0 \rightarrow y_1$), such as employment, age, schooling or returns to schooling. Importantly, the policy effect is assessed conditional on the population characteristics either in period 0 or 1, and the other effect conditional on the tax-benefit system in period 0 or 1. Hence there is no unique decomposition sequence and instead multiple combinations exist. Decomposing the total change in the following way allows to assess the policy effect conditional on *end-period* market income and population, i.e. y_1:

[6] There is a well-established strand in the economic literature which focuses on decomposing the distribution of individual earnings, e.g. Juhn et al. (1993), DiNardo et al. (1996), Lemieux (2002), Fields (2003), Yun (2006), see Fortin et al. (2011) for an overview. However, this strand overlooks the role of taxation and ignores other income components. Bourguignon et al. (2008) take a step further by looking at household level income which includes market incomes, private transfers and retirement income but still excludes taxes and non-retirement benefits. The classical source decomposition of income inequality by Shorrocks (1982) accounts for all income components; but does not allow the effects due to policy *changes* to be distinguished from effects due to market income *changes*, or decomposing incomes in nominal terms.

[7] The same formula can be applied on other income concepts, e.g. means-tested and non means-tested benefit income, income from pensions, tax or social insurance liabilities, to show the policy effect by income types (as is done in Section 5).

[8] It is important to note that the counterfactual distributions have only a statistical interpretation and do not have any economic meaning, as we have not estimated any behavioural responses to changes in the attributes.

$$\Delta I = \underbrace{I[d_1(p_1, y_1)] - I[d_0(\alpha p_0, y_1)]}_{\text{Policy effect conditional on data 1}} + \underbrace{I[d_0(\alpha p_0, y_1)] - I[d_0(\alpha p_0, \alpha y_0)]}_{\text{Other effect conditional on indexed policy 0}} + \underbrace{I[d_0(\alpha p_0, \alpha y_0)] - I[d_0(p_0, y_0)]}_{\text{Nominal effect conditional on data 0}} \quad (2)$$

While the next approach quantifies the policy effect conditional on *start-period* market income and population, i.e. y_0: [9]

$$\Delta I = \underbrace{I[d_1(p_1, y_1)] - I\left[d_1\left(\frac{1}{\alpha}p_1, \frac{1}{\alpha}y_1\right)\right]}_{\text{Nominal effect conditional on data 1}} + \underbrace{I\left[d_1\left(\frac{1}{\alpha}p_1, \frac{1}{\alpha}y_1\right)\right] - I\left[d_1\left(\frac{1}{\alpha}p_1, y_0\right)\right]}_{\text{Other effect conditional on indexed policy 1}} + \underbrace{I\left[d_1\left(\frac{1}{\alpha}p_1, y_0\right)\right] - I[d_0(p_0, y_0)]}_{\text{Policy effect conditional on data 0}} \quad (3)$$

As can be seen in equation (2) and (3), the direct policy effect is obtained by keeping market incomes and population characteristics constant and altering the tax-benefit rules and the policy parameters with monetary values. The other effect is derived by applying the same policies on the populations in periods 1 and 0. In all cases, incomes and monetary parameters are adjusted with a factor α to account for differences in nominal levels over in time, which is captured with the *nominal effect*. [10]

A comprehensive approach would involve the assessment of all combinations[11] but also requires information on household characteristics before and after the policy change. While there is no comparable household information available both for the beginning and the end of the period of interest, we can still assess the policy effect – our key interest – in *absolute* terms though not in *relative* terms (i.e. how much it contributes to the total change) with household information available for a single point in time, conditional on that state. However, it is not possible to decompose the effect of changes in population characteristics in such a case.

We extend the decomposition framework by separating the policy effect to distinguish between the effect of changes to the monetary parameters (*indexation effect*) and to the tax-benefit rules (*structural change*). The indexation effect measures how governments have adjusted monetary parameters as a whole relative to e.g. changes in incomes or price levels, hence capturing changes in effective tax burden (i.e. fiscal drag) and relative value of benefits (i.e. benefit erosion). Note that as such we measure fiscal drag and benefit erosion which has actually occurred, while previous literature, e.g. Immervoll (2005), Immervoll et al. (2006) and Sutherland et al. (2008), has focused on a (hypothetical) scenario where policies are kept constant or adjusted only according to statutory rules. Structural change measures the effect of systemic changes, both substantial reforms such as the introduction of new benefits or taxes (or abolishing existing ones) as well as fine-tuning the existing design by altering particular non-monetary parameters (e.g. tax rate, benefit withdrawal

[9] Note that this is different from the second combination used in BC and emphasises the range of possibilities. We have chosen these particular combinations to facilitate the comparison of effects in two periods and overall.

[10] In case $I(.)$ refers to a scale-invariant measure, such as commonly used Gini coefficient or a relative poverty concept, the nominal effect is typically close to zero. This is because tax-benefits systems are usually homogenous of degree one, i.e. $(\alpha p, \alpha y) = \alpha d(p, y)$, as BC demonstrated for France and Ireland. The nominal effect does not collapse for absolute measures such as change in the average income.

[11] BC assess and summarise various combinations by employing the Shorrocks-Shapley approach, which effectively means calculating the average effect for a given component across combinations.

rate). Distinguishing between these effects allows therefore quantifying two types of government action with distinct aims, which might either counterbalance or reinforce each other.

To achieve this, we rewrite the policy effect component in equation (2) as

$$\underbrace{I[d_1(p_1, y_1)] - I[d_1(\alpha p_0, y_1)]}_{\substack{\text{Indexation effect conditional on} \\ \text{tax-benefit system 1}}} + \underbrace{I[d_1(\alpha p_0, y_1)] - I[d_0(\alpha p_0, y_1)]}_{\substack{\text{Structural change conditional on} \\ \text{monetary parameters 0}}} \tag{4}$$

and in equation (3) as

$$\underbrace{I\left[d_1\left(\frac{1}{\alpha}p_1, y_0\right)\right] - I[d_1(p_0, y_0)]}_{\substack{\text{Indexation effect conditional on} \\ \text{tax-benefit system 1}}} + \underbrace{I[d_1(p_0, y_0)] - \mathrm{I}[d_0(p_0, y_0)]}_{\substack{\text{Structural change conditional on} \\ \text{monetary parameters 0}}} \tag{5}$$

In the first case, we keep the tax-benefit rules, d, as of period 1 but apply in turn the monetary parameters from the two periods. In the second case, the monetary parameters, p, are as of period 0, and we alter the tax-benefit rules.[12] (Alternatively, we could split the structural change first and then the indexation effect.) An important thing to notice is that by construction, the choice of indexation factor α affects primarily the indexation effect (where it enters one of the terms), and only affects the structural change marginally (equation 4) or not at all (equation 5).

We can now summarise how these equations are applied to measure the (direct) policy effect in the period of interest (2001-11) as well as in two sub-periods, the period before the economic crisis (2001-07) and the years covering its start (2007-11). We have information available on the population characteristics and the distribution of market incomes in 2007 (see Section 4), i.e. y_{07}, but not in 2001 or 2011. Hence, we measure the policy effect in 2001-07 with equation (2) and the policy effect in 2007-11 with equation (3), i.e. both conditional on y_{07}. The advantage of measuring the effect in two periods in the same units is that it allows combining them easily to obtain the total policy effect in 2001-11:

$$\begin{aligned} I\left[d_{11}\left(\frac{1}{\alpha_{07-11}}p_{11}, y_{07}\right)\right] - I[d_{01}(\alpha_{01-07}p_{01}, y_{07})] \\ = \underbrace{I\left[d_{11}\left(\frac{1}{\alpha_{07-11}}p_{11}, y_{07}\right)\right] - I[d_{07}(p_{07}, y_{07})]}_{\text{Policy effect in 2007-11 (see eq. 3)}} \\ + \underbrace{I[d_{07}(p_{07}, y_{07})] - I[d_{01}(\alpha_{01-07}p_{01}, y_{07})]}_{\text{Policy effect in 2001-07 (see eq. 2)}} \end{aligned} \tag{6}$$

where α_{07-11} and α_{01-07} are the counterfactual indices for the period 2007-11 and 2001-07, respectively, and counterfactual disposable income distributions (*d*) are obtained with microsimulation techniques (see section 4). The policy effect in 2001-07 is decomposed further (using equation 4)[13]

$$\underbrace{I[d_{07}(p_{07}, y_{07})] - I[d_{07}(\alpha_{01-07}p_{01}, y_{07})]}_{\text{Indexation effect}} + \underbrace{I[d_{07}(\alpha_{01-07}p_{01}, y_{07})] - I[d_{01}(\alpha_{01-07}p_{01}, y_{07})]}_{\text{Structural change}}$$

[12] Note that the additional counterfactuals combine the structure and the monetary parameters from different systems. This can be challenging as structural policy changes introduce new monetary parameters or eliminate existing ones. This can be overcome by extending a given set of monetary parameters with those existing only in the other set. See Appendix 2 for examples.

[13] To be able to understand government actions and distinguish between structural reforms and simply adjustments to the values of benefit amounts and tax thresholds, we consulted with national experts from the countries considered in our analysis.

and the policy effect in 2007-11 (using equation 5)[14]

$$\underbrace{I\left[d_{11}\left(\frac{1}{\alpha_{07-11}}p_{11}, y_{07}\right)\right] - I[d_{11}(p_{07}, y_{07})]}_{\text{Indexation effect}} + \underbrace{I[d_{11}(p_{07}, y_{07})] - I[d_{07}(p_{07}, y_{07})]}_{\text{Structural change}}$$

When interpreting the results in Section 5, it is important to remember that these are *conditional* on the population characteristics being as of 2007.

3 Counterfactual indexation

In this section, we discuss the counterfactual indexation α used to adjust the policy parameters with monetary values for the differences in nominal levels over time and against which the actual changes to the parameters are assessed. We derive results for three scenarios, where α equals either growth in average market incomes, or change in CPI or 1; though in section 5 will mostly focus on the findings based on the first two.[15]

In the first indexation scenario, benefit levels and tax thresholds are indexed relative to average market incomes and we will refer to this as the Market Income Index (MII). This means that families on benefits and those with earnings are treated in the same way, and the *aggregate* share of income which is taxed away or added as benefits remains broadly constant (though the same is unlikely to hold for a given household as their market income can exceed or remain below the average growth rate).[16] Hence, the degree of redistribution would remain unchanged.[17] When there is real growth in household market incomes, families on benefits gain in real terms because they can afford to buy more goods. When nominal growth in average market incomes is less than the increase in CPI, families on benefits lose out in real terms because they can buy less.

With CPI indexation, benefit levels and tax thresholds follow the change in prices and families on benefits can afford to buy the same basket of goods over time. When there is real market income growth, families on benefits lose out relative to families with earnings. Families with earnings pay more taxes in real terms, because tax brackets grow at a lower rate than market incomes. Overall, tax revenues grow at a higher rate than benefit expenditures and the public finance position improves. When market incomes are falling in real terms, families on benefits gain relative to families with earnings. Families with earnings pay less tax in real terms because tax brackets grow at a higher rate than market incomes. Overall, the public finance position deteriorates.

[14] The term $d_{11}(p_{07}, y_{07})$ is a counterfactual for which we apply the 2011 tax-benefit rules in combination with the 2007 policy parameters. There are cases in which a certain benefit or tax component p existed only in 2011 and so we cannot borrow its 2007 counterpart. Such changes are considered as structural changes and have no indexation effect. The same applies for the term $d_{07}(\alpha_{01-07}p_{01}, y_{07})$.

[15] In principle, α can be also a vector. For example, a counterfactual scenario could be based on the statutory indexation rules as in Avram et al. (2013) which aimed to distinguish fiscal consolidation measures from "business as usual". The effect being measured in this case captures government actions such as changes to the indexation rules or ad-hoc increases/reductions in the levels of benefits and tax thresholds. We do not consider this approach here as we are interested in all policy effects, including those from statutory indexation to measure fiscal drag and benefit erosion.

[16] Again, this holds for tax-benefit systems which are approximately linearly homogenous (though not necessarily linear).

[17] BC argue for basing α on the growth of average market incomes between two periods as this yields a 'distributionally neutral' benchmark as illustrated in Callan et al. (2007). Clark and Leicester (2004) use as an index growth in nominal GDP and argue that it is a 'constant progressivity' index.

In the third indexation scenario, with α equal to 1, we compare the nominal levels of benefits and tax thresholds in the two periods. Though this is clearly a less realistic policy choice for the long run, this scenario is of interest because in some countries there is no statutory indexation of policy parameters in place and income changes measured simply in nominal terms provides additional context for results based on CPI and MII indexation. Our simulations compare what would happen if there were no changes in benefit levels and tax thresholds with the effect of the actual changes that took place.

We adopt each of these assumptions in turn and examine the effect of policy changes over the period 2001-2011 relative to growth in average market incomes, in real terms and in nominal terms. The changes that we capture include actual indexation practice, which may conform or not to one of the indexation assumptions, together with reforms to the structure of tax-benefit systems or individual taxes and benefits. Due to the very different movements in prices and incomes in the countries considered over this period, as shown in Table 1, the assumption about what index to use in constructing the counterfactual can make a critical difference to the conclusions that are drawn about the policy effect.

Table 1: Counterfactual indices for 2001-07 and 2007-11

Country	MII			CPI		
	2001-07	2007-11	Total	2001-07	2007-11	Total
Belgium	1.162	1.07	1.243	1.122	1.112	1.247
Bulgaria	1.849	1.584	2.929	1.195	1.223	1.461
Estonia	2.039	1.152	2.349	1.252	1.193	1.494
Greece	1.425	0.989	1.409	1.220	1.141	1.391
Hungary	1.673	1.129	1.889	1.369	1.205	1.65
Italy	1.161	1.039	1.206	1.150	1.084	1.247
UK	1.258	1.083	1.362	1.114	1.104	1.229

Sources: MII is calculated using the tax-benefit microsimulation model EUROMOD to derive the change in average market income. The 2007 values are taken from the input dataset (see Table 2) and the 2001 and 2011 values are obtained by updating (or backdating) 2007 incomes with separate factors by income source reflecting their average growth. The same CPI index which is used internally in EUROMOD is also used as the basis of the counterfactual indexation, for consistency.[18]

4 EUROMOD and data

We use the tax-benefit microsimulation model EUROMOD to assess household disposable income under the different policy scenarios. EUROMOD simulates direct personal tax and social insurance contribution liabilities and cash benefit entitlements for all EU member states based on the national tax-benefit policy rules for a given year and information available in the input micro-data (see Sutherland and Figari 2013). The model makes use of micro-data from nationally representative samples of households from the European Survey on Income and Living Conditions (EU-SILC) and Family Resources Survey (FRS) for the UK (see Table 2). The data contain detailed information on individual and household characteristics as well as income by source. It is important to note that our

[18] See EUROMOD Country Reports for more information on market income updating and the specific CPI sources.

simulations are based on 2007 market incomes and population characteristics. Thus, any changes to the demographic structure and socio-economic characteristics of the population such as education level, household structure and employment are not captured in the analysis.

Some policy instruments are not possible to simulate due to lack of information in the data. These include most contributory benefits and pensions (due to the lack of information on previous employment and contribution history) and disability benefits (because of the need to know the nature and severity of the disability, which is also not present in the data). In the case of non-simulated benefits (e.g. public pensions), we approximate 2011 (2001) policies with updating (backdating) entitlements observed for 2007 with a factor reflecting the growth in the average entitlement.[19] In this case, it is not possible to separate structural effects, and all changes in non-simulated benefits are shown as indexation effects.

Table 2: Data description

Country	Input dataset	Income reference period	Number of households	Number of individuals
Belgium (BE)	EU-SILC 2008	2007 (annual)	6,300	15,072
Bulgaria (BG)	EU-SILC and National SILC variables 2008	2007 (annual)	4,339	12,148
Estonia (EE)	National SILC 2008	2007 (annual)	4,744	12,999
Greece (EL)	National SILC 2008	2007 (annual)	6,504	16,814
Hungary (HU)	EU-SILC 2008	2007 (annual)	8,818	22,335
Italy (IT)	National SILC 2008	2007 (annual)	20,928	52,135
United Kingdom (UK)	FRS 2008/9	2008/9 (monthly)	25,088	57,276

The tax-benefit system d is not only a function of market incomes and population characteristics but also certain expenditures such as housing costs. As we focus on the static effect of policy reforms, abstracting from individual behavioural responses, expenditures are considered exogenous, similar to market incomes. Hence, expenditures are kept constant in all counterfactual scenarios at their 2007 level.

In this analysis, we make adjustments for tax evasion and for the non take-up of benefits in cases where we have evidence that these are sizeable phenomena. Adjustments for tax evasion are made for Bulgaria, Greece and Italy, exploiting the available evidence in each case.[20] We adjust for the non take-up of means-tested benefits and tax credits in the UK based on official statistics.[21] In each case the adjustments are the same or equivalent in each of the policy scenarios, so we abstract from any change in the extent of evasion or non take-up due to changes in policy systems or other factors. We

[19] See EUROMOD Country Reports for more information: https://www.iser.essex.ac.uk/euromod/resources-for-euromod-users/country-reports

[20] In Bulgaria taxes are assumed to be evaded on incomes calculated as the difference between formal earnings on which contributions are paid, and earnings as reported, at the individual level. On this basis evasion occurs at all income levels but is greater proportionally at higher incomes. In Greece adjustments are made on the basis of external macro estimates of income under-reporting to the authorities, by source. All recipients of each income source are assumed to evade by the same proportion. In Italy a similar approach is used, just for self-employment income.

[21] A take-up probability for each benefit and tax credit by claimant group is estimated on a caseload basis (using statistics from the Department of Work and Pensions and HM Revenue and Customs).

expect that estimates that assumed full compliance would be amplified to some extent, compared with those shown in the paper, and also that there would be a degree of re-ranking in the baseline income distribution, especially in the case of benefit non take-up. By definition, those not taking up entitlements to income-tested benefits are located towards the bottom of the income distribution.

5 Results

In this section we estimate the extent to which the seven countries on which we focus implemented policies that contributed to reducing or increasing poverty and inequality both in the period of general economic growth between 2001 and 2007, and then again in the crisis period from 2007 to 2011. As explained above, the results from EUROMOD isolate the direct effects of *changing policies* on the income distribution, by simulating what the distributions of net incomes would have looked like in 2007 if instead of the actual 2007 tax and transfer systems, alternative ones based on those from 2001 and 2011 had been in place (indexing monetary parameters). Our results therefore abstract from all the other things that led to changes in the income distribution over the period (including changes in the socio-economic and demographic composition of the population and behavioural reactions to policy changes), allowing us to concentrate on the direct effects of changes in government policy. Throughout we focus on estimates based on the counterfactuals scenarios involving indexation by market incomes (MII) and according to prices (CPI), see section 3, as these represents more realistic choices in the long run compared to no indexation at all. The counterfactual scenario without indexation is only used to illustrate the size of policy effect in nominal terms.

We start with explaining our findings for income poverty and inequality which is our main focus in this paper. We then present detailed results on changes in disposable income across the income distribution and by age group and household type. Disposable income is defined as the sum of gross market income and cash benefits, net of direct taxes and social insurance contributions. Throughout it is adjusted for differences in household size and composition using the modified OECD equivalence scale. The poverty rate is measured as the percentage of the population with household income below 60% of the median. We use two indicators: the poverty rate measured against a threshold that is fixed, using the median based on 2007 policies ("*anchored* poverty") and the poverty rate measured against a threshold that changes according to the median under the policy scenario that is used ("*floating* poverty"). Income inequality is measured using the Gini coefficient.

