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Inequality in EU crisis countries. How effective were automatic stabilisers?

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Inequality in EU crisis countries.
How effective were automatic stabilisers?*

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Abstract

The Great Recession and the widespread adoption of fiscal austerity policies have heightened concern about inequality and how well tax-benefit systems redistribute. We examine how the distribution of income in the EU countries which were hardest hit during the recession evolved over this time. Using and extending a recently developed framework (Savage et al., 2017), the overall change in income inequality is decomposed into parts attributable to the change in market income inequality, changes in discretionary tax-benefit policy and automatic stabilisation effects. We implement this approach using the microsimulation software, EUROMOD, linked to EU-SILC survey data. Automatic stabilisation effects, particularly through benefits, are found to play an important role in reducing inequality in all the crisis countries. Their role is less important if we focus on the working age population only, due to the relative importance of old-age benefits in southern European welfare systems. Discretionary policy changes also contributed to reductions in inequality, but to a much lesser extent.

JEL: H24, D31, D63

Keywords: inequality, decomposition, Great Recession, discretionary policy, automatic stabilisation

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1. Introduction

Income inequality has been rising in most OECD countries since well before the onset of the Great Recession (GR) and the economic recovery from the GR has not reversed this trend (OECD, 2017). The widespread adoption of fiscal austerity policies during the GR has heightened concern about inequality and its effects, not only on social outcomes, such as political fall-outs (Funcke et al, 2016), but also in potentially undermining growth in the medium to longer-term. Against that background, it is now important to look beyond the initial impact of the GR to explore how income inequality has evolved as policy has responded to the challenges posed by the crisis. The specifics of how tax and welfare systems coped and the adoption, to a greater or lesser extent, of macro-fiscal austerity policies to cope with ballooning fiscal deficits are both relevant. Austerity policies were most stark in the five European countries that were unable to continue to finance their debt in the financial markets after the financial crash and had to avail of formal 'bail-out' arrangements with the European Union and IMF, namely Portugal, Ireland, Italy, Greece and Cyprus. Spain was also particularly hard-hit and had to receive assistance from the European Stability Mechanism in recapitalising its banks. The experience of these countries has been very varied. Greece at one end of the spectrum remains in crisis mode. Ireland at the other end of the spectrum has successfully completed a stringent bail-out programme, with growth now returned, and the fiscal deficit reduced to the point where debt can be financed at very low interest rates. Unemployment has fallen to close to pre-crisis levels in all countries except Spain, where it remains high.

The distributional impact of tax-transfer systems can change due to explicit discretionary changes in tax-benefit policies (e.g., higher tax rates or lower welfare payment rates). It may also be substantially affected by changes in the underlying population and distribution of income (e.g., a higher proportion of pensioners, or increased unemployment). Dolls et al. (2012, 2017) concentrate on this latter component, and examine, ex ante, the degree of "automatic stabilisation" of aggregate income inherent in the systems of EU countries and the US, under either an income or an unemployment shock. Their focus is therefore on the redistributive properties of a given tax-transfer system on alternative distributions of market income. They find than countries with weak automatic stabilisers were also those which experienced major economic contractions and increases in unemployment during the crisis.

A separate literature, initiated by Bargain and Callan (2010) and followed up by Bargain (2012); Jenkins et al (2013); Bargain et al (2017); Paulus and Tasseva (2017a); Matsaganis & Leventi (2014); Creedy and Hérault (2015) and Sologon et al (2017) among others, focuses on identifying, for a given population and income distribution, the impact of discretionary changes in tax-transfer policy on measures of income inequality and poverty.[1] In this approach "automatic" responses of existing policies to income or unemployment shocks are not separately identified but included with other factors, such as changes in unemployment or

[1] Cowell & Fiorio (2011) provide a framework for reconciling microeconometric decomposition approaches of this type with regression methodology.

the distribution of market incomes. In this paper we apply an approach which draws on both perspectives to identify the impact of tax and benefit policy on changes to income inequality over time in a selection of EU countries, and the breakdown of this change between discretionary and automatic components.

Evaluating the automatic stabilisation component of tax-benefit policy is often conducted using macro data (see Girouard and André (2005) for example). Micro-data has many advantages over macro-data in this context. As argued by Dolls et al. (2012), the use of micro-data and the use of microsimulation allow us to investigate the causal effects of shocks on household disposable income, holding everything else constant. It is possible, therefore, to isolate the impact of automatic stabilisation from other factors, such as discretionary tax-benefit policy, that can affect macro-based studies. In addition, macro-data analysis, by design, prohibits examination of the distributional impact of automatic stabilisation. The second main advantage of using microdata in this context is the ability to analyse the impact of automatic stabilisation on changes in income inequality, rather than solely focussing on average or aggregate income. Our framework isolates the impact of automatic stabilisation on income inequality in this ex post manner.

We apply and extend a framework developed by Savage et al. (2017), which builds on the approach of Bargain and Callan (2010), to decompose the change in inequality during the GR into components attributable to changes in market income, changes in discretionary policy, and the automatic stabilisation properties of the pre-existing tax-transfer systems. Paulus and Tasseva (2017b) employ a similar method to provide an overview of how automatic stabilisers absorbed market shocks in the EU-27 over the course of the GR, finding that automatic stabilisation played at least as important a role as discretionary policy. We provide a more in-depth study of this nature for the EU countries which were hardest hit by the GR and, using detailed decompositions, can investigate the contribution of market income, discretionary policy and automatic stabilisation to inequality changes, with a focus on particular instruments within the tax-benefit system in each country. We use EU-SILC data on incomes and the EUROMOD tax-benefit model to construct appropriate counterfactuals for the decomposition. Our results give a better understanding of how changes in inequality were generated or prevented in a number of European countries who were most vulnerable to market income shocks during the crisis.