5.1 Effects of policy reform on poverty

Figure 1 and Figure 2 summarise the effects of changing policy in the seven countries in two ways. Figure 1 shows how the poverty rates would have changed against an *anchored* poverty line (i.e. fixed at the 2007 level) over the two sub-periods and over the ten years as a whole comparing the 2001 and 2011 systems, with all their parameters adjusted in turn by MII and CPI against the 2007 system, and with each system applied to the market income distribution in 2007. Figure 2 shows the effects of policy on poverty measured against a *floating* poverty line which moves with changes in policies. As with Figure 1, the comparison is with the 2001 and 2011 systems, adjusting all their parameters in turn with market income and price inflation, against the 2007 system. The change in the poverty rate is measured in percentage points. A positive change indicates an increase in

poverty, while negative change shows a drop in poverty. Table 3 provides the numbers behind Figure 1 and Figure 2 and also shows how the floating poverty line changes with the policy system.

Table 3: Poverty thresholds and poverty rates

	Poverty line			Poverty rate	*Anchored* poverty rate		*Floating* poverty rate	
Policy system:	2001	2007	2011	2007	2001	2011	2001	2011
Country			**MII indexation**					
Belgium	858	887	899	11.6	12.4	8.8	11.1	9.5
Bulgaria	220	215	207	21.1	21.2	23.6	22.2	22.3
Estonia	4,196	4,312	4,329	19.5	23.0	17.7	21.5	17.9
Greece	589	556	530	20.0	17.8	21.6	20.2	19.6
Hungary	50,316	51,697	53,619	12.9	11.8	12.0	10.7	13.6
Italy	798	774	771	17.8	17.7	18.0	19.0	17.8
UK	695	660	675	16.8	17.6	15.4	19.8	16.3
			CPI indexation					
Belgium	842	887	880	11.6	13.7	10.3	11.5	9.9
Bulgaria	193	215	227	21.1	30.7	17.0	26.4	19.7
Estonia	3,796	4,312	4,281	19.5	30.4	19.0	26.4	18.7
Greece	562	556	504	20.0	20.3	23.7	20.6	19.9
Hungary	45,231	51,697	51,858	12.9	19.2	13.6	11.9	13.8
Italy	794	774	755	17.8	17.9	19.2	19.1	18.0
UK	668	660	669	16.8	20.4	16.0	20.8	16.5

Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to the 2007 levels using MII or CPI. Poverty line is 60% of median equivalised household income, shown in monthly terms and in the national currency. Anchored poverty is measured using 60% of median equivalised household income in 2007 as the poverty line. Floating poverty is measured using 60% of median equivalised household income under each scenario as the poverty line.

As a rule of thumb, the higher the counterfactual indexation factor (i.e. alpha) for a given country, the less the anchored poverty rate is shown to decrease as a result of policy changes. This is because a higher alpha will bring indexed policy parameters, and hence counterfactual disposable incomes, closer to the 2007 levels (see equation 6 in section 2), thus requiring larger policy changes to achieve reductions in the anchored poverty rate. (Intuitively, any government action is less generous the higher the expectations about indexation.) This holds for all seven countries, both in the first period (2001-07) where MII exceeded CPI for all countries as well as in the second period (2007-11) where market incomes increased in real terms only in Bulgaria (see Table 1). This is also the case for the floating poverty line, although the effect is less pronounced due to the shifts in the poverty line.

5.1.1 Policy and anchored poverty rates

It is striking how varied the experiences of the seven countries were, both over the ten years as a whole and over the separate periods (see Figure 1). Measured against an anchored poverty line and compared to a MII-indexed counterfactual, policy reforms over the last decade had poverty-reducing

effects in Belgium (4 percentage points), Estonia (5 pp) and the United Kingdom (2 pp). In comparison with a price-indexed counterfactual scenario, policy changes have greatly reduced the risk of poverty in five out of the seven countries, the most in Bulgaria (14 percentage points) and Estonia (11 pp) and Hungary (6 pp), and in each case with the greatest effects between 2001-07. With economic growth, it was easier for these countries to increase the values of cash benefits that are received by those on low incomes more rapidly than price inflation and even than growth in market incomes, for instance, or to reduce taxes for those with low incomes. Those changes meant that poverty measured against an anchored line was lower than it would otherwise have been. In contrast, in Italy and Greece, compared to both 2001 MII and CPI indexed counterfactuals, poverty measured with an anchored line was higher or unchanged with 2011 policies.

We further divide the reforms into two parts – those due to structural reforms (such as changes in percentage rates of tax) and those due to ways in which the uprating of benefits and tax brackets differed from the overall rate of price inflation. With the exception of Italy, the 'indexation effect' shown in Figure 3 was poverty reducing in all countries and in both periods meaning that monetary parameters affecting those on low incomes were on the whole adjusted ahead of price inflation. However, structural policy changes increased poverty in Greece and Hungary in the first period and also increased poverty or had a neutral effect in all countries in the second period. These effects of structural policy changes are very similar with counterfactual indexation by MII (Figure 4), as indexation assumptions matter primarily for the 'indexation effect' component.[22] The poverty-reducing effect of indexation effects when using MII indexation of the counterfactual tends to be smaller or negative (increases in poverty), than when using CPI (Figure 3). In the second period, when in some countries CPI grew faster than MII (see Table 1), the use of the MII to index the counterfactual leads to the indexation effect being more strongly poverty-reducing. This applies in Greece indicating that the actual indexation of policies affecting those at risk of poverty was greater (or less negative) than the change in market incomes.

5.1.2 Policy and floating poverty rates

But if the focus is on *floating* poverty rates, the story of what happened in each country is rather different, taking the benchmark as being one where 2001 tax and benefit systems were adjusted in line either with price inflation or market income growth (see Figure 2). In this case it is only Hungary that emerges as having policies that meant that poverty was much higher than it would have been against the 2001 system indexed in line with MII or CPI – by 3 and 2 percentage points respectively, meaning that policy changes served to increase incomes at the median more than at the bottom of the distribution.

The extent to which policy changes had an impact on median incomes is what drives the differences between Figure 1 and Figure 2. Focussing on the first period and the changes relative to MII, using a floating poverty line reduces the poverty-reduction effect of policies (relative to using the anchored line as shown in Figure 1) in Belgium and Estonia as well as Hungary. This is consistent with policy changes having a greater positive (or less negative) effect on incomes at the median than on incomes at the bottom of the distribution. The reverse is the case in other countries where policy changes in this period favoured the bottom of the income distribution relative to the middle. In the second

[22] See corresponding terms in equation 4 (and 5) in section 2.

period the positions reverse for Estonia and UK (in opposite directions) with the poverty-reduction effect being smaller using the floating poverty line than the anchored line in the UK and larger in Estonia. It is also larger in Greece and Bulgaria, as in the first period.

There are similar effects when comparing the CPI-indexed results in Figure 1 and Figure 2, although the patterns across countries are not the same. However, it seems that regardless of the indexation assumption the early period policy changes favoured those at risk of poverty over those at the median in Greece and Italy. They were less beneficial to the poor than those with middle incomes in Hungary in both periods, in Belgium and Estonia in the first period and in the UK in the second.

Figure 5 and Figure 6 show the policy effect decomposed into that due to structural change and indexation effects. The findings remain broadly consistent with the results for anchored poverty. Exceptions indicate where policy changes have had a particularly large differential effect on incomes at the median (which determine the floating poverty line) and incomes of those in or close to poverty levels. For example, comparing Figure 3 and Figure 5 (which use CPI indexation as the counterfactual) shows that for Greece structural changes 2001-07 served to increase anchored poverty but reduce floating poverty. This is consistent with the changes affecting both incomes at the median and incomes at the bottom, but with a larger effect at the bottom. The opposite can be seen for Belgium (with CPI) and Estonia (with MII) in the early period.

5.1.3 Floating poverty reduction and the effect on the public finances

In understanding the effectiveness of policy, the scale of the impact it achieves on poverty may be related to the overall cost to public finances. If a country is reducing the net yield from its tax and transfer system, and so households as a whole are gaining, it may be easier to be reducing poverty at the same time. By contrast, if changes are generating net revenue and contributing to an improvement in the public finances, achieving a poverty-reducing effect at the same time may be harder.

The scale of the reductions in poverty using a floating line due to policy changes, shown in Figure 2 can be compared with the average net effects of policy on all households in the two periods shown in Figure 7. Here, we focus on the comparisons using the MII indexation counterfactual as these are most relevant for considering the fiscal effect. The diamonds in the diagram show to what extent tax and transfer systems in 2001-11 contributed to the average net gain or loss for households, and the bars show the overall net effect split into the two periods, 2001-07 and 2007-11.

What is most striking in this comparison is how much households in Greece lost on average over the decade compared to the 2001 system uprated in line with market incomes – by around 6 per cent in the first period and 5 per cent in the second period. But this contribution to public finances was accompanied by a small poverty-reducing effect (Figure 2). In other words, while the tax and transfer system was changed in ways that helped the public finances, at a net cost to households as a whole, this was done without the changes contributing to greater poverty when measured against a floating poverty line.

Households as a whole were also net losers between 2001 and 2007 from policy change in Bulgaria, Italy and the UK. In Bulgaria, this had a poverty-increasing effect; in Italy and the UK the balance of reforms had a poverty reducing effect. The Estonian case in this period was different, with a gain to households as a whole – and so a net fiscal cost – accompanying the poverty-reducing effect of

policy. In Belgium in this period there was also a gain to households as a whole but the policy changes had a small poverty-increasing effect. In Hungary there was a negligible change in aggregate household income but a large increase in poverty. In the period 2007-11 there was a big gain on average for all households in Hungary but a small poverty-increasing effect of policy.

One immediate lesson from this is that there have been periods when some governments reformed their tax and transfer systems in ways that generated net revenue by comparison with un-reformed (but income-adjusted) systems, but carried out those reforms in a way that had a poverty-reducing effect, or at least a neutral one. In some other countries although policy reforms resulted in gains in average household income, they left the bottom end of the distribution worse off compared to the median income.

5.2 Inequality effects of policy reforms

Looking more generally at effects on inequality overall, Figure 8 and Table 4 show whether policy changes tended to increase or to reduce overall inequality in disposable incomes, as measured by the Gini coefficient, relative to what would have happened with market income indexation or price indexation of the 2001 system. Using the first of these comparisons, the effects of policy changes on overall inequality were fairly neutral between 2001 and 2007 in five of the countries. But, as shown in Figure 9, which distinguishes the impacts of structural changes and indexation effects, in Italy and the UK, structural policy reforms implied a Gini coefficient that was more than 1 percentage point lower than it would have been, though this was partly offset by the indexation effect increasing inequality.

The effects on inequality were much more varied due to policy changes introduced in the second period – with a substantial contribution to higher inequality in both Bulgaria and Hungary (2 pp), but contributions to lower inequality in Belgium, Estonia, Greece and the UK. It is notable that in the 2007-11 period, structural reforms tended to increase inequality, with especially large effect in Hungary, but indexation had inequality-reducing effects (Figure 9). Overall, policy changes in the whole period served to increase the Gini in Hungary and Bulgaria (2 percentage points), and lowered it in the remaining countries (between 0.5-1.5 pp).

If we compare the policy reforms in the first period to a counterfactual 2001 price-indexed system, the results, as might be expected, show much greater inequality reduction for the 2007 system (Figure 10). We find that policy had an inequality reducing effect in all countries with especially large impact in Bulgaria and Estonia. In the second period, 2007-11, policy changes had much smaller effect on reducing inequality. In fact, in Italy and especially in Hungary the 2011 tax-benefit system was more conducive to inequality than the 2007 system. Over the whole decade, policy changes reduced the Gini in all countries except for Hungary where structural changes in the second period had large inequality increasing effect.

Table 4: Inequality levels measured by Gini coefficient

Country	Gini coefficient %					
	2001	2007	2011	2001	2007	2011
	MII indexation			CPI indexation		
Belgium	22.7	22.9	22.1	23.0	22.9	22.4
Bulgaria	34.8	35.2	36.9	38.9	35.2	34.6
Estonia	31.2	30.8	30.1	35.5	30.8	30.5
Greece	33.3	33.3	32.6	33.6	33.3	33.1
Hungary	24.9	25.0	27.2	26.2	25.0	27.6
Italy	32.0	30.7	30.9	32.0	30.7	31.1
UK	33.8	33.2	32.5	34.8	33.2	32.7

Source: Authors' calculations using EUROMOD version F6.36. Notes: 2001 and 2011 policy parameters are adjusted to the 2007 levels using MII or CPI. Gini coefficient is measured based on equivalised household disposable income.

5.3 Distributional effects by income group

A more detailed view of the factors driving this can be seen in Figure 11 and Figure 12 showing the impact of policy changes on successive tenths of the income distribution ordered by disposable incomes in 2007. The first shows the impact of changes between 2001-07, and the second 2007-11.

In these figures, as well as the effects of policy changes relative to MII and CPI indexation we also show the effects assuming that the counterfactual policies were constant in nominal terms. Looked at this way we can say that policy changes increased household incomes across the income distribution in all countries in the first period, except top income decile groups in Italy and the UK (see the green dotted line in Figure 11). Apart from Greece and Hungary with relatively flat profiles, the changes were also proportionally larger for lower income groups. Results based on the CPI counterfactual indexation (the blue dashed line) show, however, that policy changes were not everywhere sufficient to keep up with price increases, and even less so with changes in market incomes (the black line), with a positive effect present for all income groups only in Estonia. With CPI and MII indexation, the profiles are also flatter and even regressive for Belgium, Bulgaria and Hungary.

In the second period (Figure 12), the effects in nominal terms were still positive though to a lesser extent, except in Greece which was the only country of the seven considered here where policy changes reduced nominal incomes. The effects were broadly progressive in six countries and with a U-shape in Hungary. As in the earlier period, policy changes could not match the price increases in some countries, but unlike in the earlier period, the MII-based scenario now shows a less distinct picture compared to CPI-based scenario in all countries but Bulgaria, due to falling real market incomes. In comparison with the market income indexed counterfactual, the effects in Greece were even marginally better than in nominal terms. Overall, the differences between indexation scenarios are much more marked for lower income groups, especially in Bulgaria, Estonia and the UK. Under the comparison using MII indexation the overall picture is broadly progressive in Belgium, Estonia, Greece (except for the bottom decile group) and the UK, U-shaped in Hungary and flat in Italy.

These results use a particular ranking of households which is the same in each scenario – that using 2007 policies. We might expect the shape of the distributional effects to be different if an alternative

income measure were used for ranking. Figure 29 and Figure 30 in Appendix 3 show the results across the income distribution, as in Figure 11 and Figure 12, but using household incomes from the 2001 and 2011 policy scenarios (respectively, and in each case using indexation assumption-specific values) to rank households. The comparisons suggest that while the different rankings do indeed alter the pictures to some extent especially at the bottom of the distributions, the story that they tell is broadly the same.

5.3.1 Indexation effects

We further distinguish between the structural effect and indexation effect, focusing on the comparison with market income-based indexation (see Figure 13 and Figure 14). The level and incidence across the income distribution of the indexation effect is of particular interest because it allows us to assess the distributional effect of fiscal drag (in relation to taxes) together with the equivalent phenomenon for cash benefits, termed "benefit erosion". If the indexation effect is negative then this reflects fiscal drag/benefit erosion, meaning that governments are systematically raising more taxes or paying less in benefits (in relative terms) than would occur if the policy parameters kept pace with incomes. If the indexation effect is positive, then tax thresholds and benefits have been increased ahead of incomes (or prices, as in Figure 15 and Figure 16). Since stylised versions of the phenomena have been shown to be regressive in effect (Sutherland et al., 2008), the distributional effects of any actual fiscal drag or benefit erosion is of particular interest.

Figure 13 shows mixed evidence for the period 2001-07: indeed regressive effects from not indexing to market incomes in Bulgaria, Greece and the UK, though the effect is relatively flat in Belgium and Italy. The indexation effect was even beneficial to households in Estonia (in the bottom decile groups) and Hungary, and in the latter also progressive in its pattern. (Figure 14) the indexation effect is negative and also regressive only in Bulgaria. In the remainder of the countries (except Italy where there is negligible effect) indexation brings gains to households, progressively across the income distribution, except in Hungary where they are larger for households with higher income.

In interpreting the generally rather positive influence of indexation effects on income distribution it is important to remember that they include the effects of both regular statutory indexation and occasional ad hoc increases to payment levels and tax thresholds. It is also important to note that, in the second period market incomes were falling in real terms in all of the countries considered, except Bulgaria. Nevertheless, as Figure 16 shows, even when measured against prices indexation generally had a positive effect on incomes that was progressive across the income distribution, except in Hungary and Italy.

5.3.2 Structural changes and indexation effects

The incidence of indexation effects across the income distribution may be mitigated or re-inforced by the effects of structural policy changes. We consider this by looking at the countries in turn and mainly base our discussion around the effects using the market income indexed counterfactuals (see Figure 13 and Figure 14). Equivalent analysis using the CPI indexed counterfactual is shown in Figure 15 and Figure 16.

In *Belgium*, losses in the first decile group and slightly regressive gains in other decile groups were the result of structural changes in 2001-07 as the indexation effect was only minor. This resulted in a small increase in poverty and inequality (measured against MII indexation). The outcome was clearly the opposite in the second period, where structural changes were negligible and the indexation effect brought proportionally larger gains for the bottom of the distribution resulting in the largest poverty reduction among the seven countries and a substantial reduction in inequality.

In *Bulgaria* between 2001 and 2007 policy changes, particularly indexation that lagged behind income growth (the long-dash line), meant the greatest proportionate reduction for the bottom two groups, only partly offset by structural reforms (the short-dash line). This accounted for the inequality-increasing effect shown in Figure 8, although interestingly the more detailed effects on particular groups (particularly the elderly) meant that this did not lead to a rising poverty count (see the final part of this section). The balance of policy between 2007 and 2011 was more severely regressive (due to introduction of flat income tax), with gains for the top income group alongside a loss equivalent to 10 per cent of income for the bottom one, and smaller losses for successive tenths of the distribution. Over this period, floating poverty was higher as a result of the reforms.

In *Estonia* between 2001-2007 all income groups gained from structural reforms (somewhat more at the top), but the most notable factor contributing to reducing both poverty and inequality was more generous indexation benefiting the second, third and fourth income groups. A similar pattern followed in the second period, during which structural reforms slightly reduced net incomes across the distribution, but indexation benefited the bottom. More detailed analysis (see in the next subsection) shows that it was in particular the indexation of public pensions above the rate of income growth that was the main factor behind this.

In *Greece* structural reforms in the first period meant larger losses higher up the distribution, but indexation which fell behind income growth resulted in larger losses lower down. The combined effect was roughly proportional, with a neutral effect on inequality and a small downward effect on poverty (measured with the floating poverty line) that we saw above. In 2007-11 the effects of structural reform were sharply regressive, with larger losses for the bottom two tenths, but indexation ahead of income growth (or, rather, not matching income declines) was of more benefit to the bottom. This drove the overall inequality-reducing and poverty reducing effects. A major factor in the later period were tax increases, but accompanied by some rises in the value of both means-tested and non-means-tested benefits relative to other incomes.

In *Hungary* the dominant component of policy change from 2001-2007 were strongly regressive structural reforms that meant much larger losses for those at the bottom of the income distribution than at the top. In particular, tax reforms that benefited higher income groups the most, partly offset their losses from changes in other parts of the system, including social insurance contributions. However gains to lower income groups from indexation moderated this effect to some extent, leaving an overall neutral effect on inequality but a substantial effect in raising poverty. From 2007 to 2011 although positive, the effect on the income distribution was strongly regressive due to the introduction of flat income tax in 2011. As a result, as we saw before (Figures 2 and 8), inequality and floating poverty were increased by policy change.

The changes in *Italy* from 2001-2007 had more straightforward net effects, with structural changes, notably from taxation, reducing incomes by most proportionately, higher up the income distribution. This contributed to reducing inequality overall as well as the floating poverty rate. Uniquely amongst

the countries and the two periods studied, there was very little change in the distributional effect of the tax and transfer system between 2007 and 2011, which is why the effects on inequality and poverty were also small.

The position in the *United Kingdom* from 2001 to 2007 presents another pattern again. Overall, indexation behind market income growth meant losses for all income groups, and most for the poorest. But these were offset by structural reforms (to means-tested benefits) which benefited three bottom income groups in particular. This made the overall net effect progressive, reducing inequality and, especially, poverty. In the 2007-11 period, structural reforms (again especially to means-tested benefits) had regressive effects, but indexation of benefits and pensions above the rate of income growth had progressive effects which more than offset these, leading to a similar downward effect on inequality and a small poverty reducing effect.

The outcome in the first period looks much the same with the CPI indexation (Figure 15) for Belgium and Italy. The profiles also remain similar in Greece and Hungary, though due to larger indexation effects no decile group faces substantial losses overall. However, what is rather remarkable is the strongly progressive pattern of gains now emerging for Bulgaria, Estonia and the UK. These are especially large in the first two of these countries which experienced the largest growth in real incomes of the seven countries considered in the period 2001-07. As pointed out above, it is primarily the indexation effect which depends on the choice of the counterfactual indexation. The results for the second period (Figure 16) are very similar to those with MII indexation with only Bulgaria revealing substantial differences (matching those in the first period) as the only country which had a substantial real income growth. The overall effect is less beneficial in other countries, where price increases exceeded income growth.

Two things follow from this kind of breakdown. First, what can look like similar net effects of policy on inequality and poverty can result from very different patterns of change across the income distribution as a whole, and are often the result of structural reforms and indexation policies that act in opposite directions. In turn, what lies behind these changes can reflect the net effect of complex changes to different aspects of taxes and transfers that need to be seen together to understand the overall balance of policy change.

5.4 Effects of policy reforms by age group

The incidence of the effects of policy reforms by types of people is also of interest, and in particular whether younger people have been favoured over older people, or vice versa. Different criteria are often applied to transfers and taxes for pensioners from other parts of the tax and transfer systems. For this reason, we also look at the balance of the impacts of policy reforms by age group and by household type. Figure 17 (for 2001-07) and Figure 18 (for 2007-11) show the age effects using the market income counterfactual indexation scenarios, and Figure 19 and Figure 20, respectively, using the CPI-indexation.

Note here that the age group is that of the *individuals* but their incomes are based on those of the *household* in which they live (adjusted for household size, and assuming equal sharing). Thus changes that affect, for instance, transfers for children will have an impact on the age group containing children and on the age groups containing their parents. Similarly, if elderly people live in a larger

household, changes to public pensions will be taken as affecting all household members, not just the pensioners themselves.

Figure 17 shows some immediate contrasts in the first period. Here the solid line gives the combined net effect of structural reforms (short dashes) and the indexation effect (long dashes) relative to indexation of the 2001 system by market income. The countries divide into three groups.

In *Bulgaria*, *Estonia* and *Hungary* policies were tilted towards those aged 60 or more. In Estonia, that meant that the largest gains went to older people; in Hungary children and middle-aged people lost, but older people gained, while the effect for those over 65 was neutral in Bulgaria with everyone else losing out. In these countries it was growth of public pensions in excess of growth in market incomes that led to this. The same patterns are much more pronounced with the CPI-indexation (Figure 19), and now showing gains across all age groups in all three countries.

In *Belgium* and *Greece*, and less sharply in *Italy,* the changes in the first period were tilted against older people, with no gains or larger proportionate losses for those over 60. In all three cases this was largely driven by the shape of structural reforms, further compounded by indexation (of public pensions) in Greece that fell behind income growth. In Italy, households with elderly members also lost through lower public pensions, while large families benefited through gains in the value of their non-means-tested benefits, ameliorating the losses of children and parents to some extent. Greece is the only country where the trend is opposite with the CPI-indexation, i.e. now the elderly gaining and other age groups losing out.

In the *United Kingdom* the age distribution of losses from policy change was fairly neutral, although with somewhat smaller losses for the youngest children, helped in particular by an increase in the generosity of means-tested transfers (tax credits) for relatively low-income families with children. With the CPI-indexation, the effect has the U-shape across age groups with elderly and the youngest having small gains, and others experiencing small losses.

The patterns in the second period shown in Figure 18 were again different between the countries, and in some cases from the pre-crisis period.

In *Estonia* again and now in *Belgium* policy reforms were tilted towards the elderly, in both cases because of more favourable indexation than income growth (now negative in real terms) affecting public pensions received by going to households with elderly members. Reforms were largely neutral for people aged below 60 with MII indexation, though revealing small losses with the CPI indexation.

In *Italy* and the *United Kingdom* reforms generated small gains for older people, while in *Greece* losses were smaller for older people than others. In Italy and the UK that reflected relative gains in public pensions but in Greece relative gains in means-tested benefits for households with elderly members, while tax changes meant larger losses for other households. With the CPI indexation, preferential treatment of elderly people disappears in Italy and taking even the opposite direction in Greece.

In *Bulgaria* people of all ages lost slightly as a result of both structural reforms and indexation changes (based on MII), so the policy changes were largely neutral between age groups. However, the result is very different on the basis of price-indexation, with largest gains for elderly people compared to any other country.

But in *Hungary* there was a sharp reversal of the balance of reforms by age, with substantial gains for children and younger adults, but large losses for older people, on a scale that more than offset their gains in the first period. The changes over this period were dominated by tax reforms, with reduced taxes for non-pensioners (particularly those with higher incomes), but with some pensions brought into taxation.

Overall there were striking differences by age among the countries and between the two time periods in the impact of policy change. Older people were favoured (or less severely affected) in Bulgaria, Estonia and Hungary in the earlier period, and in Belgium, Estonia, Italy and the UK in the second period. But older people were the most adversely affected in Greece and Italy in the first period and – in a striking reversal – in Hungary in the second period.

5.5 Features of reform in each country

The broad impacts of the reforms in each country described above come from very varied changes within the separate components of their tax and transfer systems. This section describes the key features of those changes (for simplicity concentrating on comparisons with an income-indexed base), drawing on the analysis of the impact of policy reforms across each income group for the seven countries shown in Figure 21 and Figure 22 (for the two periods) as well as the effects by household type shown in Figure 23 and Figure 24. The household types are not mutually exclusive and include households with elderly people (aged 65+), households with children (aged under 18), households with one earner, households with more than one earner, large families (three or more children) and lone parent households. Both sets of charts break down the impacts into those due to changes in social insurance contributions, (direct) taxes, public pensions, non-means-tested benefits, and means-tested benefits. The line shows the net effect of all components (for Figure 21 and Figure 22 matching the net effects already shown in Figure 11 and Figure 12, respectively).

Results using the CPI indexed counterfactual are provided, but not discussed, in Figure 25 and Figure 26 for the effects across income decile groups and in Figure 27 and Figure 28 for the effects by household type.

5.5.1 Belgium

The overall regressive effects of Belgium's policy changes between 2001 and 2007 arise from large losses in the bottom decile group and solid gains in other decile groups. These were due to structural reforms reducing means-tested benefits and cutting taxes progressively (Figure 21), leading to a notable increase in average disposable income, while the indexation effect was only minor (Figure 13). Policy changes in the first period were targeted to the population aged under 65, while the effect on the elderly was neutral on average (Figure 23). Even though anchored poverty still increased somewhat, median income increased more than incomes at the bottom and both the poverty based on the floating poverty line and inequality increased slightly as noted earlier.

The period 2007-11 shows exactly the opposite with clearly progressive gains primarily through the indexation effect as now structural changes matter little. Policies now favoured the elderly very strongly, with public pensions kept ahead of market incomes, and apart from the relative increase of non means-tested benefits raising incomes for the two bottom deciles (Figure 22) and lone parent

families (Figure 24), there was little other change. Policies decreased inequality and especially poverty – more than in any other country – in the second period, as well as for the whole period.

5.5.2 Bulgaria

Similarly to Belgium, Bulgaria's policy changes in the first period were regressive with the largest losses concentrated on the bottom decile group and as can be seen in Figure 21 also stemming from a fall in the value of means-tested benefits. This however was a result of indexation of transfers that fell well below income growth, only partly offset by some structural reforms to them. Figure 23 shows that large families (with 3 or more children) were the biggest losers from these changes, while pensioners were comparatively protected. As we noted above, however, this was not associated with a large impact on poverty rates because the households affected from the first income decile group were already in poverty.

The largest changes overall were losses affecting all income groups from structural changes in social insurance contributions (increased rates for employees[23]), partly offset for all income groups apart from the lowest by structural reforms to direct taxes (reduced tax rates).

In the second period (Figure 22), the net effects of the policy changes were more sharply regressive. In 2008, Bulgaria replaced the progressive income taxation it had in place with a flat tax reform with no tax exemption for the poor which lead to increases in average tax rates across the whole income distribution with the exception of the top two income deciles. In this case, losses from means-tested benefits for the poorest group (due again to indexation below income growth) were combined with structural tax changes from which all income groups lost, apart from the top two income groups. Again families with children were most affected by the changes, particularly the largest families. Families with elderly members were relatively well protected.

5.5.3 Estonia

By contrast, Estonia's reforms between 2001 and 2007 were (mostly) progressive. Figure 21 shows that this resulted from substantial benefits to the bottom half of the income distribution from improved public pensions (from indexation), at the same time as structural reforms to taxation (the flat tax rate lowered by 4 pp) that benefited the top half of the income distribution almost as much. Households with elderly members, unsurprisingly gained most from the pension changes, and lost least from higher social insurance contributions, accounting for the sharp tilt in gains towards older people.

In the second period shown in Figure 22, the dominant feature was again more generous public pensions from indexation above the rate of income growth (which in turn lagged behind price increases). For higher income groups the negative effects of higher social insurance contributions outweighed benefits from lowering the income tax rate further, and the top half of the distribution lost overall. The end result was as described above: progressive changes overall, tilted towards those

[23] Although total social insurance contributions (SIC) paid by employees and employers fell, the ratio between employee and employer SIC fell from 80:20 to 65:35 in favour of the employers. As a result, employees ended up paying higher SICs.

aged over 60, and contributing both to lower inequality and lower poverty than they would otherwise have been.

The main driver of the overall poverty-reducing impact over the decade as a whole – the largest amongst the seven countries – was therefore the way in which public pensions were indexed more rapidly than income growth, both before and after the crisis, but also due to the pensioners being more concentrated around the poverty line. In the first period there was a significant net cost of the reforms as a whole, equivalent to 3 per cent of household income overall. In the second period they had a neutral effect (compared to the 2007 system indexed to income growth).

5.5.4 Greece

In the first period, the losses across the income distribution (Figure 21) stemmed from a combination of structural reforms to social insurance contributions and taxes as well as indexation of public pensions (the latter spread remarkably equally across the income distribution) that was slower than income growth. The overall comparatively small effects of tax changes resulted from structural reforms (to the rate schedule) leading to higher taxes, offset by changes to indexation (to the size of the general tax allowance). The means-tested benefit for large families became universal (non-means tested) in 2002, which explains the drop in disposable income due to means-tested benefits offset by a increase in disposable income due to non means-tested benefits. The larger population coverage of the universal benefit moderated losses for the lowest income groups a little.

The second period was dominated by tax changes that reduced incomes fairly evenly across the income distribution. The structural components of this were regressive, while the indexation effect (in the presence of falling average market income) offset this at the bottom, leaving a neutral effect overall. There were some relative gains for the bottom half of the income distribution from means-tested benefits, non-means-tested benefits and public pensions falling less than market incomes, at the same time as structural reforms reduced the value of public pensions to those in higher income groups. Together these produced the progressive revenue-raising effect shown in Figure 12, and the small contribution of policy change to lower floating poverty across the ten years as a whole.

5.5.5 Hungary

As we already saw, the net effect of policy change from 2001 to 2007 in Hungary was regressive. Figure 21 shows this resulted from means-tested benefit losses for the bottom two income groups, losses from social insurance contributions across the distribution, and pension and structural tax reforms benefiting the top half of the distribution. Overall, the bottom tenth were 10 per cent worse off than they would have been with an unchanged but income-linked system, but the top half gained (apart from the top tenth). Larger families were the biggest net losers from the reforms, while households with elderly members were the biggest gainers. Overall the changes had a significant effect, leading to the largest increase in poverty (measured with the floating poverty line) among the countries in the first period.

On the surface, the substantial changes between 2007 and 2011 were from a structural tax reform that brought its greatest benefits to the highest income groups and a substantial positive effect from public pension changes relative to market incomes (Figure 22). But the effect on average was offset

by certain pensions being brought into tax (Figure 24). It was the regressive nature of the tax reforms in the later period, combined with the reductions in the relative value of means-tested benefits for non-pensioners in the earlier period that meant that policy changes overall had the effect of increasing poverty over the decade as a whole.

5.5.6 Italy

The composition of policy change in Italy was more straightforward. Between 2001 and 2007 it was dominated by revenue-raising and progressive structural tax changes, with little else changing apart from small losses to all income groups from indexation of public pensions falling behind market incomes. While all household types lost, large families were somewhat protected.

Between 2007 and 2011 there were few structural reforms, and the very limited net effect of policy change for all income groups was the result of public pension indexation that was more generous than a link to incomes and tax bracket indexation that was less generous. The top income group had a small net gain as a result of structural tax changes, but the scale of the effects on all groups was much more modest than for any of the other countries in the post-crisis period.

5.5.7 United Kingdom

Finally, Figure 21 shows that it was the increased generosity of means-tested benefits for households in the first three decile groups (as a result of a structural reform associated with the 'new tax credits' introduced by the Blair government) that meant the reforms overall were progressive. In other respects, all income groups were affected by increased taxes (from both structural and indexation changes) and falls in the relative value of both public pensions and non-means-tested benefits. This combination contributed to reducing inequality as well as poverty.

In the post-crisis period from 2007 to 2011 shown in Figure 22, the reforms overall had a progressive effect, with the lowest income groups gaining most proportionately from indexation of public pensions and means-tested benefits that was more generous than overall income growth (partly offset by structural reforms including higher taper rates for tax credits which reduced their reach up the income distribution). At the same time, the top income group lost from the addition of a top income tax rate and an increase in social insurance contribution rates for higher earners. This left the reforms reducing inequality and contributing to a modest downward effect on poverty.

6 Conclusions

In this paper we assess the direct effect of tax-benefit policy changes on the distribution of household disposable income, and on poverty in particular, in seven EU countries in 2001-2011. We further split the period into two using 2007 as the mid-point to investigate policy effects before and since the Great Recession. We follow the decomposition framework of Bargain and Callan (2010), extending it further to distinguish between structural policy reforms and how policy parameters such as benefit amounts and tax bracket thresholds have evolved over time (i.e. the indexation effect). The assessment of policy effects relies on constructing counterfactual income distributions (using the microsimulation method), where the choice of an appropriate indexation factor for monetary

parameters (to adjust the counterfactual for changes in nominal levels over time) can be – as we demonstrate – important for the outcome.

Our main empirical findings are the following. The effect of policy changes on poverty (measured using an anchored poverty line) varied across countries with a clear poverty-reducing effect in Belgium, Estonia and the UK, and an unambiguous poverty-increasing effect in Greece and Italy. In terms of floating poverty (i.e. shifting poverty lines), policy changes had a poverty-increasing effect only in Hungary. In the crisis period, it was the indexation effect which contributed to poverty (as well as inequality) reduction in nearly all cases, meaning that monetary parameters on the whole were adjusted ahead of price inflation and often also relative to market incomes, since these were falling in real terms (except in Bulgaria). Structural changes typically the opposite effect on poverty. This means that countries undertook deliberate reforms to their systems rather than resorting to less explicit fiscal drag and benefit erosion when their public finances became under pressure. Except in Belgium, policies since the crisis also achieved less in terms of poverty reduction compared to the pre-crisis period. This is not only problematic in the sense that it implies the drawing back of safety nets at the time when they are needed the most, but also points towards the need to achieve more under favourable economic conditions in order to be better prepared for more challenging economic periods. On the other hand, there are periods when governments reformed their systems resulting in net revenue but in a way that avoided increasing poverty. Examples include Greece in both periods (only for poverty using a floating line) and UK in the first period. There are also examples where policy changes that reduced revenue also resulted in higher poverty (Hungary, using poverty with a floating line).

Overall there were striking differences by age between the countries and the two time periods in the impact of policy change. Older people were favoured (or less severely affected) in Bulgaria, Estonia and Hungary in the period before 2007, and in Belgium, Estonia, Italy and the UK after 2007. But older people were the most adversely affected in Greece and Italy in the first period and – in a striking reversal – in Hungary in the second period

There are two obvious caveats and hence also directions in which our work can be taken forward. First, due to limited data availability we assessed *absolute* policy effects conditional on 2007 (i.e. mid-period) market incomes and population structure. Using data from another point in time would not necessarily produce the same results. Indeed, in order to analyse policy effects in *relative* terms (i.e. as a proportion of total changes) as well as interactions with other changes, additional decompositions would need to be carried out on datasets from the start- and end-periods (i.e. 2001 and 2011). However, the EU-SILC survey only started in 2003 (with a few countries) and achieved near-full EU coverage in the 2005 wave.[24] Alternatively, other income surveys for 2001 could be considered, but in that case part of the changes in the income distribution would be also due to differences in the underlying survey methodology. The 2012 wave (with 2011 incomes), on the other hand, is under construction at the time of writing. Second, we focus on direct effects only and leave aside behavioural adjustments (e.g. labour supply) to policy changes. This might be an important omission if the policy changes introduced in the period were specifically designed to alter the incentive e.g. take paid work or work longer hours. An extension of the work here could attempt to capture these as well.

[24]http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/documents/SILC_IMPLEMENTATION_headezr.pdf

Looking across our results, what is most striking is quite how varied and complex the differences between countries in their use of fiscal instruments and in their effects were. For policy-making this illustrates the freedom of action policy-makers have, even when they are trying to achieve similar changes in their fiscal positions. The period from 2001 to 2011 was not a 'lost decade' as policy changes did have poverty-reducing effects in most of the countries that we examine. The caveats about lack of comparable poverty estimates for the period 2001-11 notwithstanding, the available evidence (Appendix 1) suggests that out of the seven countries, poverty has risen over the period in five countries and fallen only slightly in two (Estonia and UK). Only in Hungary can some of the observed increase in poverty be explained by government action through tax-benefit policy changes. In the other countries poverty would have risen by more (or fallen by less), had policies remained as in 2001.

From a policy point of view there is a clear need to understand the important influence of indexation of policies on the outcomes in terms of poverty and inequality and relative gains and losses by social and demographic groups. Especially in times of economic volatility, whether policies should keep pace with market incomes, with prices or some other economic variable is an important issue for consideration and open debate. Indexation by the growth in market incomes keeps public support in line with changes in private incomes, and hence relative poverty using a floating threshold constant, though may imply that benefit levels are cut in times of economic hardship.

Indexation of policies by changes in the price level means that public support may lag behind market incomes in times of growth but protects living standards in periods when real (market) incomes are falling, also offering greater automatic stabilisation. If short-term fiscal considerations make this impossible then, as our analysis shows for some countries, it is still possible to structure policy changes to provide relative protection for those on low incomes.