This paper makes several significant contributions to the literature on the impact of tax-benefit systems on households' experience of the GR. We contribute new evidence on how income distributions changed in a selection of countries most severely affected by the GR. Our methodology is novel in that it allows us to disentangle discretionary policy effects from automatic stabilisation in an ex post context. We go beyond quantifying the role of automatic stabilisers in cushioning simulated market shocks and show how they shaped income distributions in the wake of a real and very substantial market income shock. We further show how an extension to this method can be used to isolate the contribution of specific taxes and benefits to automatic stabilisation of inequality during the crisis. This allows us to comment on how existing tax-benefit systems (including particular instruments) as well as new fiscal policies helped to cushion the impact of the GR in the EU countries which were hardest hit by the GR.

2. Data and Method

2.1 Microsimulation and Data

We use the tax-benefit microsimulation software, EUROMOD, which numerically simulates tax-benefit rules, allowing the computation of all social contributions, direct taxes and transfers to yield household disposable income.[2] It is linked to EU-SILC data for years 2008 (2007 incomes) and 2014 (2013 incomes).[3] One exception is Ireland, for which 2014 data is not yet available in EUROMOD. We therefore report results based on EUROMOD for Ireland with an end-year of 2011 policies linked to 2012 data (containing a mix of 2011 and 2012 incomes). However, we find similar results in a 2008-2013 framework using SWITCH, the Irish national model (Savage et al, 2017). We simulate disposable income distributions and inequality indices for a base year at the onset of the crisis (2007) and for an end year for which microsimulation models (with the relevant data) are available (usually 2013). We also simulate some counterfactual scenarios, described in the next section. Figure 1 shows that this period encompasses all periods of negative GDP growth in the countries concerned (except for Cyprus, which registered slightly negative GDP growth in 2014).

The major advantage of a microsimulation model is that it allows us to examine counterfactual scenarios (e.g. what if tax-benefit policies had simply been indexed in line with price inflation or wage growth?). This allows us to isolate the changes in inequality and poverty that are due to government policy and those that are due to market forces. Using our decomposition method (described in the next section), we can now also break down the "market forces" component into the relative contributions of direct changes in market income and automatic stabilisation caused by the pre-existing tax-benefit system, isolating the relative contribution of both taxes and benefits to these.

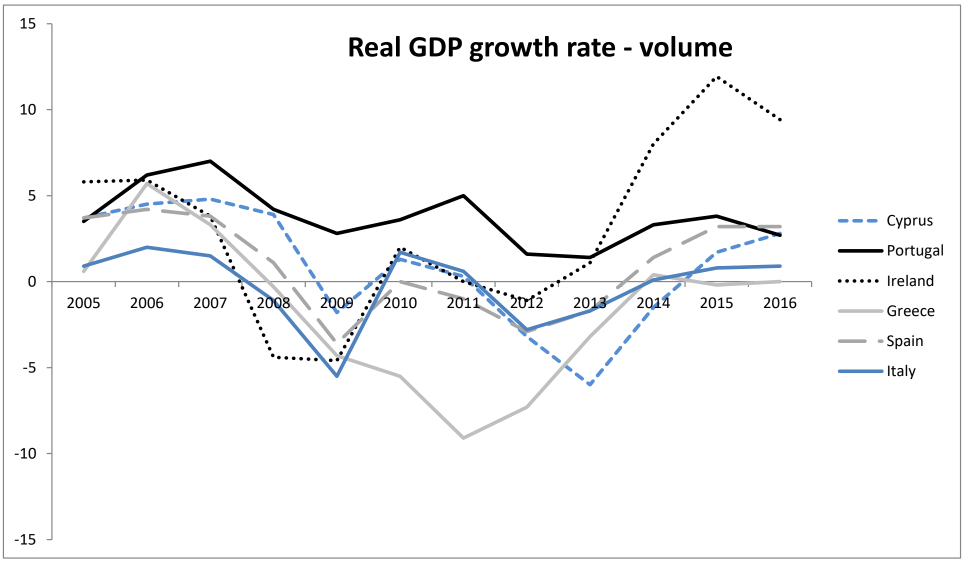
It is worth noting the standard limitations that accompany the use of microsimulation models. Firstly, the models are static and assume no behavioural response to policy changes. Any behavioural responses occurring between 2007 and 2013 will therefore be picked up in the market income and automatic stabilisation category. Survey data tends to have problems accurately capturing the higher end of the income distribution. However, it is these data which are the subject of extensive analysis in the debate about income inequality, and our approach helps to identify what lies behind the headline results. We also take care to compare our simulated inequality indices with those reported in official statistics (Table 5). The

[2] For a comprehensive overview of EUROMOD, see Sutherland and Figari (2013)

[3] Started in 2003 for 6 member states (Belgium, Denmark, Greece, Ireland, Luxemburg and Austria), as well as Norway, EU-SILC was extended to other EU countries from 2004. It gathers annual cross-sectional information on European individuals and households (incomes, socio-demographics, social exclusion, life condition). It was originally created to provide the material for structural indices of social cohesion in Europe (Laeken indices). EU-SILC (statistics on income and life conditions) constitute the most recent and important source of microdata for comparative studies on income distribution in Europe.

inequality indices simulated by EUROMOD and reported in official statistics are similar and change in the same manner during the crisis. There is one major exception: for Cyprus, EUROMOD simulates an increase in the disposable income Gini index between the base and the end period of around 7 points. The recorded increase according to official Eurostat statistics (which is based on EU-SILC) is around 3 points, casting some doubt on the reliability of the Cypriot simulations. For this reason, in what follows, we do not present results for Cyprus.