From an analytical point of view, our detailed analysis of the nature of the policy changes reveals that what can look like similar net effects of policy on inequality and poverty can result from very different patterns of change across the income distribution as a whole, and are often the result of structural reforms and indexation policies that act in opposite directions. In turn, what lies behind these changes can reflect the net effect of complex changes to different aspects of taxes and transfers that need to be seen together to understand the overall balance of policy change.

References

Adam, S. and J. Browne (2010). Redistribution, work incentives and thirty years of UK tax and benefit reform. IFS Working Paper 10/24, The Institute for Fiscal Studies.

Avram, S., F. Figari, C. Leventi, H. Levy, J. Navicke, M. Matsaganis, E. Militaru, A. Paulus, O. Rastrigina, and H. Sutherland (2013). The distributional effects of fiscal consolidation in nine EU countries. EUROMOD Working Paper EM2/13, University of Essex.

Bargain, O. (2012a). Decomposition analysis of distributive policies using behavioural simulations. *International Tax and Public Finance 19*(5), 708–731.

Bargain, O. (2012b). The distributional effects of tax-benefit policies under New Labour: A decomposition approach. *Oxford Bulletin of Economics and Statistics 74*(6), 856–874.

Bargain, O. and T. Callan (2010). Analysing the effects of tax-benefit reforms on income distribution: A decomposition approach. *Journal of Economic Inequality 8*(1), 1–21.

Bargain, O., T. Callan, K. Doorley, and C. Keane (2013a). Changes in income distributions and the role of tax-benefit policy during the great recession: An international perspective. IZA Discussion Paper 7737.

Bargain, O., M. Dolls, H. Immervoll, D. Neumann, A. Peichl, N. Pestel, and S. Siegloch (2013b). Partisan tax policy and income inequality in the U.S., 1979-2007. IZA Discussion Paper 7190.

Bourguignon, F., F. Ferreira, and P. Leite (2008). Beyond Oaxaca-Blinder: Accounting for differences in household income distributions. *Journal of Economic Inequality 6*(2), 117–148.

Brewer, M. and L. Wren-Lewis (2012). Accounting for changes in income inequality: Decomposition analyses for Great Britain, 1968-2009. ISER Working Paper 2012-17, University of Essex.

Callan, T., K. Coleman, and J. R. Walsh (2007). Assessing the impact of tax-transfer policy changes on poverty: methodological issues and some European evidence. In O. Bargain (Ed.), *Micro-Simulation in Action: Policy Analysis in Europe Using EUROMOD*, Volume 25 of *Research in Labor Economics*. Elsevier.

Cantillon, B. and F. Vandenbroucke (Eds.) (2014). *Reconciling Work and Poverty Reduction*. New York: Oxford University Press.

Clark, T. and A. Leicester (2004). Inequality and two decades of British tax and benefit reforms. *Fiscal Studies 25*(2), 129–158.

Dennis, I. and A.-C. Guio (2004a). Monetary poverty in New Member States and Candidate Countries. Statistics in Focus 12/2004, Eurostat, Luxembourg.

Dennis, I. and A.-C. Guio (2004b). Poverty and social exclusion in the EU. Statistics in Focus 16/2004, Eurostat, Luxembourg.

DiNardo, J., N. M. Fortin, and T. Lemieux (1996). Labor market institutions and the distribution of wages, 1973-1992: A semiparametric approach. *Econometrica 64*(5), 1001–1044.

European Council (2000). Lisbon European Council Presidency Conclusions 23-24 March.

Fields, G. S. (2003). Accounting for income inequality and its change: A new method, with application to the distribution of earnings in the United States. In S. W. Polachek (Ed.), *Worker Well-Being and Public Policy*, Volume 22 of *Research in Labor Economics*, pp. 1–38. Emerald Group Publishing Limited.

Fortin, N., T. Lemieux, and S. Firpo (2011). Decomposition methods in economics. In O. Ashenfelter and D. Card (Eds.), *Handbook of Labor Economics*, Volume 4, Part A, Chapter 1, pp. 1–102. Elsevier.

Immervoll, H. (2005). Falling up the stairs: The effects of 'bracket creep' on household incomes. *Review of Income and Wealth 51*(1), 37–62.

Immervoll, H., H. Levy, C. Lietz, D. Mantovani, and H. Sutherland (2006). The sensitivity of poverty rates to macro-level changes in the European Union. *Cambridge Journal of Economics 30*(2), 181–199.

Jenkins, S. P., A. Brandolini, J. Micklewright, and B. Nolan (Eds.) (2013). *The Great Recession and the Distribution of Household Income*. Oxford University Press.

Juhn, C., K. M. Murphy, and B. Pierce (1993). Wage inequality and the rise in returns to skill. *Journal of Political Economy 101*(3), 410–442.

Lemieux, T. (2002). Decomposing changes in wage distributions: A unified approach. *The Canadian Journal of Economics / Revue canadienne d'Economique 35*(4), 646–688.

Nolan, B., W. Salverda, D. Checchi, I. Marx, A. McKnight, I. G. Tóth, and H. G. van de Werfhorst (Eds.) (2014). *Changing Inequalities and Societal Impacts in Rich Countries: Thirty Countries' Experiences*. Oxford University Press.

Sefton, T., J. Hills, and H. Sutherland (2009). Poverty, inequality and redistribution. In *Towards a more equal society? Poverty, inequality and policy since 1997*, pp. 21–47. Bristol: The Policy Press.

Shorrocks, A. F. (1982). Inequality decomposition by factor components. *Econometrica 50*(1), 193–211.

Sutherland, H. and F. Figari (2013). EUROMOD: the European Union tax-benefit microsimulation model. *International Journal of Microsimulation 6*(1), 4–26.

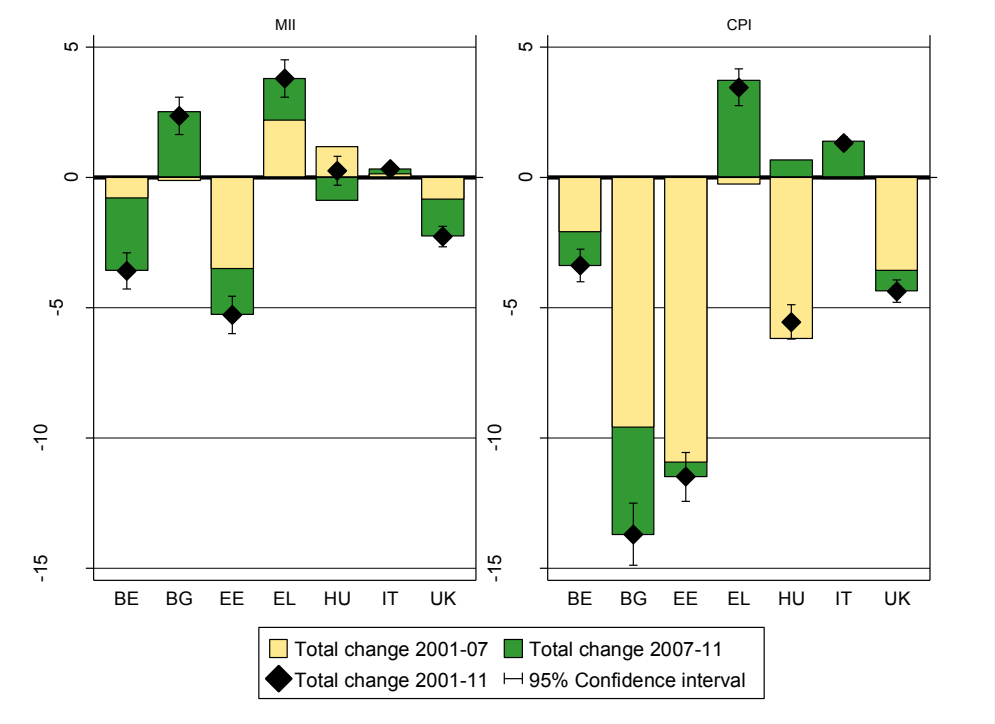
Sutherland, H., R. Hancock, J. Hills, and F. Zantomio (2008). Keeping up or falling behind? The impact of benefit and tax uprating on incomes and poverty. *Fiscal Studies 29*(4), 467–498.

Tóth, I. G. (2014). Revisiting grand narratives of growing inequalities: Lessons from 30 country studies. In B. Nolan, W. Salverda, D. Checchi, I. Marx, A. McKnight, I. G. Tóth, and H. G. van de Werfhorst (Eds.), *Changing Inequalities and Societal Impacts in Rich Countries: Thirty Countries' Experiences*. Oxford University Press.

Yun, M.-S. (2006). Earnings inequality in USA, 1969-99: Comparing inequality using earnings equations. *Review of Income and Wealth 52*(1), 127–144.

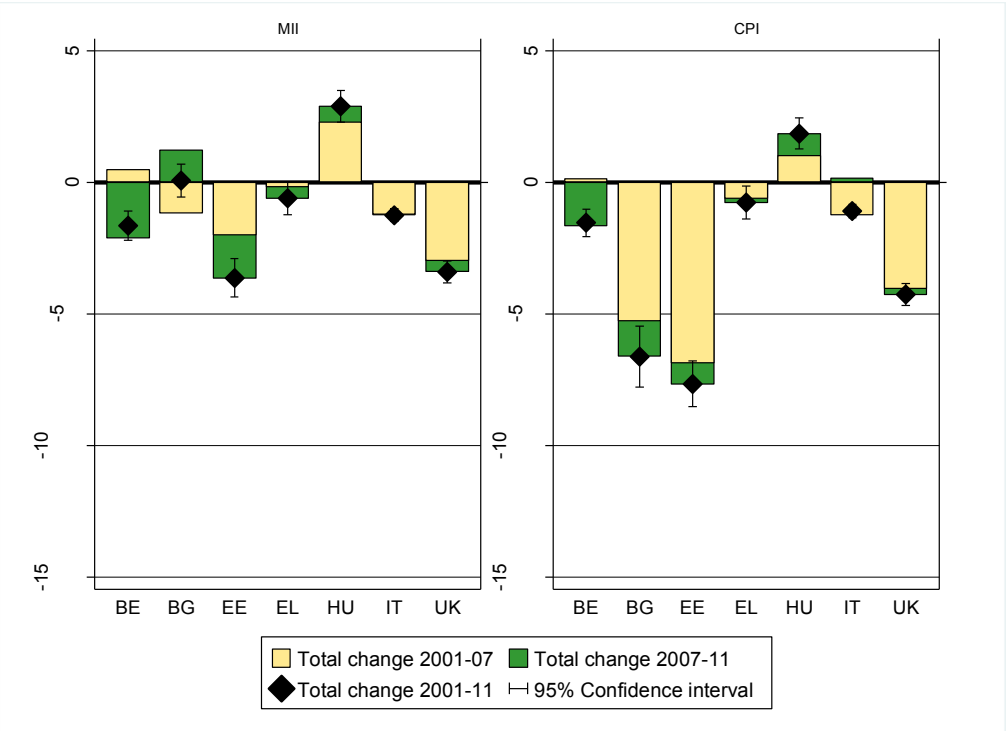
Figures

Figure 1: Effect of policy changes 2001-2011 on anchored poverty



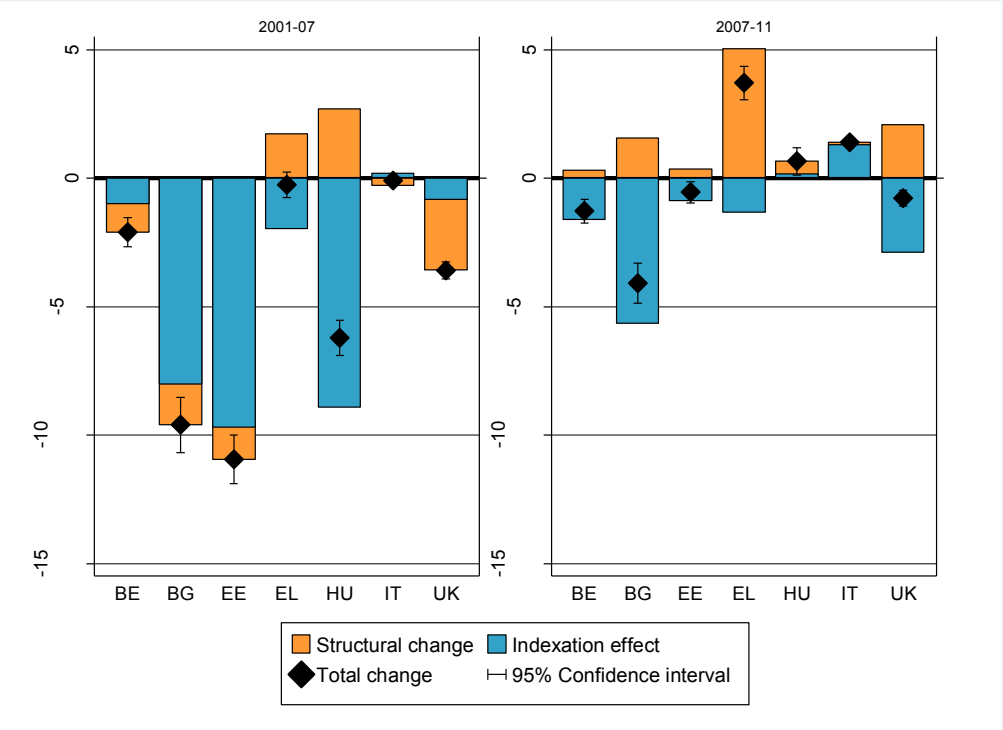
Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to 2007 levels using growth in market income (MII) or CPI; anchored poverty is measured using 60% of median equivalised household income in 2007 as the poverty line. Standard errors for confidence intervals are calculated using the delta method.

Figure 2: Effect of policy changes 2001-2011 on floating poverty



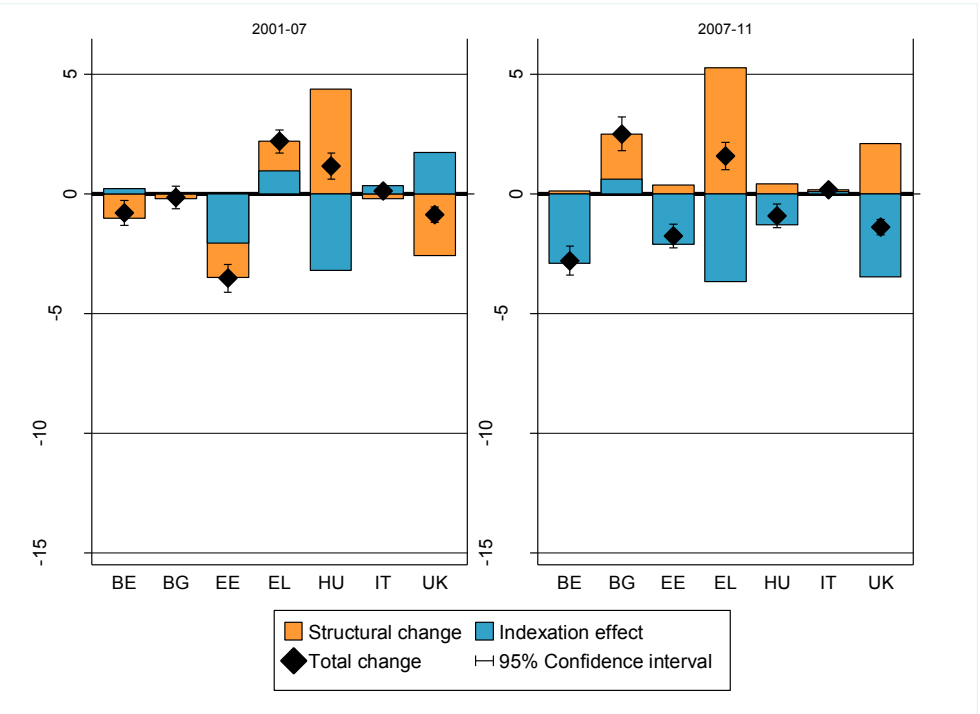
Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to 2007 levels using growth in market income (MII) or CPI; floating poverty is measured using 60% of median equivalised household income under each scenario as the poverty line. Standard errors for confidence intervals are calculated using the delta method.

Figure 3: Effects of policy changes against a CPI-indexed counterfactual on anchored poverty: structural change and indexation effect, 2001-07 and 2007-11



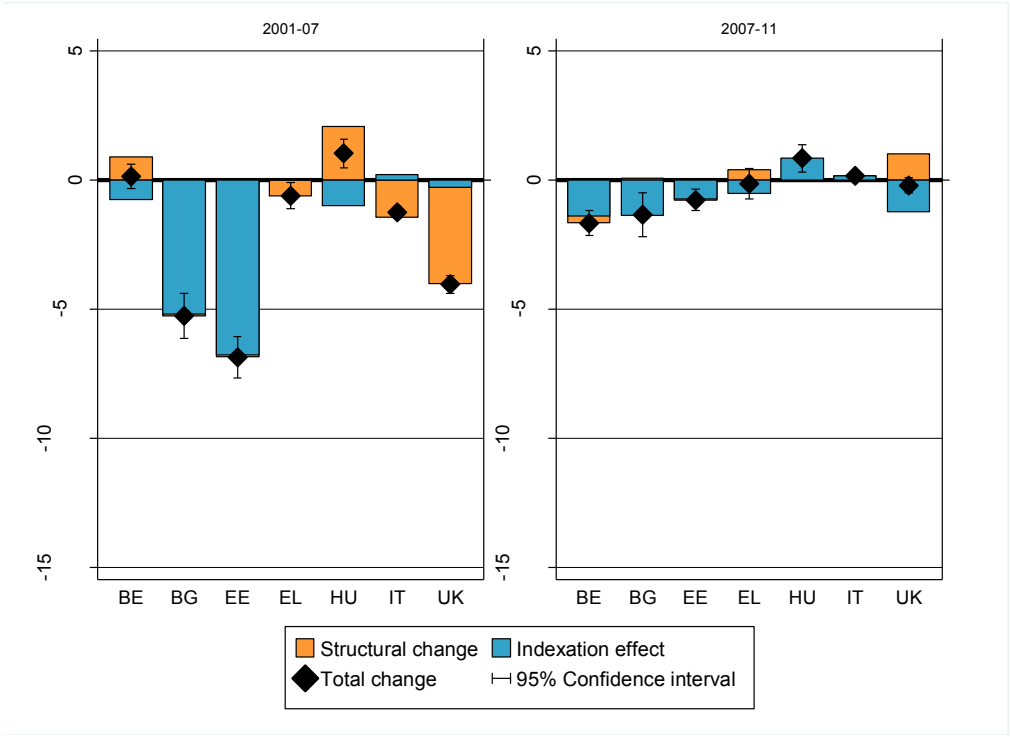
Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to the 2007 levels using CPI; anchored poverty is measured using 60% of median equivalised household income in 2007 as the poverty line. Standard errors for confidence intervals are calculated using the delta method.

Figure 4: Effects of policy changes against a market income-indexed counterfactual on anchored poverty: structural change and indexation effect, 2001-07 and 2007-11



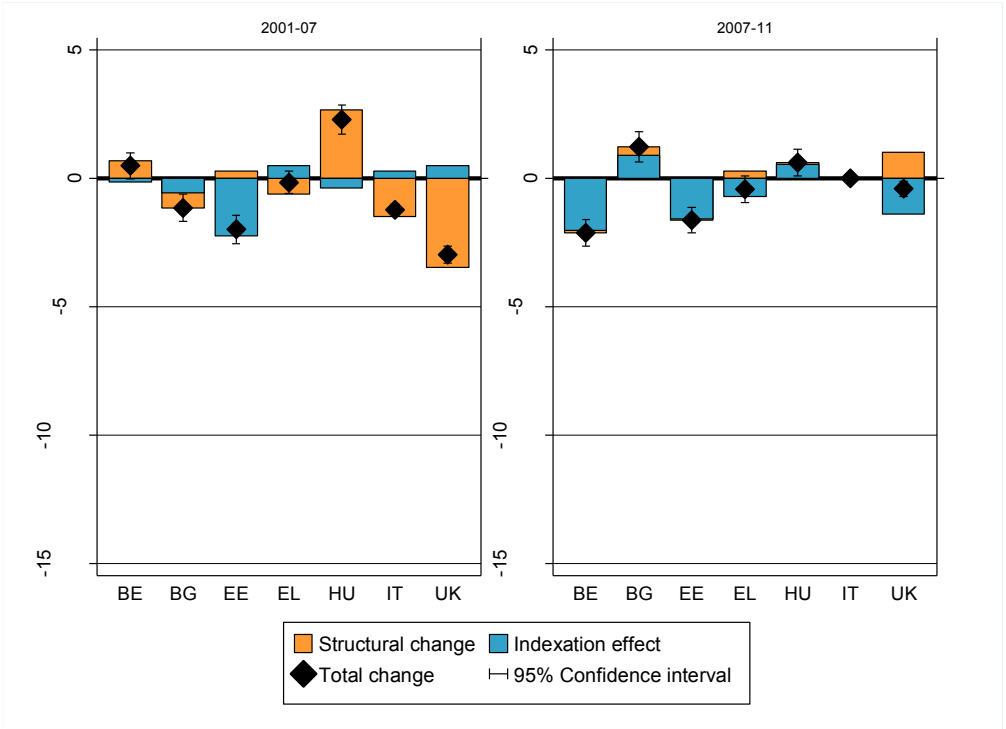
Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to the 2007 levels using MII; anchored poverty is measured using 60% of median equivalised household income in 2007 as the poverty line. Standard errors for confidence intervals are calculated using the delta method.

Figure 5: Effects of policy changes against a CPI-indexed counterfactual on floating poverty: structural change and indexation effect, 2001-07 and 2007-11



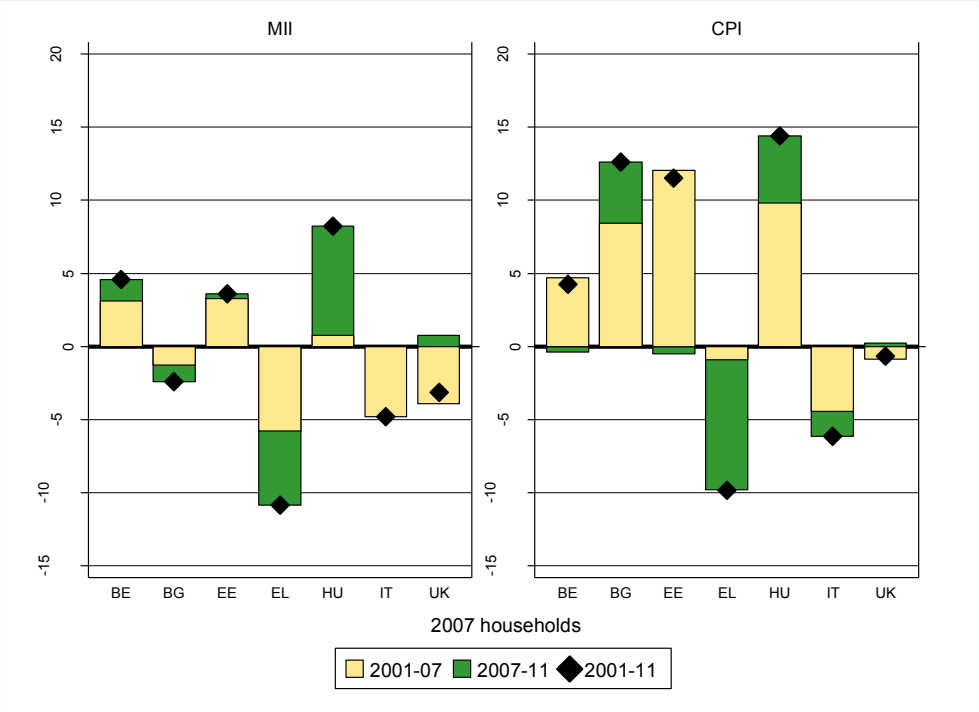
Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to the 2007 levels using CPI; 60% of median equivalised household income used as a poverty line for floating poverty. Standard errors for confidence intervals are calculated using the delta method.

Figure 6: Effects of policy changes against a market income-indexed counterfactual on floating poverty: structural change and indexation effect, 2001-07 and 2007-11



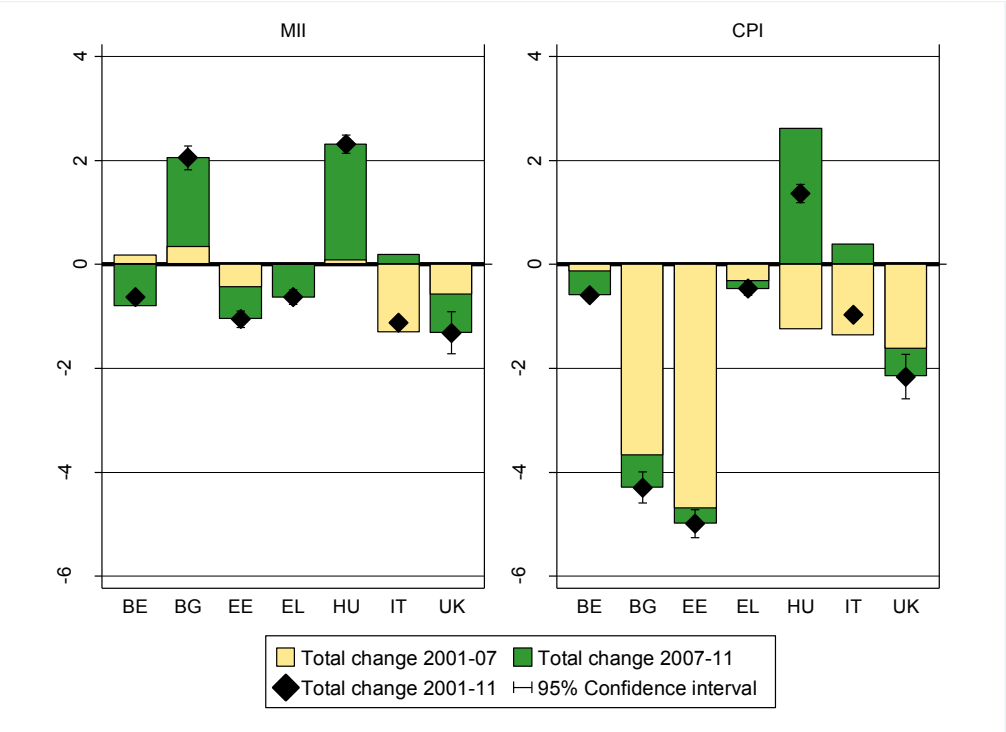
Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to the 2007 levels using MII; 60% of median equivalised household income used as a poverty line for the floating poverty. Standard errors for confidence intervals are calculated using the delta method.

Figure 7: Effect of policy changes 2001-2011 relative to MII and CPI indexation on household disposable income



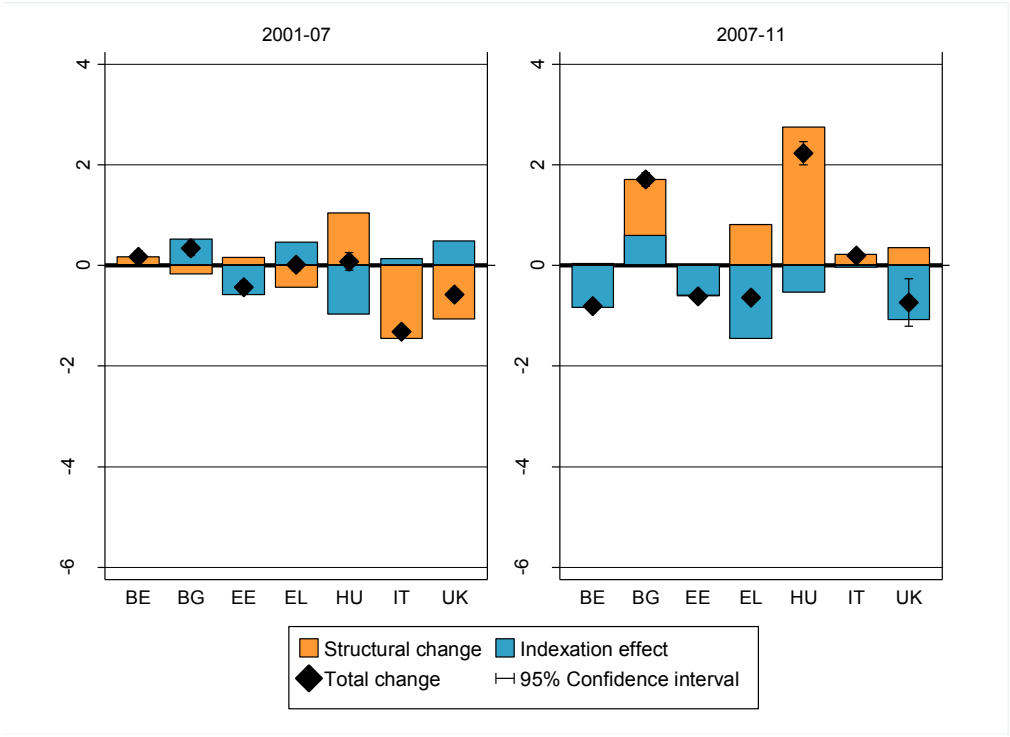
Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to the 2007 levels using market income (MII) or prices (CPI).

Figure 8: Effect of policy changes relative to MII and CPI indexation on the Gini coefficient 2001-11



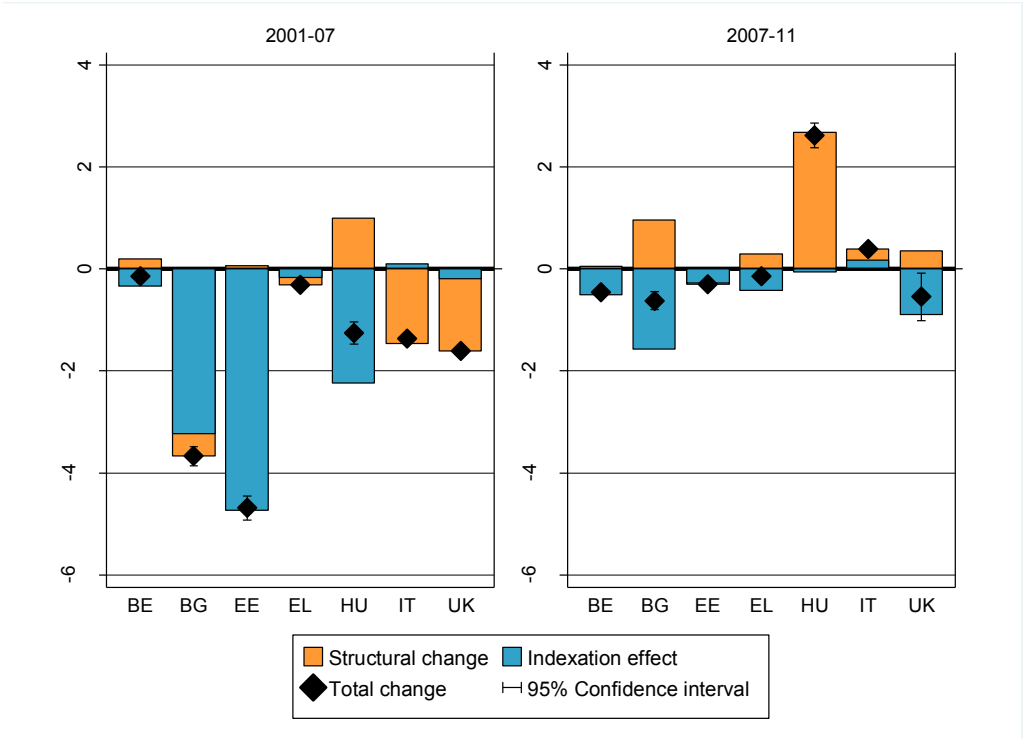
Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to the 2007 levels using using market income (MII) or prices (CPI). Standard errors for confidence intervals are calculated using the delta method.

Figure 9: Effect of policy changes relative to MII indexation on the Gini coefficient: structural change and indexation effect, 2001-07 and 2007-11



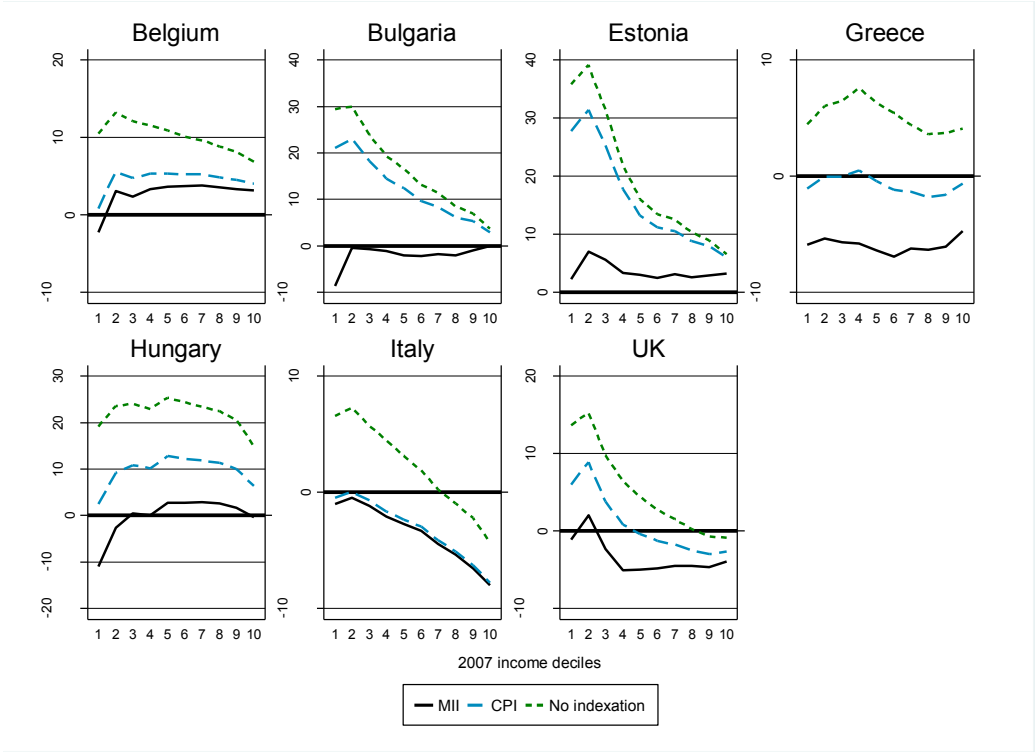
Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to the 2007 levels using MII. Standard errors for confidence intervals are calculated using the delta method.

Figure 10: Effect of policy changes relative to CPI indexation on the Gini coefficient: structural change and indexation effect, 2001-07 and 2007-11



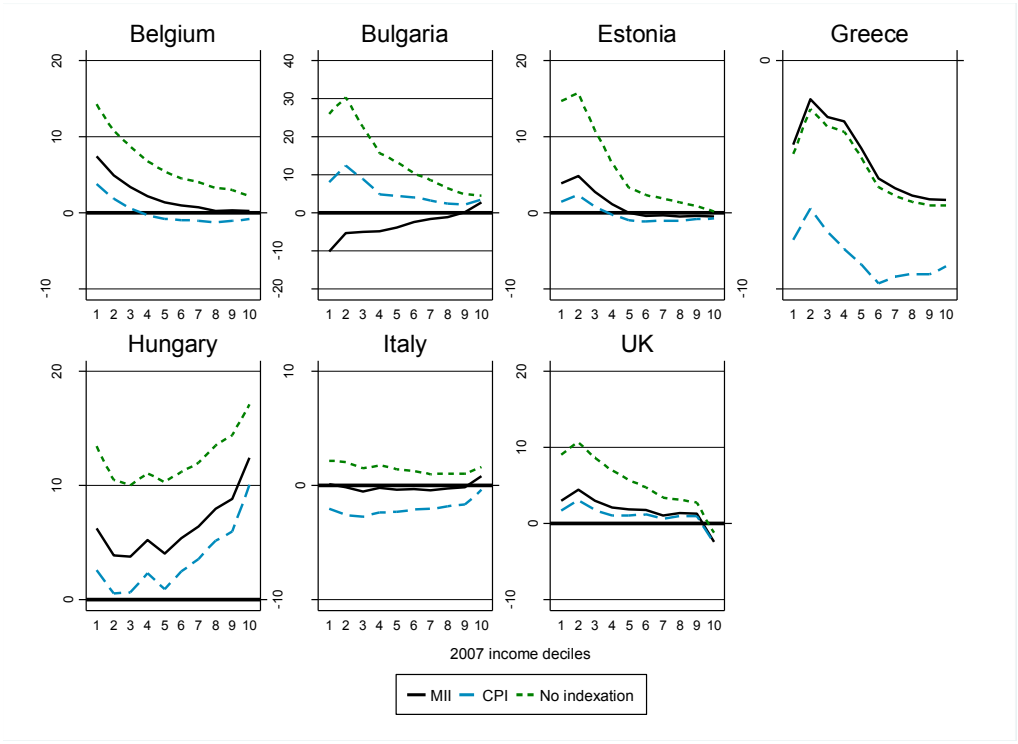
Source: Authors' calculations using EUROMOD version F6.36.
Notes: 2001 and 2011 policy parameters are adjusted to the 2007 levels using CPI. Standard errors for confidence intervals are calculated using the delta method.