Figure 1: Real GDP growth rate in crisis countries



Sources: Eurostat and Irish Central Statistics Office (CSO). Note: From 2015 onwards, Ireland's national accounts are distorted by the reclassification of multinational companies or their assets as being resident in Ireland. Therefore, modified Gross National Income (GNI), as computed by the CSO, is used for Ireland for 2015 and 2016 to ensure comparability with the other countries.*

Other important considerations when using a microsimulation model include the systematic underreporting of income for the purposes of tax evasion. Tax evasion has been found to be a widespread phenomenon in two of the countries in our samples, Greece and Italy (Sutherland and Figari, 2013). For these countries, a simple adjustment is included in the model to split recorded employment and self-employment income into a component which is assumed to be reported to the tax authority and a residual component which is assumed to be evaded (see Ceriani et al., 2013 for further discussion of this issue).

Take-up of means-tested benefits is generally not 100% although basic microsimulation of benefits attributes them to all eligible households. We deal with this by introducing random non-take-up, where possible, to certain means-tested benefits which have low reported take-up rates.[4] In addition to this there may be some policy changes that are not captured by a tax-benefit model due to a lack of information in the underlying data that prevents simulation of a tax or benefit. Lastly, indirect taxes are generally not captured in microsimulation models as

[4] This includes in-work benefits in Ireland (Family Income Supplement), social pension and unemployment assistance for older workers in Greece and the Social Supplement for the Elderly in Portugal

expenditure information is often not present in the income surveys used to build a database for the tax-benefit model.[5]

2.2 Decomposition Method

In this section, we outline the method used to decompose the change in inequality into three components: a market income effect, an automatic stabilisation effect and a discretionary policy effect. The decomposition can be applied to any inequality index defined over the full range of incomes (including zeros and negatives). For clarity, in this section we discuss the decomposition applied to the Gini index, one of the most commonly used indices of income inequality. We start by defining the change in the Gini coefficient based on disposable income[6], as the change in the Gini based on market incomes, $G(M_1) - G(M_0)$, minus the change in the Reynolds-Smolensky (RS) index, $R_1 - R_0$.[7] This starting point makes clear that the change in $G(D)$ over any time period is determined by the degree to which any change in the distribution of market incomes is offset by a change in the amount of redistribution done by the tax-benefit system. It is the second component of the equation that we are particularly interested in. $R_1 - R_0$ is a combination of the impact of automatic stabilisation and the impact of discretionary changes to the tax-benefit system.

$$\mathrm{G}(\mathrm{D}_1) - \mathrm{G}(\mathrm{D}_0) = \mathrm{G}(\mathrm{M}_1) - \mathrm{G}(\mathrm{M}_0) - [\mathrm{R}_1 - \mathrm{R}_0] \quad (1)$$

$$= [\mathrm{G}(\mathrm{M}_1) - \mathrm{G}(\mathrm{M}_0)] - [[\mathrm{G}(\mathrm{M}_1) - \mathrm{G}(\mathrm{D}_1)] - [\mathrm{G}(\mathrm{M}_0) - \mathrm{G}(\mathrm{D}_0)]]$$

It is useful at this point to show how this method relates to the commonly used decomposition proposed by Bargain-Callan (2010), BC hereafter. We define $G(D)$ as the result of a tax-benefit function $d(.)$ which transforms market incomes M into disposable incomes D, based on monetary tax-benefit parameters p (benefit payments, tax thresholds etc.).

We can therefore define the change in $G(D)$ as:

$$\Delta G(D) =$$

$$[G(M_1) - G(M_0)] - [G(M_1) - G(d_1(p_1, M_1)) - \{G(M_0) - G\big(d_0(p_0, M_0)\big)\}] \quad (2)$$

To isolate the impact of the discretionary changes in tax-benefit policy from the impact of automatic stabilisation, we introduce a Gini based on a counterfactual distribution of income $G\big(d_0(\alpha p_0, M_1)\big)$. This index summarises income inequality in a distribution of disposable incomes calculated using end-year market incomes transformed into disposable incomes

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[5] Kaplanoglou and Rapanos (2016) examined how the distribution of consumption in Greece changed between 2008 and 2013. They found evidence of a significant increase in consumption inequality, with indirect tax changes contributing to this outcome. See also Pestel and Sommer (2016), Decoster et al. (2014), and Savage (2017) for analyses based on imputation of expenditure data into a tax-benefit microsimulation database.

[6] Equivalised household disposable income, where the OECD equivalence scale is used to equivalise incomes (1 for the first adult, 0.7 for subsequent adults, 0.5 for children).

[7] The RS index is simply defined as the difference between the Gini based on market incomes and the Gini based on disposable incomes. It is therefore a measure of how much redistribution is done by the tax-benefit system in a given year.

under the start-year tax-benefit system, where the parameter, α, indexes monetary tax-benefit parameters, p_0, to common end year values[8].

To equation (2) we add and subtract $[G(M_1) - G(d_0(\alpha p_0, M_1))]$, giving:

$$\Delta G(D) = [G(M_1) - G(M_0)] - [G(M_1) - G(d_1(p_1, M_1)) - \{G(M_0) - G(d_0(p_0, M_0))\}] + [G(M_1) - G(d_0(\alpha p_0, M_1))] - [G(M_1) - G(d_0(\alpha p_0, M_1))] \quad (3)$$

The comparison with the BC decomposition can be made clear at this point. Rearranging terms in equation (3), and cancelling all $G(M_t)$ gives us the BC decomposition in which market income changes and automatic stabilisation are captured in what BC term the "other" effect:

$$\Delta G(D) =$$

$$G(d_1(p_1, M_1)) - G(d_0(\alpha p_0, M_1)) \quad \text{(4a) "policy" effect}^{9}$$

$$+ G(d_0(\alpha p_0, M_1)) - G(d_0(p_0, M_0)) \quad \text{(4b) "other" effect}$$