Figure 11: Effect of policy changes on average disposable income by income decile groups, 2001-07



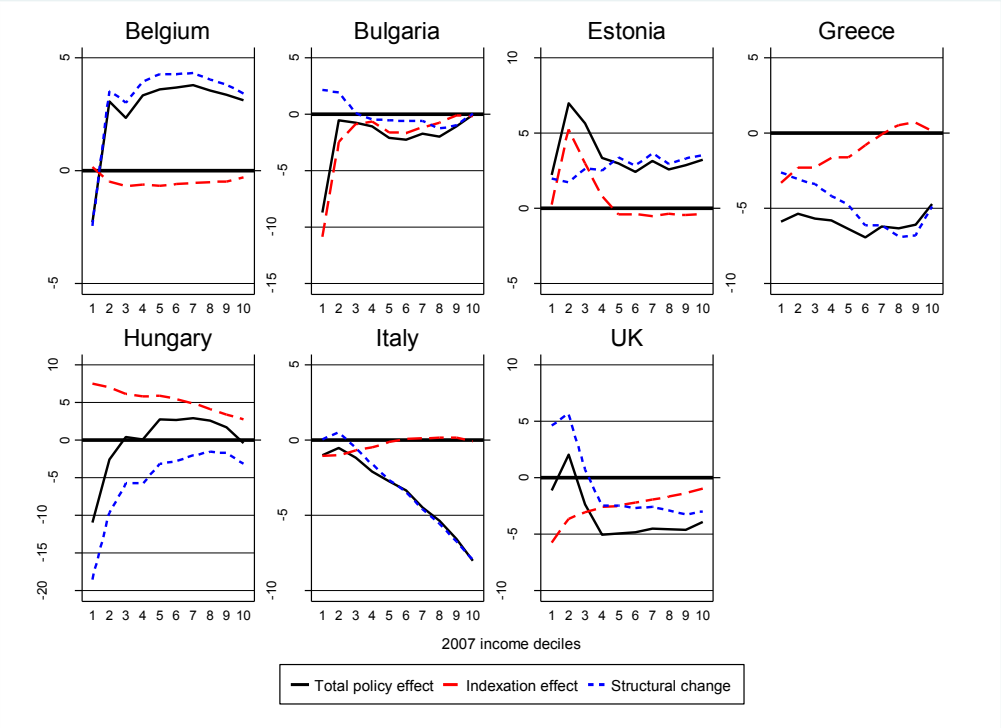
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2007 household equivalised disposable incomes. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 12: Effect of policy changes on average disposable income by income decile groups, 2007-11



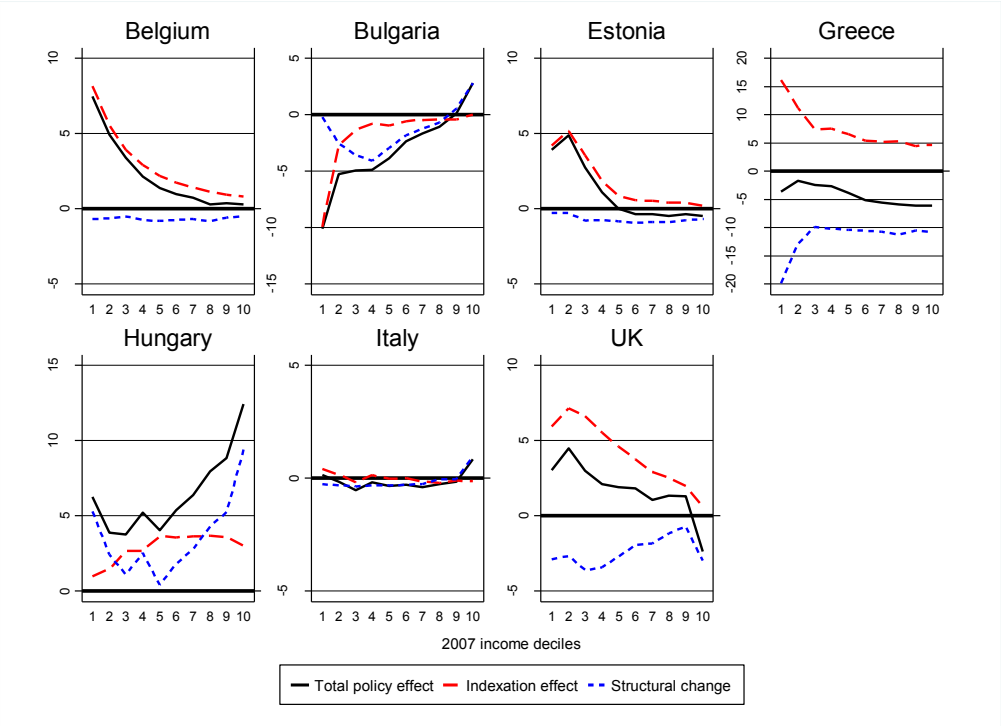
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2007 household equivalised disposable incomes. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 13: Effect of policy changes relative to MII indexation on average disposable income by income decile groups: structural change and indexation effect, 2001-07



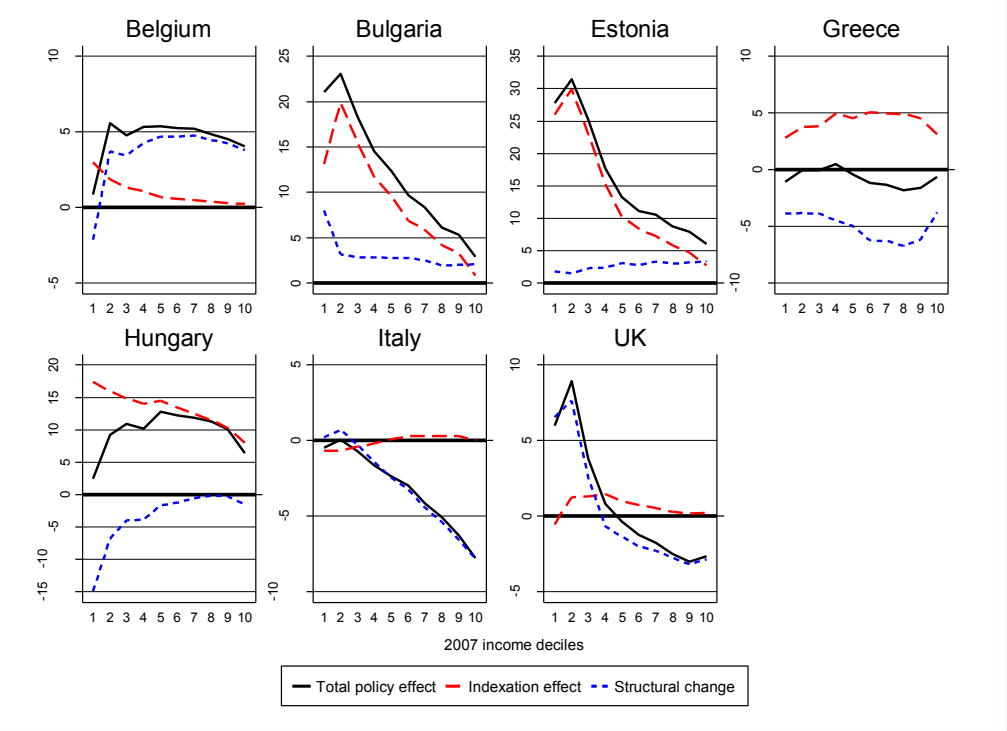
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2007 household equivalised disposable incomes. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 14: Effect of policy changes relative to MII indexation on average disposable income by income decile groups: structural change and indexation effect, 2007-11



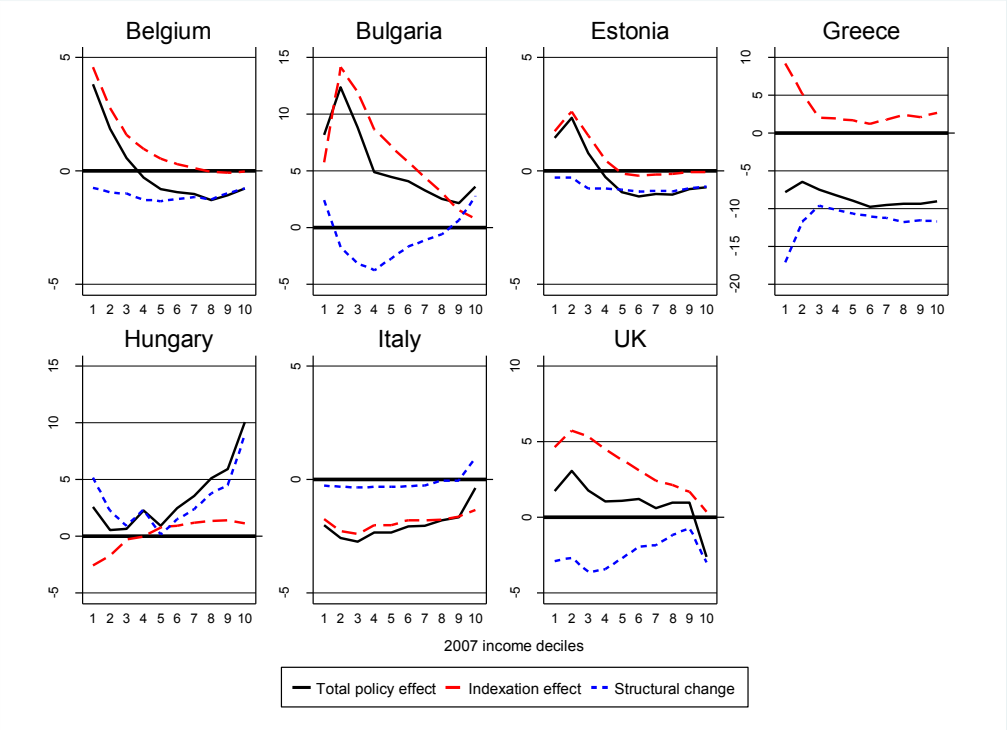
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2007 household equivalised disposable incomes. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 15: Effect of policy changes relative to CPI indexation on average disposable income by income decile groups: structural change and indexation effect, 2001-07



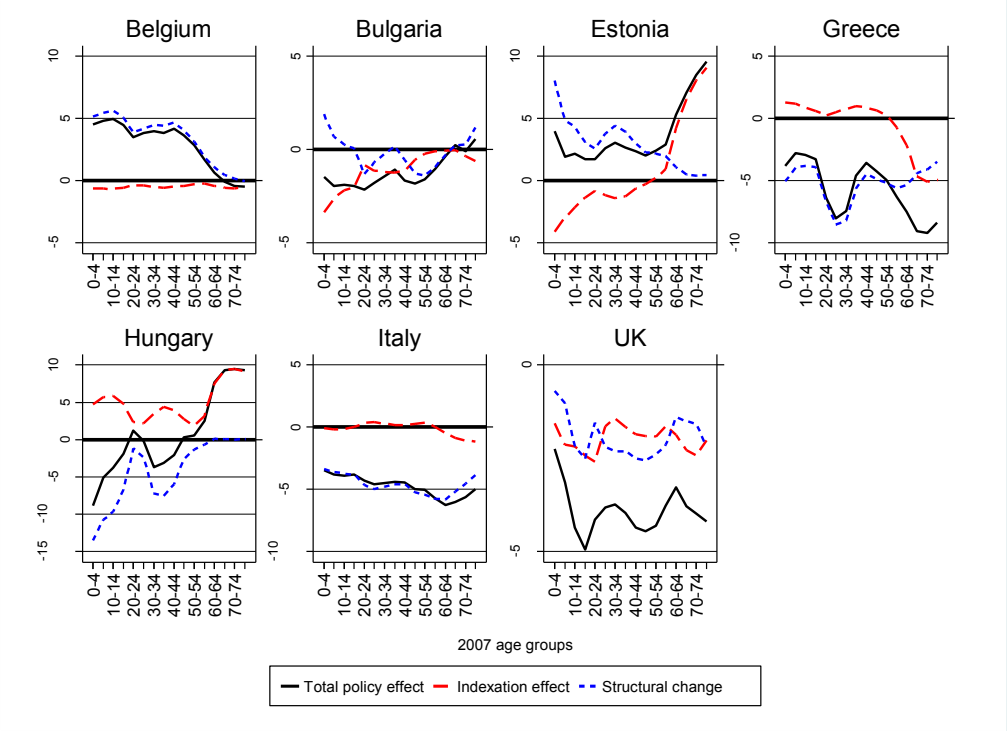
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2007 household equivalised disposable incomes. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 16: Effect of policy changes relative to CPI indexation on average disposable income by income decile groups: structural change and indexation effect, 2007-11



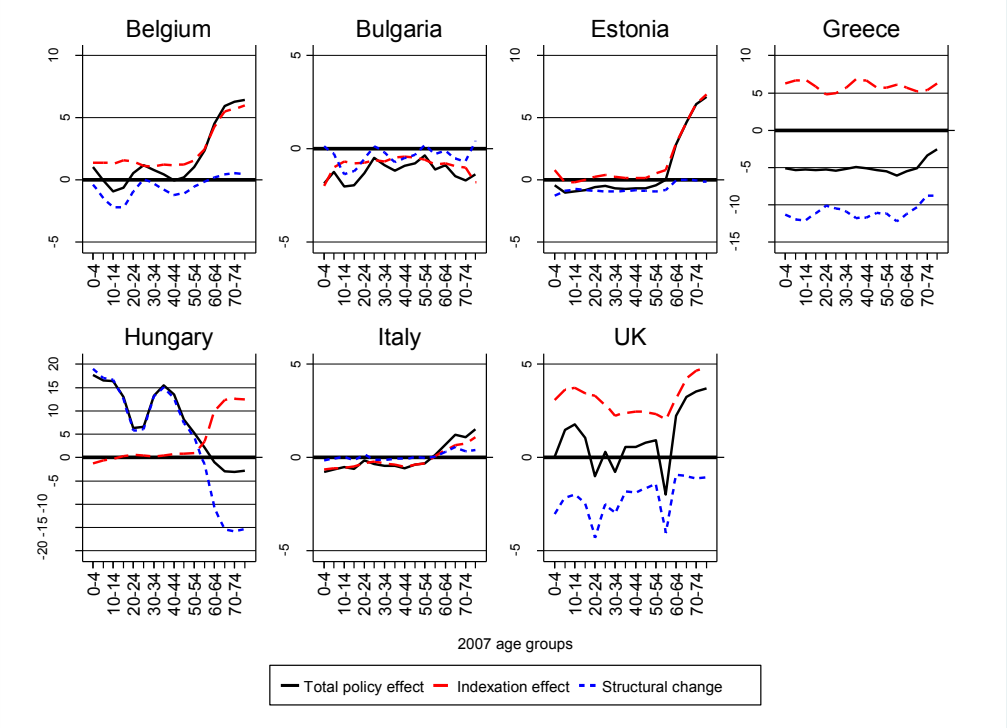
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2007 household equivalised disposable incomes. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 17: Effect of policy changes relative to MII indexation on average disposable income by age groups, 2001-07



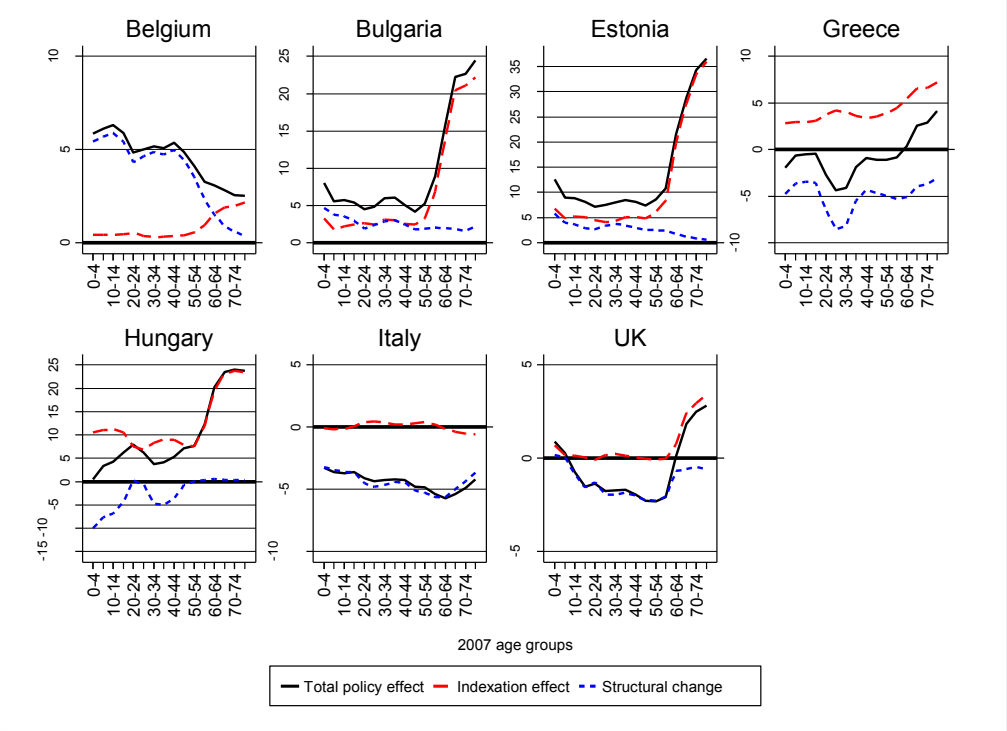
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Individuals are grouped in 5 years-age categories based on 2007 population. The eldest group contains individuals aged 80+. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 18: Effect of policy changes relative to MII indexation on average disposable income by age groups, 2007-11



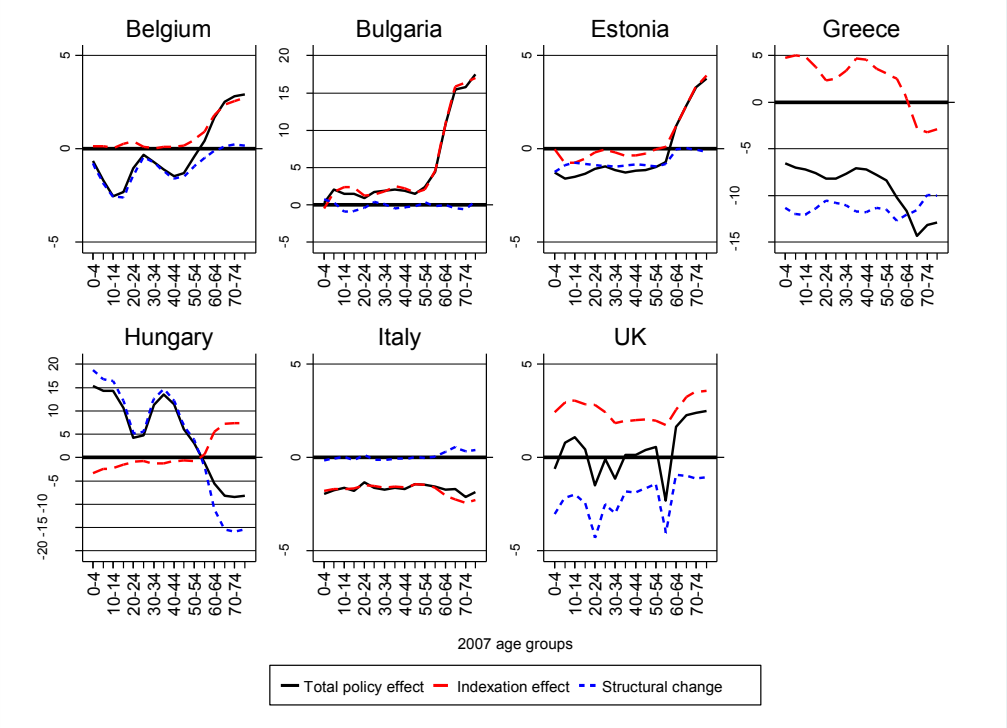
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Individuals are grouped in 5 years-age categories based on 2007 population. The eldest group contains individuals aged 80+. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 19: Effect of policy changes relative to CPI indexation on average disposable income by age groups, 2001-07