Alternatively, by rearranging equation (3), we can decompose the overall impact of the tax-benefit system into the impact of the change in the distribution of market income (expression 5a), the impact of discretionary changes to tax-benefit policies (expression 5b), and the impact of automatic stabilisation (expression 5c):

$$\Delta G(D) =$$

$$[G(M_1) - G(M_0)] \quad \text{(5a) Market income effect}$$

$$-[G(M_1) - G(d_1(p_1, M_1)) - G(M_1) + G(d_0(\alpha p_0, M_1)) \quad \text{(5b) Discretionary policy}$$

$$+G(M_1) - G(d_0(\alpha p_0, M_1)) - G(M_0) + G(d_0(p_0, M_0))] \quad \text{(5c) Auto Stabilisation}$$

These expressions can be simplified by moving to the use of notation based on the fact that the Reynolds-Smolensky index (R) is simply the difference between $G(M_t)$ and $G(D_t)$*:*

$$\Delta G(D) =$$

$$[G(M_1) - G(M_0)] \quad \text{(6a) Market income effect}$$

$$-[\ \{R[M_1, d_1(p_1, M_1)] - R[M_1, d_o(\alpha\, p_o, M_1)]\} \quad \text{(6b) Discretionary policy}$$

$$+\{R[M_1, d_o(\alpha p_o, M_1)] - R[M_0, d_o(p_o, M_0)]\}\ ] \quad \text{(6c) Auto Stabilisation}$$

The discretionary policy effect above is estimated using final year data for the counterfactual distributions. The effect can also be estimated based on initial-year data, using the decomposition:

$$\Delta G(D) =$$

[8] See discussion later in this section for choices on the value of α.

[9] What BC define as the "policy" effect captures only the impact of discretionary policy changes.

$[G(M_1) - G(M_0)]$ (7a) Market income effect

$-[\ \{R[M_1, d_1(p_1, M_1)] - R[\alpha M_0, d_1(p_1, \alpha M_0)]\}$ (7b) Auto Stabilisation

$+\{R[\alpha M_0, d_1(p_1, \alpha M_0)] - R[M_0, d_o(p_o, M_0)]\}\ ]$ (7c) Discretionary policy

In what follows, we report decomposition results using initial year data, but results based on end-year data (available on request) lead to similar conclusions.

It is straightforward to further decompose either the automatic stabilisation or the discretionary policy components to separately identify the effect of tax policy and the effect of benefit policy. For example, expression 6(c) shows the impact of automatic stabilisation on inequality. We can isolate the contribution of benefit policy from the contribution of tax policy to overall automatic stabilisation by introducing a benefit function, $b(.)$, which transforms market income into post-transfer, pre-tax income, giving us:

$R[M_1, d_o(\alpha, p_o, M_1)] - R[M_0, d_o(p_o, M_0)] =$

$R[M_1, b_o(\alpha, p_0, M_1)] - R[M_0, b_o(p_o, M_0)]$ (8a) Automatic Benefit Stabilisation

$+ R[b_o(\alpha\, p_0, M_1),\ d_o(\alpha\, p_0, M_1)] - R[b_o(p_o, M_0), d_o(p_o, M_0)]$

(8b) Automatic Tax Stabilisation

or by introducing a tax function, $t(.)$, which transforms market income into post-tax pre-benefit income, giving us:

$R[M_1, d_o(\alpha\, p_o, M_1)] - R[M_0, d_o(p_o, M_0)] =$

$R[M_1, t_o(\alpha p_0, M_1)] - R[M_0, t_o(p_o, M_0)]$ (9a) Automatic Tax Stabilisation

$+ R[t_o(\alpha\, p_0, M_1),\ d_o(\alpha\, p_0, M_1)] - R[t_o(p_o, M_0), d_o(p_o, M_0)]$

(9b) Automatic Benefit Stabilisation

We report results using the decomposition in equation 8 but results using equation 9 are qualitatively similar. Similarly, expression 6(b) can be decomposed to separately identify the impact of discretionary tax policy from discretionary benefit policy. Further breakdowns into the contribution of specific taxes and benefits (e.g., unemployment benefit) are also possible (and are performed) by replacing the tax or benefit function with a partial tax or benefit function, *t*(.)* or *b*(.),* which takes account only of the tax/benefit instrument we are interested in isolating.

In this analysis, we allow α, the indexation parameter, to take three possible values. The first is the change in average market income between the base and end periods, i.e. it measures each component against a scenario where tax-benefit policy parameters are indexed in line with developments in market income. The second is wage growth, i.e., we index policy parameters in line with average annual wage growth. The third is CPI whereby tax-benefit policies are assumed to evolve in line with the consumer price index. These approaches allow us to account for three different types of indexation, which seem most relevant to make tax-benefit policy parameters in monetary units comparable over time. These are also the most common indexation types used by governments in practice. The relevant figures for each indexation assumption are displayed in Table 1. CPI and wage growth are generally positive and broadly similar (except for Greece where CPI grew by 14% but wages declined by 11%). Market income growth, by contrast, has been negative in every country except for Spain where market income registered no growth over the period concerned. In what follows, we present results using the wage growth indexing assumption. However, despite some divergence across the three measures, the decomposition results are not particularly sensitive to this parameter.

Table 1: Measures of price and income growth between 2007 and 2013 (2011 for Ireland)

	Market income growth	CPI	Wage growth
Greece	-37%	14%	-11%
Spain	0%	14%	17%
Ireland	-9%	1%	2%
Portugal	-10%	10%	6%
Italy	-3%	11%	8%

Market income growth is calculated using EU-SILC data for the base (2007) and end (2011/2013) periods. CPI figures come from Eurostat. Annual wage growth statistics come from the OECD.

2.3 Automatic Stabilisers and Income Inequality

Automatic stabilisers, such as progressive tax systems and unemployment benefits, cushion market income shocks so that the resulting disposable income shock is less severe than the original market income shock. Dolls et al (2012) estimate that automatic stabilisers absorb 38% of a proportional market income shock in the EU. Estimations from the European Commission (2017) also put this figure at around one-third. The effect of automatic stabilisers on income *inequality* is less clear-cut because of the relative nature of inequality measures (Atkinson & Brandolini, 2006). Depending on the type of market income shock and the tax-benefit system, automatic stabilisers may either cushion income inequality or, less frequently, exacerbate it. At the same time, benefits which are constant before and after a market income shock – such as some child-related and age-related universal benefits – can help to cushion income inequality from a market shock, even though they do not cushion income losses. This can be seen as a form of "passive" stabilisation of inequality arising from the existence of these benefits, rather than any increased eligibility to them.

Some examples may help to clarify these points. Consider first a proportional reduction of 10% in market income in a simplified system with a progressive income tax and no transfers. The progressivity of the taxation system would ensure that a 10% decrease in market income translates into less than a 10% decrease in average disposable income. In other words, the taxation system cushions the shock to market income. However, its effect on inequality is more nuanced. Market income inequality, as measured by the Gini coefficient, would be unchanged by a 10% fall in all market incomes - this is an inherent property of the Gini index. Disposable incomes, however, will not fall in this uniform fashion – losses will be lower where income falls bring taxpayers into lower tax brackets. This means that, depending on the specific features of the taxation system and the distribution of market income, disposable income inequality may either increase or decrease under a proportional income shock to market income.

Taking a second example of a system in which there is no taxation and the only transfer is a non-means-tested old-age benefit, we can think about a similar market income shock. If all market incomes decrease by 10% but there is no change to old-age benefits, average disposable income will decrease by less than 10%, as in the taxation example. There is no change to the market income Gini. However, this time, the Gini of disposable income will decrease because the pension benefit, which is the same for all eligible households, becomes a more important proportion of disposable income and results in some convergence in the income distribution.[10]

From these examples, it is clear that the impact of automatic stabilisers on income inequality cannot be determined a priori but must be a matter for empirical investigation. This is the task undertaken here, drawing on the decomposition approaches set out above.

3. The Tax and Benefit Systems in the Crisis Countries

There is considerable heterogeneity across EU countries in the level of stabilisation inherent in the tax and benefit systems. In response to a simulated proportional shock to market incomes or an increase in unemployment, (Dolls et al. (2012) found that the overall stabilisation of disposable incomes ranged from 25 per cent to 56 per cent of the overall change in market incomes. Variation in tax-benefit design can, therefore, have different implications for the automatic response to income or unemployment shocks. In this section, we briefly discuss some of the key features of the tax-benefit systems in each of the countries analysed. We also summarise the key reforms to each of the systems implemented during the 2007 to 2013 period.

3.1 Social Protection

A significant degree of variation exists in the targeting of social protection expenditure across countries. The sub-panels of Figure 2 show the proportion of total social protection expenditure by social protection function. Unemployment supports (in the left-hand panel of Figure 2) represent a significantly higher proportion of total social protection expenditure in Ireland and Spain than the other three countries analysed here, particularly during the recession. With a pre-crisis unemployment rate of 4.5 per cent, Ireland spent 8 to 9 per cent of its social expenditure budget on unemployment supports. Spain spent approximately 10 per cent of its social protection budget on unemployment supports in the pre-crisis years. During the crisis, expenditure on unemployment benefits increased significantly in Ireland and Spain due to the increase in unemployment, even though cuts were made to the rate of unemployment benefits paid in both countries. Despite similar increases in unemployment in Greece and Portugal, there is very little evidence of a resulting increase in unemployment

[10] If the nature of the market income shock means that more people actually move into retirement afterwards or become eligible to higher means tested payments, this effect will be strengthened.

benefit expenditure due to combination of strict eligibility conditions and reductions in the value of the payments during the austerity period. Ireland also devoted a significantly higher proportion of its social protection budget to Family and Children state supports than the other countries (see also Table 4 in Section 4.1), a pattern that remains consistent throughout the recession.

The right-hand panel of Figure 2 shows that the pension system is the primary form of social protection available in Greece and Italy, with approximately half of total social protection expenditure spent on old-age payments. A further 8-10 per cent of social protection expenditure in these two countries goes on survivor payments. Before the onset of recession in Greece, the standard retirement age was 65 for men and 60 for women. However, a number of exceptions applied, including a reduced pension available to those with 15 years of social insurance contributions, and a number of "hazardous" occupations with entitlement to a full pension up to five years before "standard" occupations.[11] Austerity measures introduced in Greece included an increase in the retirement age by up to 7 years with immediate effect, large reductions in pension payments, and a reduction in the number of occupations classified as hazardous. Similar reforms were implemented in Italy, with the retirement age increased by up to 5 years, though the increase in this case was phased in over a number of years. At the other end of the scale, Ireland had the lowest proportion of social protection expenditure devoted to old-age payments. Pre-crisis, just over 20 per cent of social expenditure was on old-age payments, increasing to about 25 per cent from 2010 onwards. Rates of payment of state pensions in Ireland were largely unaffected by austerity measures, though there was an immediate rise in the effective state pension age and a time path for future increases was announced.