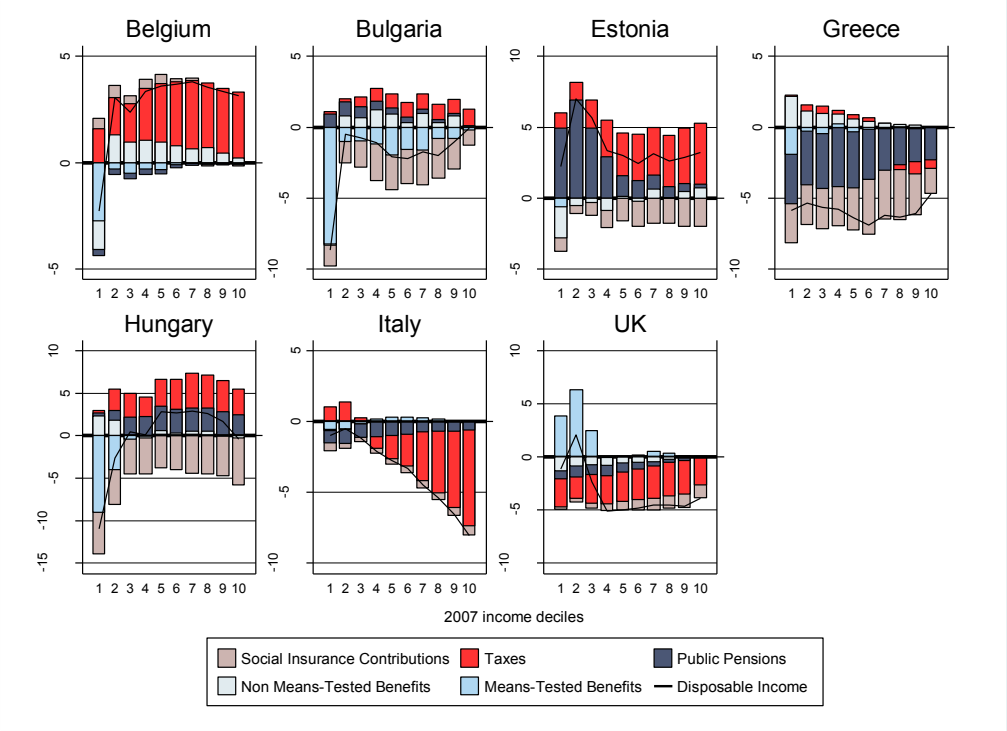
Source: Authors' calculations using EUROMOD version F6.36,
Notes: Individuals are grouped in 5 years-age categories based on 2007 population. The eldest group contains individuals aged 80+. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 20: Effect of policy changes relative to CPI indexation on average disposable income by age groups, 2007-11



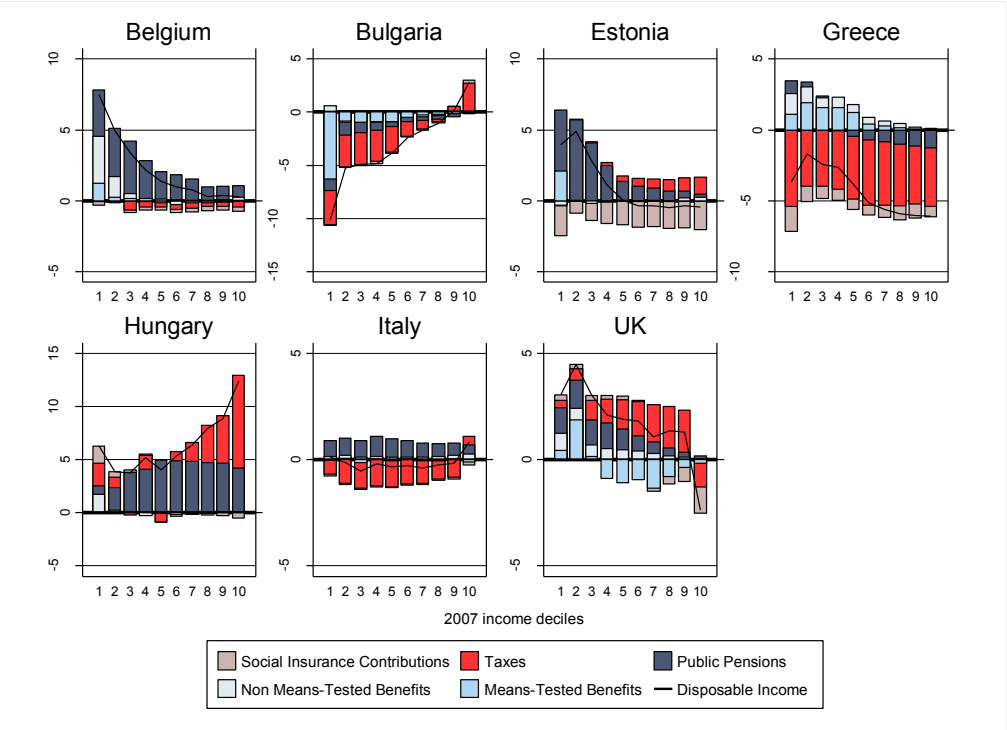
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Individuals are grouped in 5 years-age categories based on 2007 population. The eldest group contains individuals aged 80+. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 21: Effect of policy changes relative to MII indexation on average disposable income by income components and income decile groups, 2001-07



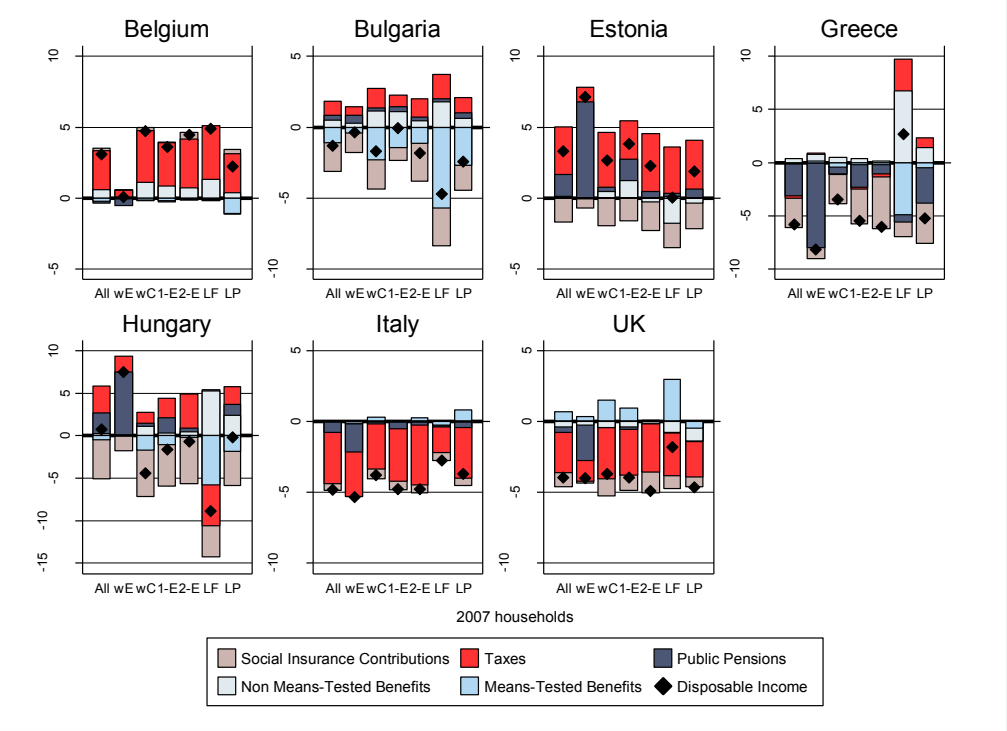
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2007 household equivalised disposable incomes. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 22: Effect of policy changes relative to MII indexation on average disposable income by income components and income decile groups, 2007-11



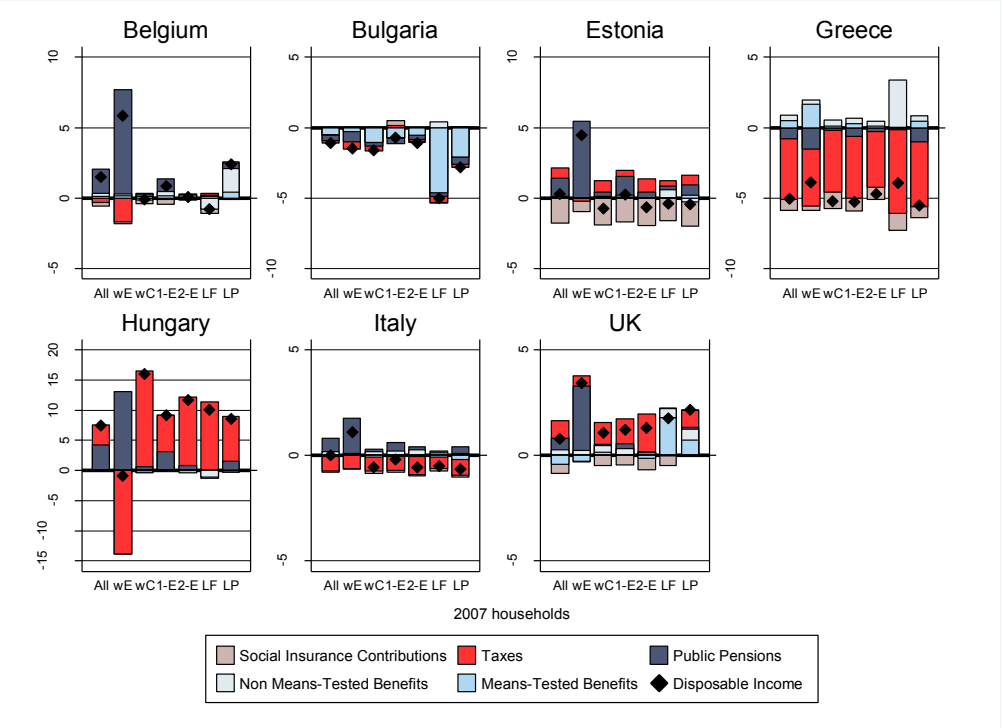
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2007 household equivalised disposable incomes. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 23: Effect of policy changes relative to MII indexation on average disposable income by income components and household type, 2001-07



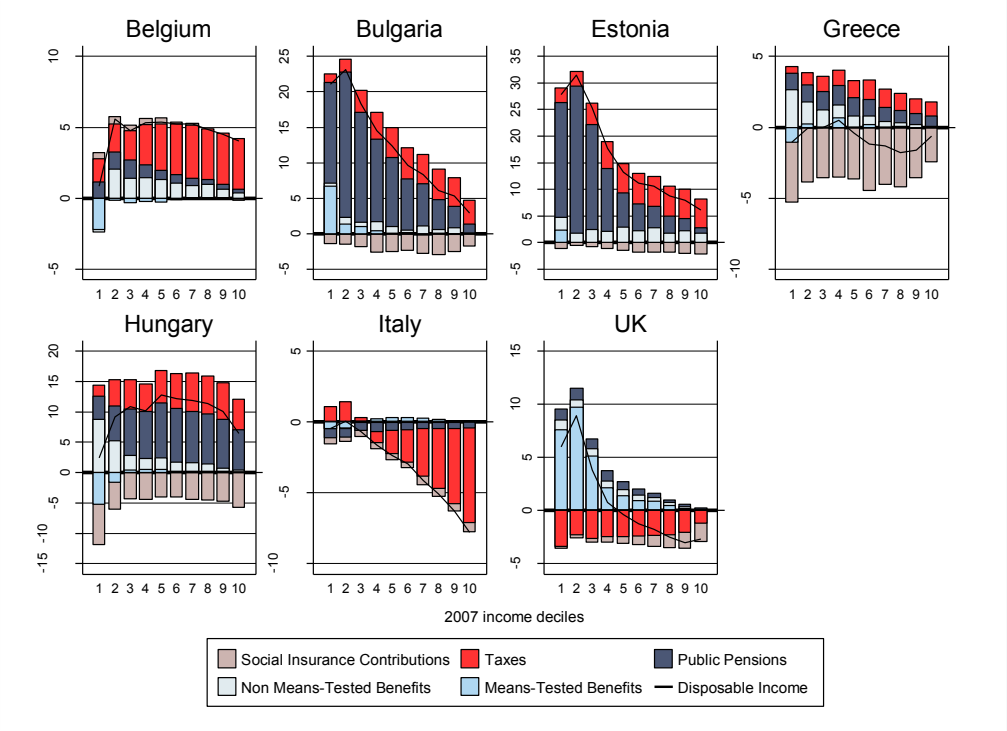
Source: Authors' calculations using EUROMOD version F6.36. Notes: Household types are non-exclusive and based on the 2007 population. All=All households; wE= hhs with elderly people (age 65+); wC=hhs with children (age <18); 1-E=One-earner hhs; 2-E=Two-earner hhs; LF=Large families (3+ children); LP=Lone parent hhs. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 24: Effect of policy changes relative to MII indexation on average disposable income by income components and household type, 2007-11



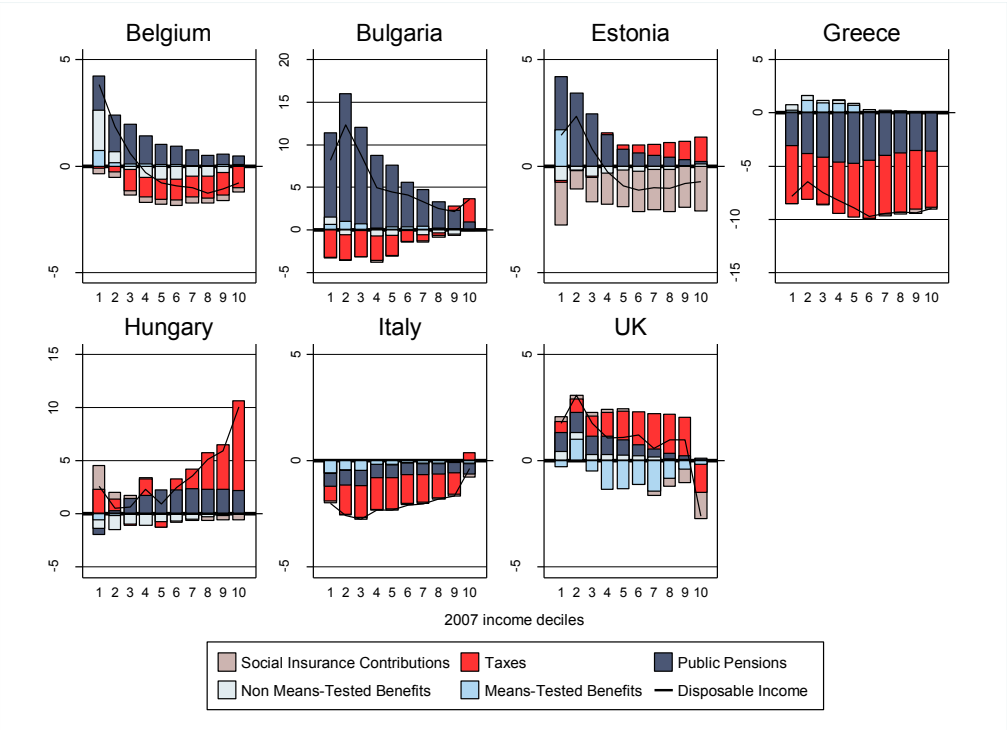
Source: Authors' calculations using EUROMOD version F6.36. Notes: Household types are non-exclusive and based on the 2007 population. All=All households; wE= hhs with elderly people (age 65+); wC=hhs with children (age <18); 1-E=One-earner hhs; 2-E=Two-earner hhs; LF=Large families (3+ children); LP=Lone parent hhs. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 25: Effect of policy changes relative to CPI indexation on average disposable income by income components and income decile groups, 2001-07



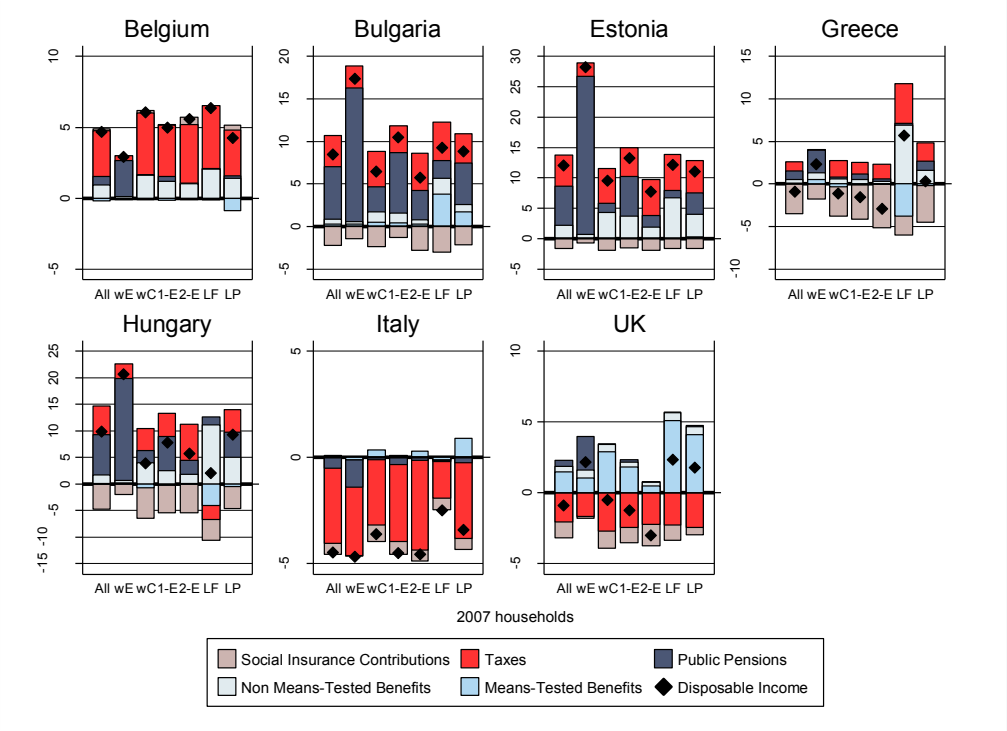
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2007 household equivalised disposable incomes. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 26: Effect of policy changes relative to CPI indexation on average disposable income by income components and income decile groups, 2007-11



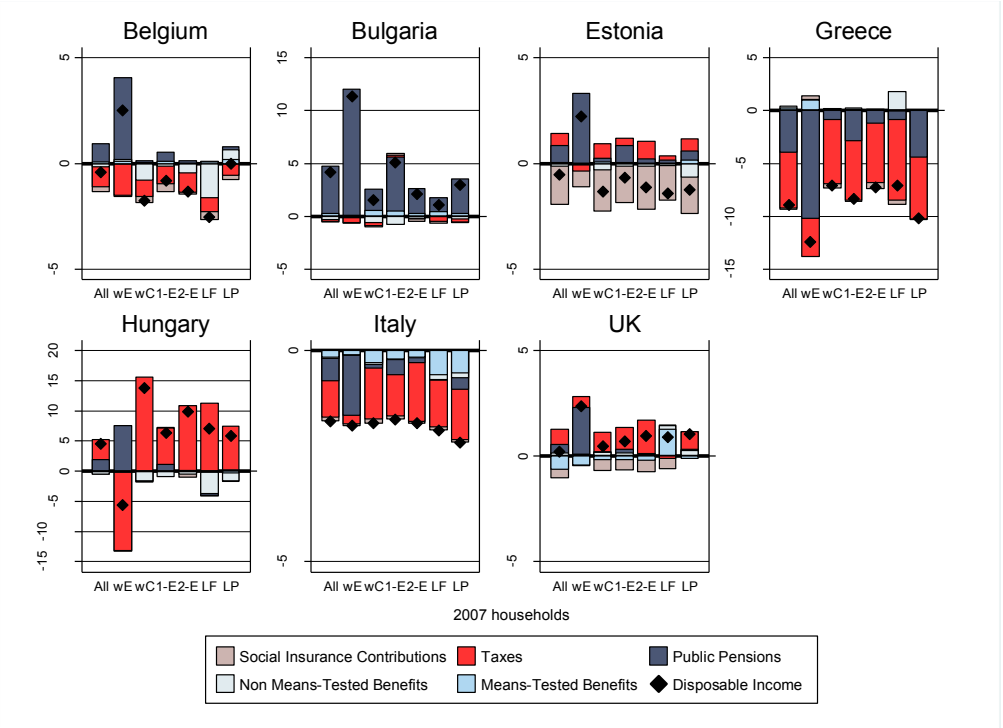
Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2007 household equivalised disposable incomes. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 27: Effect of policy changes relative to CPI indexation on average disposable income by income components and household type, 2001-07



Source: Authors' calculations using EUROMOD version F6.36. Notes: Household types are non-exclusive and based on the 2007 population. All=All households; wE= hhs with elderly people (age 65+); wC=hhs with children (age <18); 1-E=One-earner hhs; 2-E=Two-earner hhs; LF=Large families (3+ children); LP=Lone parent hhs. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 28: Effect of policy changes relative to CPI indexation on average disposable income by income components and household type, 2007-11



Source: Authors' calculations using EUROMOD version F6.36. Notes: Household types are non-exclusive and based on the 2007 population. All=All households; wE= hhs with elderly people (age 65+); wC=hhs with children (age <18); 1-E=One-earner hhs; 2-E=Two-earner hhs; LF=Large families (3+ children); LP=Lone parent hhs. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Appendix 1: Poverty and income inequality estimates 2001, 2007 and 2011

Table 5 shows estimates from Eurostat sources for risk-of-poverty (using 60% of the median as the threshold) and the Gini coefficient for incomes in 2001, 2007 and 2011 for the countries covered by this study. The 2007 and 2011 estimates come from a data source that is broadly comparable across countries and through time: the EU-SILC. However, the "2001" estimates come from a mix of sources including ECHP for the EU-15 countries (referring to 2000 incomes) and Household Budget Survey data for the remainder. Thus these estimates are not comparable across countries. More importantly for the questions addressed in this paper, they are not comparable with those provided for 2007 and 2011 incomes. Differences may be as much to do with differences in survey methodology and concepts as between the actual situations in the respective periods. Nevertheless, the table provides a broad-brush summary of the direction of movement in the two indicators in the two sub-periods.