3.2 Income Taxes and Social Security Contributions

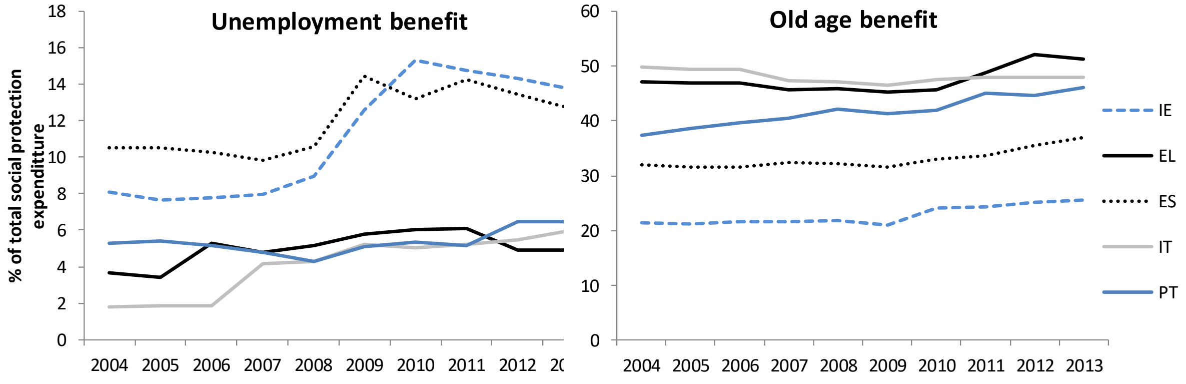
Each of the countries analysed here has a tax-benefit system which is progressively structured, whereby the marginal effective tax rate increases with income. Some important differences exist across the countries and over time however. Table 2 compares the top income tax rate and social security contributions (the "all-in rate") in each country over time.

Pre-crisis, the top "all-in" rate varied from between 43 per cent in Spain to 50.7 per cent in Italy. This increased in all countries by 2011, apart from Italy. By 2013, the top tax rate had decreased below its pre-crisis rate in Greece. No change occurred in Ireland and Italy while a further increase can be observed in Portugal and Spain.

Table 3 shows that average tax and social security rates (ATRs) increased with gross wages in all countries. The difference between the ATR at 67 per cent of the average wage and 167 of the average wage is largest in Ireland, the result of the relatively low threshold at which the top rate of income tax is paid in the Irish tax system. Between 2007 and 2013, the ATR increased across the earnings distribution in all five countries, particularly in Ireland and Portugal.

[11] In 2006, over 30 per cent of contributors to the primary private sector fund (IKA) were in "hazardous" occupations (Leventi et al., 2010).

Figure 2: Unemployment benefit and old age benefit expenditure as a percentage of total social protection expenditure



Source: Eurostat

Table 2 Top personal income tax & employee social security contributions (All-in rate)

	2007	2011	2013
Greece	49.6	57.3	46.0
Ireland	43.6	52.0	52.0
Italy	50.7	47.3	47.3
Portugal	48.4	55.5	61.3
Spain	43.0	45.0	52.0

Source: OECD

Table 3: Average income tax and social security contribution rate for singles, by percentage of average wage

Proportion of average gross disposable income:	67%	100%	133%	167%
2007				
Greece	19	26	29	33
Ireland	6	14	21	26
Italy	25	29	33	36
Portugal	17	22	26	29
Spain	16	21	24	25
2013				
Greece	20	26	31	35
Ireland	13	20	28	33
Italy	27	31	35	38
Portugal	20	27	31	35
Spain	18	23	26	28

Source: OECD

4. The Evolution of Income Inequality over the Great Recession

This section examines changes in the labour market, in income and in income inequality observed in our selection of countries during the GR. We first look at how the labour market structure of the population, as well as the level of income, changed between the base and end periods. We then decompose the changes in a number of inequality indices over the crisis into the relative contributions of market income, discretionary policy and automatic stabilisation. Finding that the automatic stabilisation properties of benefits contributed the most to stabilising inequality during the crisis, we further decompose this factor into the relative contribution of the most important benefits in each economy (unemployment and old-age benefits) to get a more detailed picture of what parts of the benefit system made the largest contribution to stabilising inequality in the crisis countries. As shown in the next sub-section, the crisis was one of strong increases in unemployment and reductions in market income, factors which affect the working age population more than, for example, the older population. Therefore, in a final step, we repeat the exercise for the working age population to zone in on the drivers of inequality for this important demographic group.

4.1 Summary statistics

Using EUROMOD policies from before and after the crisis, linked to the relevant EU-SILC data, Table 4 shows how labour market behaviour, income, taxes and benefits have evolved in the crisis countries over the crisis period.

Table 4: Labour market status and income in crisis countries in base and end periods

	Spain				Greece				Ireland				Portugal				Italy			
	Base		End		Base		End		Base		End		Base		End		Base		End	
	Mean	***N***	**Mean**	***N***	**Mean**	***N***	**Mean**	***N***	**Mean**	***N***	**Mean**	***N***	**Mean**	***N***	**Mean**	***N***	**Mean**	***N***	**Mean**	***N***
A. Household monthly income (excluding 0s)																				
Market income	2,626	*0.91*	2,407	*0.93*	2,548	*0.85*	1,794	*0.80*	5,064	*0.89*	4,385	*0.83*	2,077	*0.87*	1,871	*0.84*	3,174	*0.91*	3,014	*0.91*
Benefits	855	*0.58*	1,006	*0.72*	982	*0.55*	716	*0.79*	1,247	*0.89*	1,163	*0.91*	488	*0.88*	651	*0.76*	1,126	*0.78*	1,253	*0.76*
unemployment	367	*0.11*	406	*0.34*	199	*0.07*	235	*0.08*	757	*0.23*	820	*0.34*	375	*0.07*	372	*0.13*	285	*0.11*	328	*0.15*
old age benefits	1,165	*0.34*	1,466	*0.35*	1,227	*0.40*	1,146	*0.45*	1,178	*0.20*	1,355	*0.18*	831	*0.40*	955	*0.40*	1,612	*0.43*	1,841	*0.42*
other	193	*0.30*	214	*0.36*	114	*0.26*	86	*0.45*	844	*0.82*	658	*0.81*	109	*0.61*	130	*0.46*	276	*0.54*	255	*0.52*
Tax	379	*0.77*	497	*0.75*	345	*0.60*	249	*0.88*	1,020	*0.75*	947	*0.83*	299	*0.78*	347	*0.82*	726	*0.96*	770	*0.91*
Employee social security	164	*0.79*	157	*0.77*	286	*0.84*	207	*0.82*	324	*0.66*	404	*0.59*	215	*0.76*	210	*0.74*	291	*0.69*	311	*0.62*
Self-employed social security	256	*0.17*	217	*0.19*	198	*0.35*	266	*0.28*	104	*0.42*	68	*0.26*	172	*0.14*	347	*0.05*	311	*0.28*	289	*0.29*
Disposable income	2,414	*1.00*	2,435	*1.00*	2,191	*1.00*	1,541	*1.00*	4,601	*1.00*	3,667	*1.00*	1,811	*1.00*	1,603	*1.00*	2,792	*1.00*	2,728	*1.00*
B. Individual labour Market Status																				
School		*0.21*		*0.22*		*0.21*		*0.21*		*0.30*		*0.30*		*0.21*		*0.22*		*0.21*		*0.21*
Employee		*0.37*		*0.30*		*0.28*		*0.21*		*0.34*		*0.30*		*0.38*		*0.34*		*0.29*		*0.29*
Self-employed		*0.07*		*0.06*		*0.14*		*0.11*		*0.07*		*0.05*		*0.09*		*0.05*		*0.09*		*0.08*
Unemployed		*0.06*		*0.14*		*0.04*		*0.13*		*0.05*		*0.09*		*0.05*		*0.11*		*0.04*		*0.07*
Inactive		*0.14*		*0.11*		*0.13*		*0.12*		*0.14*		*0.12*		*0.08*		*0.05*		*0.16*		*0.16*
Disabled		*0.02*		*0.02*		*0.01*		*0.01*		*0.04*		*0.04*		*0.01*		*0.02*		*0.01*		*0.01*
Pensioner		*0.13*		*0.14*		*0.18*		*0.21*		*0.07*		*0.09*		*0.18*		*0.22*		*0.19*		*0.18*
Over-65's		*0.16*		*0.18*		*0.18*		*0.20*		*0.11*		*0.12*		*0.17*		*0.20*		*0.20*		*0.21*

Results based on own simulations using EUROMOD linked to EU-SILC data for the base (2007) and end (2011 for Ireland and 2013 for all other countries) periods. Monthly income is averaged over households with non-zero values for the specific income type. In panel A, Column "N" shows the proportion of household which are repicients in the total population. In panel B, column "N" shows the propotion of individuals in each category of the population.

Panel A in Table 4 shows average income, tax and transfer statistics for households in each country in the base and end period. These exclude zeros. The proportion of households recording a non-zero value for each component of disposable income is also shown. Monthly market income decreases sharply between the base and end periods. The proportion of households receiving market income also declines in Greece, Ireland and Portugal. The level of unemployment benefit received increases slightly in most countries but the proportion of households in receipt of unemployment benefit increases substantially in Ireland and Spain. The level of old age benefits received by households also increases (or stays stable) but the proportion of household in receipt of this type of welfare varies considerably from a low of 20% in Ireland in 2007 to a high of 43% in Italy in the same year. "Other" benefits play a relatively small role as their monetary value is quite low across countries, apart from Ireland, where the role of family benefits is quite important. In terms of taxation, the average level of tax paid by household increases in Spain, Italy and Portugal and decreases in Greece and Ireland. However, the proportion of households paying income tax increases substantially in Greece, Ireland and Portugal. These developments in welfare and taxation incidence and amount reflect both the automatic stabilisation properties of the base period tax and benefit system and the discretionary changes to the system enacted to stabilise public finances.

Panel B in Table 4 categorises individuals by their labour market status. The most notable shifts between the base and end period are out of employment and into unemployment. Employment probabilities are stable in Italy but decrease in all other countries from between 3 to 7 ppt. Unemployment probabilities increase by between 3 and 9 ppt across countries. In most countries, the probability of being self-employed also decreases over the crisis period while the proportion of pensioners increases.

As explained in Section 2.1, the use of a simulated baseline is essential to allow the construction of counterfactual scenarios. To ensure that our simulations are "good enough" to sustain the analysis, we compare the simulations to results from actual survey data. Table 5 shows how Gini coefficients for market and disposable incomes, calculated using EUROMOD, evolved between the base and end periods. These are compared to external figures from Eurostat/OECD and show good validity both in terms of magnitude and direction of change. As discussed in Section 2.1, the exception to this is Cyprus and, for this reason, we exclude Cyprus from the remainder of the analysis.

The Gini index of market income inequality has increased substantially in all the countries studied. The largest increases are recorded in Spain, where the market income Gini increased by around 8 points. This increase is followed closely by Greece (recording an increase of 6 points) and then by Ireland, Italy and Portugal (a 3-4 point increase). Despite increases in the market income Gini in every country, the disposable income Gini only increased substantially in Spain (4 points). Greece and Italy experienced smaller increases in disposable income inequality with the Gini coefficient increasing by 1-2 points between 2007 and 2013. Disposable income inequality in Ireland and Portugal actually fell slightly over the period examined, by 1-2 points.

The five "crisis countries" we study all experienced a substantial rise in market income inequality, as measured by the Gini index, during the GR. However, while Spain and Italy also registered large increases in disposable income inequality, Greece, Ireland and Portugal experienced relatively stable or falling disposable income inequality. Clearly, the tax-benefit systems of the latter countries were more effective in cushioning the effects of rising market inequality during the GR. The question of whether this was due to the automatic stabilisation capacities of these systems or due to discretionary policies implemented over the course of the GR is tackled in the next section.