Table 5: Poverty and income inequality estimates 2001, 2007, 2011

Source of data:	Mixed	EU-SILC	EU-SILC		
	income reference period			Direction of movement	
	2000/01	2007	2011	2001-07	2007-11
Poverty risk with 60% of the contemporary equivalised median as the threshold (%)					
Belgium	13	14.8	14.9	up	flat
Bulgaria	16	21.3	21.2	up	flat
Estonia	18	19.5	17.6	up	down
Greece	20	20.1	23.1	flat	up
Italy	19	18.7	19.4	flat	(up)
Hungary	10	12.4	14.0	up	up
United Kingdom	17	18.7	16.2	up	down
Gini coefficient (%)					
Belgium	28	27.5	26.5	flat	(down)
Bulgaria	26	35.9	33.6	up	down
Estonia	35	30.9	32.5	down	up
Greece	33	33.4	34.3	flat	(up)
Italy	29	31.0	31.9	up	(up)
Hungary	23	25.2	26.9	up	up
United Kingdom	31	32.6	33.0	up	flat

Sources: Eurostat. 2007 and 2011 estimates are based on 2008 and 2012 EU-SILC respectively (except for UK which uses 2007 and 2011 SILC for the 2007 and 2011 income reference periods). 2001 estimates (some using 2000 incomes) are from Eurostat (for EU-15) and Dennis and Guio (2004a, 2004b).

Appendix 2: Examples for indexation effect and structural change

This section provides four examples for hypothetical policy changes which illustrate the difference between the indexation effect and the structural change (see Section 2).

Example 1

Assume that in period 0, country A had the following progressive income tax schedule: for incomes between 0 and 1,000 the tax rate was 0; between 1,000 and 1,200, it was 15%; between 1,200 and 2,000, it was 25%; and above 2,000, it was 35%. Statutory indexation rules exist in the country, so that each year tax brackets are increased by 15%. In addition, in period 1 the government increased the tax rate for the second bracket from 15% to 17%, so that the tax rules were: for incomes between 0 and 1,150, the tax rate was 0; between 1,150 and 1,380, it was 17%; between 1,380 and 2,300, it was 25%; and above 2,300, it was 35%.

Assume that we have information on people's characteristics and market incomes from period 1. Now let us assume that an individual had market income y_1 equal to 2,400.

Furthermore, prices grew between the two periods by 10%, so that the CPI-based counterfactual index $\alpha = 1.1$. The index is used in the counterfactual scenarios (see below) to scale up the monetary parameters from period 0, p_0, which are then applied to market incomes from period 1, y_1, and effectively shows how benefit amounts and tax brackets between the two periods have grown relative to prices.

Let us calculate the change in disposable income due to the policy effect and decompose it into indexation effect and structural change. As we are interested in the change in individual disposable income, we will look at the change in $d(p, y)$ instead of the change in the summary indicator $I[d(p, y)]$ and would transform equation (4) into:

$$\Delta^P = \underbrace{d_1(p_1, y_1) - d_1(\alpha p_0, y_1)}_{\text{Indexation effect}} + \underbrace{d_1(\alpha p_0, y_1) - d_0(\alpha p_0, y_1)}_{\text{Structural change}}$$

In this example, the indexation of tax brackets is treated as the indexation effect while the change in the second tax bracket is a structural change. Let us now calculate the individual's disposable income as in period 1 and as in the two counterfactual scenarios.

Disposable income in period 1 is calculated by simply replacing the tax-benefit rules and the policy monetary parameters as they are in that period:

$$d_1(p_1, y_1) = 2{,}400 - (1{,}150 * 0\% + (1{,}380 - 1{,}150) * 17\% + (2{,}300 - 1{,}380) * 25\% + (2{,}400 - 2{,}300) * 35\%) = 2{,}095.9$$

Next, in the first counterfactual scenario, we keep the tax-benefit rules as of period 1 but replace the monetary parameters of that period (tax brackets) with their counterparts from period 0, indexed by price inflation:

$$d_1(\alpha p_0, y_1) = 2{,}400 - (1{,}100 * 0\% + 1.1 * (1{,}200 - 1{,}000) * 17\% + 1.1 * (2{,}000 - 1{,}200) * 25\% + (2{,}400 - 1.1 * 2{,}000) * 35\%) = 2{,}072.6$$

In the last counterfactual scenario, we also replace the tax-benefit rules from period 1 with those from period 0:

$$d_0(\alpha p_0, y_1) = 2{,}400 - (1{,}100 * 0\% + 1.1 * (1{,}200 - 1{,}000) * 15\% + 1.1 * (2{,}000 - 1{,}200) * 25\% + (2{,}400 - 1.1 * 2{,}000) * 35\%) = 2{,}077$$

We can finally calculate the change in disposable income due to the policy effect.

$$\Delta_A^P = \underbrace{2{,}095.9 - 2{,}072.6}_{\text{Indexation effect}} + \underbrace{2{,}076.2 - 2{,}077}_{\text{Structural change}} = \underbrace{23.3}_{\text{Indexation effect}} + \underbrace{-4.4}_{\text{Structural change}} = 18.9$$

The policy effect is positive (18.9), i.e. disposable income has increased between the two periods due to policy changes. In other words, the individual was better off in period 1 than in period 0.

Example 2

Now let us consider another example. In period 0, country B had the same progressive income tax schedule as country A in period 0. In period 1, however, the government decided to revise the tax schedule and make it less progressive: for incomes between 0 and 1,200 the tax rate was 0; between 1,200 and 2,000, it was 15%; between 2,000 and 3,000, it was 25%; and above 3,000, it was 35%. Assume an individual in period 1 with income y_1 equal to 2,400 and price inflation between the two periods equal to 10%, so that the counterfactual index $\alpha = 1.1$.

In this example, the change of tax brackets is not an indexation effect but a structural change. Thus, the indexation effect is non-existent and in $d_1(\alpha p_0, y_1)$ we will simply replace αp_0 with p_1.

$$d_1(p_1, y_1) = d_1(\alpha p_0, y_1) = 2{,}400 - (1{,}200 * 0\% + (2{,}000 - 1{,}200) * 15\% + (2{,}400 - 2{,}000) * 25\%) = 2{,}180$$

$$d_0(\alpha p_0, y_1) = 2{,}400 - (1{,}100 * 0\% + 1.1 * (1{,}200 - 1{,}000) * 15\% + 1.1 * (2{,}000 - 1{,}200) * 25\% + (2{,}400 - 1.1 * 2{,}000) * 35\%) = 2{,}077$$

$$\Delta_B^P = \underbrace{2{,}180 - 2{,}180}_{\text{Indexation effect}} + \underbrace{2{,}180 - 2{,}077}_{\text{Structural change}} = \underbrace{0}_{\text{Indexation effect}} + \underbrace{103}_{\text{Structural change}} = 103$$

The policy effect in country B is 103 (with zero indexation effect), much larger than it would have been in country A for the same individual.

Example 3

Now let us return to our first example and assume that in addition to the changes in tax brackets and the second marginal tax rate, the government in country A decided to introduce in period 1 a new basic income benefit equal to 200. Let us now assume that in addition to the progressive income taxation, country B already had a basic income scheme in period 0, with the benefit amount equal to 200. In period 1, the government did not do any benefit adjustments for price inflation or incomes growth and kept the benefit level nominally the same. The calculations for country A and country B policy are now as follows:

In period 1, in addition to subtracting the tax liability of the individual gross income, we have to add to it the basic income benefit:

$$d_1(p_1, y_1) = 2{,}400 - (1{,}150 * 0\% + (1{,}380 - 1{,}150) * 17\% + (2{,}300 - 1{,}380) * 25\% + (2{,}400 - 2{,}300) * 35\%) + 200 = 2{,}295.9$$

As a next step, we want to calculate the individual's disposable income by keeping the tax-benefit rules as of period 1 but using the monetary policy parameters from period 0, indexed by price inflation. Note that the basic income scheme did not exist in period 0, i.e. p_0 is non-existent, and so, we will simply add to the net income the benefit as it is in period 1:

$$d_1(\alpha p_0, y_1) = 2{,}400 - (1{,}100 * 0\% + 1.1 * (1{,}200 - 1{,}000) * 17\% + 1.1 * (2{,}000 - 1{,}200) *$$

$$25\% + (2{,}400 - 1.1 * 2{,}000) * 35\%) + 200 = 2{,}272.6$$

In the last counterfactual, disposable income is calculated based on the tax-benefit rules and monetary parameters, indexed by price inflation, in period 0:

$$d_0(\alpha p_0, y_1) = 2{,}400 - (1{,}100 * 0\% + 1.1 * (1{,}200 - 1{,}000) * 15\% + 1.1 * (2{,}000 - 1{,}200) * 25\% + (2{,}400 - 1.1 * 2{,}000) * 35\%) = 2{,}077$$

Finally, the policy effect is:

$$\Delta_A^P = \underbrace{2{,}295.9 - 2{,}272.6}_{\text{Indexation effect}} + \underbrace{2{,}076.2 - 2{,}077}_{\text{Structural change}} = \underbrace{23.3}_{\text{Indexation effect}} + \underbrace{195.6}_{\text{Structural change}} = 218.9$$

As the introduction of the new benefit altered the tax-benefit rules, we treated it as structural policy change. The indexation effect remained the same as in the first example; however, the structural change became larger and positive.

Example 4

For country B, as in country A in period 1, in addition to subtracting the tax liability of the individual gross income, we have to add to it the basic income benefit:

$$d_1(p_1, y_1) = 2{,}400 - (1{,}200 * 0\% + (2{,}000 - 1{,}200) * 15\% + (2{,}400 - 2{,}000) * 25\%) + 200 = 2{,}380$$

In contrast to country A, the basic income did exist in period 0 in country B, i.e. p_0 equals 200:

$$d_1(\alpha p_0, y_1) = 2{,}400 - (1{,}200 * 0\% + (2{,}000 - 1{,}200) * 15\% + (2{,}400 - 2{,}000) * 25\%) + 200 * 1.1 = 2{,}400$$

$$d_0(\alpha p_0, y_1) = 2{,}400 - (1{,}100 * 0\% + 1.1 * (1{,}200 - 1{,}000) * 15\% + 1.1 * (2{,}000 - 1{,}200) * 25\% + (2{,}400 - 1.1 * 2{,}000) * 35\%) + 200 * 1.1 = 2{,}297$$

The policy effect in country B is:

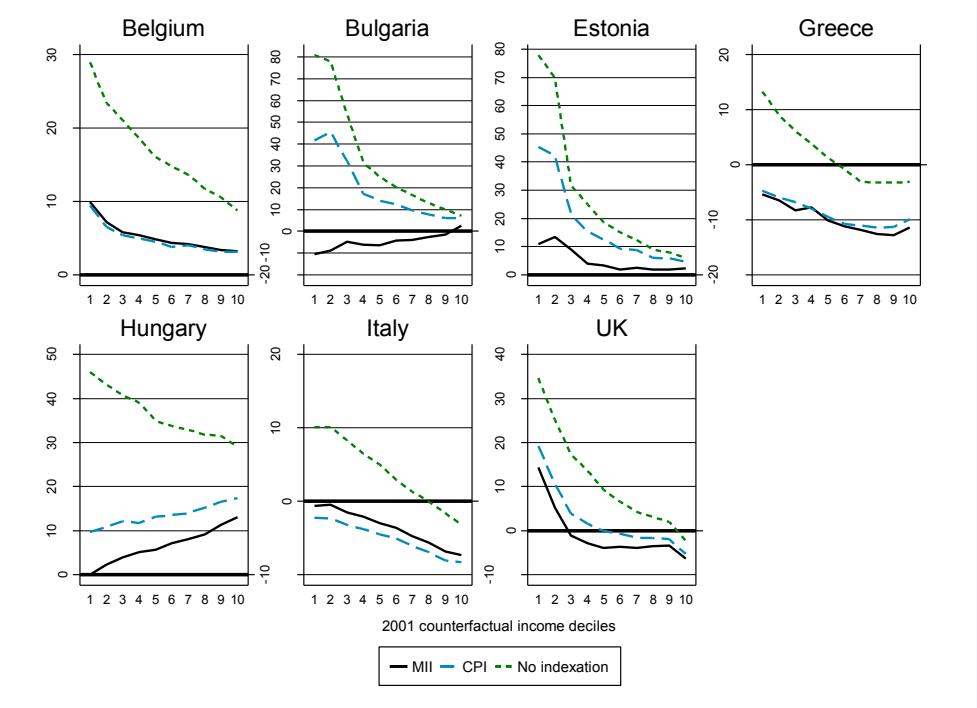
$$\Delta_B^P = \underbrace{2{,}380 - 2{,}400}_{\text{Indexation effect}} + \underbrace{2{,}400 - 2{,}297}_{\text{Structural change}} = \underbrace{-20}_{\text{Indexation effect}} + \underbrace{103}_{\text{Structural change}} = 83$$

The effect of keeping the level of the basic income nominally constant appeared in the indexation effect. The government's did not adjust the benefit amount over time which translated into negative change in disposable income (with respect to price changes).

Although an individual with the same market income in both countries would have had higher disposable income in both periods in country B, we find that the positive policy effect in country A was around 3 times larger than in country B.

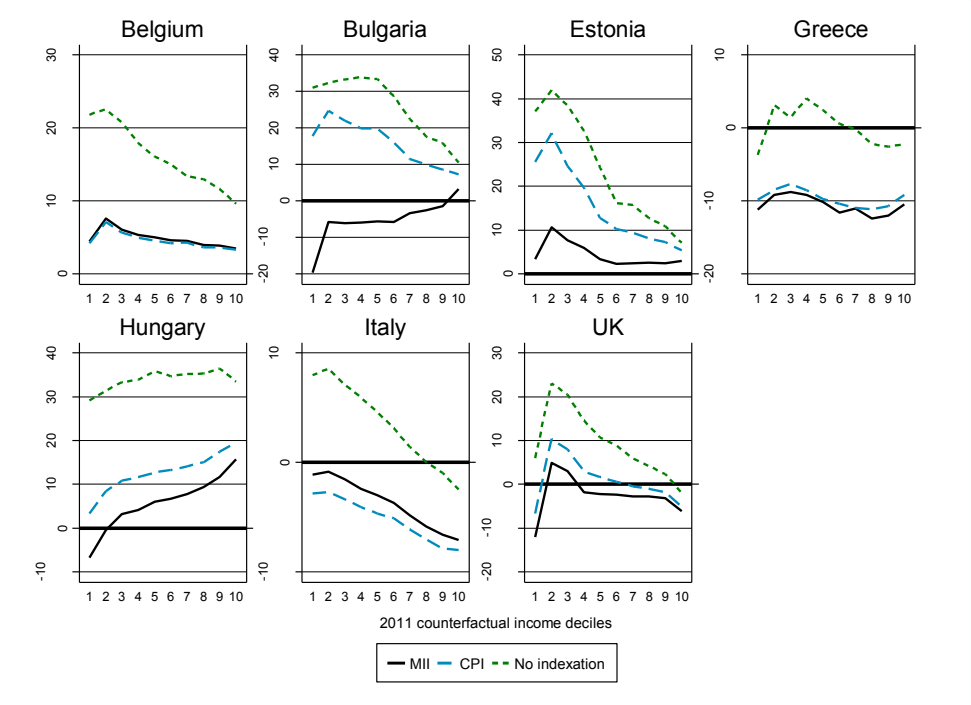
Appendix 3: Alternative ranking of households

Figure 29: Effect of policy changes 2001-2011 on disposable income by income decile groups with households ranked using 2001 counterfactual income



Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2001 counterfactual household equivalised disposable incomes. The figure shows the % change in average equivalised household disposable income in 2007. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

Figure 30: Effect of policy changes 2001-2011 on disposable income by income decile groups with households ranked using 2011 counterfactual income



Source: Authors' calculations using EUROMOD version F6.36.
Notes: Income deciles are derived based on 2011 counterfactual household equivalised disposable incomes. The figure shows the % change in average equivalised household disposable income in 2007. The charts are drawn to different scales, but the interval between gridlines on each of them is the same.

ImPRovE: Poverty Reduction in Europe. Social Policy and Innovation

Poverty Reduction in Europe: Social Policy and Innovation (ImPRovE) is an international research project that brings together ten outstanding research institutes and a broad network of researchers in a concerted effort to study poverty, social policy and social innovation in Europe. The ImPRovE project aims to improve the basis for evidence-based policy making in Europe, both in the short and in the long term. In the short term, this is done by carrying out research that is directly relevant for policymakers. At the same time however, ImPRovE invests in improving the long-term capacity for evidence-based policy making by upgrading the available research infrastructure, by combining both applied and fundamental research, and by optimising the information flow of research results to relevant policy makers and the civil society at large.

The two central questions driving the ImPRovE project are:

- How can social cohesion be achieved in Europe?
- How can social innovation complement, reinforce and modify macro-level policies and vice versa?

The project runs from March 2012 till February 2016 and receives EU research support to the amount of Euro 2.7 million under the 7th Framework Programme. The output of ImPRovE will include over 55 research papers, about 16 policy briefs and at least 3 scientific books. The ImPRovE Consortium will organise two international conferences (Spring 2014 and Winter 2015). In addition, ImPRovE will develop a new database of local projects of social innovation in Europe, cross-national comparable reference budgets for 6 countries (Belgium, Finland, Greece, Hungary, Italy and Spain) and will strongly expand the available policy scenarios in the European microsimulation model EUROMOD.

More detailed information is available on the website http://improve-research.eu.

Bea Cantillon (Coordinator)
E-mail: bea.cantillon@uantwerpen.be
Phone: +32 3 265 53 98
Address: University of Antwerp –Sint-Jacobstraat 2 (M.177) – 2000 Antwerp -Belgium

Tim Goedemé (Manager)
E-mail: tim.goedeme@uantwerpen.be
Phone: +32 3 265 55 55
Mobile: +32 494 82 36 27
Address: University of Antwerp – Sint-Jacobsstraat 2 (M. 185) – 2000 Antwerp - Belgium