Table 5: Comparison between simulated and official figures for inequality in crisis countries in the base and end period

	EUROMOD		Eurostat/OECD	
	Base	End	Base	End
Gini (market income)				
Greece	0.51	0.58	0.50	0.57
Spain	0.45	0.53	0.45	0.53
Ireland	0.50	0.54	0.51	0.57
Portugal	0.53	0.57	0.52	0.56
Cyprus	0.38	0.46	-	-
Italy	0.50	0.53	0.49	0.52
Gini (disposable income)				
Greece	0.33	0.34	0.33	0.35
Spain	0.29	0.34	0.31	0.35
Ireland	0.28	0.27	0.31	0.32
Portugal	0.35	0.33	0.36	0.34
Cyprus	0.27	0.34	0.30	0.32
Italy	0.30	0.32	0.32	0.33

Indices are calculated using 2007 EUROMOD policies linked to 2008 data (base period) and 2013 (2011 for Ireland) EUROMOD policies linked to 2014 (2012 for Ireland) data (end period). Incomes are equivalised using the OECD equivalence scale.

5. Decomposing the change in income inequality during the crisis

5.1 The role of market income, discretionary policy and automatic stabilisation

The distributional impact of tax-transfer systems can change due to explicit discretionary changes in tax-benefit policies (e.g., higher tax rates or lower welfare payment rates). But the distributional impact may also be substantially affected by how the tax-benefit system interacts with changes in the underlying population and distribution of income (e.g., an increased expenditure on state transfers due to a higher proportion of pensioners, or increased unemployment).[13] We use the decomposition elaborated in Section 2 to decompose the change in disposable income inequality measured by the Gini coefficient into the relative contributions of market income changes, discretionary policy changes and automatic stabilisation. We also examine two further indices of inequality, the 75/25 percentile ratio (the ratio between the seventy-fifth and the twenty-fifth centile of equivalised disposable

[13] This has long been recognised in the literature on tax progressivity; see, for example, Lambert and Thoresen (2009).

income) and the Generalised Entropy Index GE(2) which is equivalent to half the coefficient of variation.[14] The GE(2) is more sensitive to differences in income shares among the rich, while the Gini coefficient is more sensitive to changes in the middle of the income distribution. The 75/25 percentile ratio is concerned with inequality between the medium-rich and the medium-poor. This range of indices sheds light in a comprehensive manner on changes in income inequality.

Results are displayed in Figure 3 and are also detailed in Table 6 in the Appendix. The black diamonds in Figure 3 depict the total change in each index over the period in question while the different coloured bars indicate the relative contribution of market income changes, discretionary policy (DP) and automatic stabilisation (AS). Within these last two categories, we distinguish between the effect of taxes and benefits separately. The AS effect is split into Automatic Benefit Stabilisation (ABS) and Automatic Tax Stabilisation (ATS). Likewise, the DP effect is split into Discretionary Tax Policy (DTP) and Discretionary Benefit Policy (DBP).

Looking firstly at the Gini index in the upper panel of Figure 3, immediately evident is the fact that changes in market income worked to increase inequality during the GR. This was also apparent from Table 5. This is particularly true in Greece and Spain where the market income effect is quite large. However, in all countries, changes in market income increased inequality. Turning next to discretionary policy, we find that the effect of discretionary changes to tax policy was somewhat inequality reducing in all countries but Greece. This effect is likely to be driven by the fact that all the countries studied, particularly Ireland and Portugal, increased the progressivity of their taxation systems during the crisis (Table 3). Discretionary changes to benefits during the crisis, on the other hand, had no discernible effect on inequality.

Looking next at automatic stabilisation, we find that this property of the tax-benefit system made a substantial contribution to decreasing inequality in all countries. In each country, the effect of AS is larger than that of DP and, in some countries (Portugal, Greece and Ireland), its magnitude is comparable to that of market income changes. The automatic stabilising effect of benefits dominated. In Portugal, Ireland, Greece and Italy, existing benefits cushioned the shock to market income to the extent that inequality decreased or was relatively stable between the beginning and the end of the crisis. In Spain, the existing benefits system also cushioned inequality but not to the same extent, with the result that the Gini index increased by 4 points.

We turn next to the P75/25 ratio, shown in the middle panel of Figure 3. The P75/25 ratio measures inequality in the middle of the income distribution. Like the Gini index, the only country to experience an increase in the P75/25 index during the crisis was Spain. There are many similarities between the contributors to changes in the Gini index and changes in the P75/25 ratio. Market income played the biggest role, increasing this measure of inequality in

[14] The reason for focusing on these three measures is that they are capable of dealing with zero or negative incomes, which is necessary for our decomposition framework. In principle, other measures of inequality or poverty with similar properties could also be used.

all countries. Market income shocks were counteracted by ABS. Only in Spain, did ABS not completely counteract market income changes.

Finally, we focus on another family of inequality measures, the General Entropy measure which includes the GE(2) index. The GE indices measure non-randomness or data compression and the GE(2) index puts more weight on differences between welfare levels higher up in the distribution than lower down in the distribution. The change in the GE(2) measure is depicted in the lower panel of Figure 3. This measure of inequality decreased in Portugal and Ireland, was stable in Italy and Greece and increased in Spain between the base and end periods. Decomposing the changes to this index, we find that it was less sensitive than other measures to the changes in market income experienced in Portugal and Ireland during the crisis but still increased in response to market income shocks in Greece and Spain. As with the other measures of inequality, in all countries the automatic stabilising effect of benefits do the most to counteract increases in inequality as measured by this index.

We find little effect of either automatic tax stabilisation or discretionary benefit policy on any measure of inequality. Taking the example of a 10 per cent market income shock and disregarding any welfare benefits, a progressive tax system stabilises the top of the income distribution more than the bottom of the income distribution, which is likely to increase income inequality in the process. Therefore, ATS is not a channel through which we might expect much inequality stabilisation. In terms of DBP, most discretionary changes to welfare benefits over the period aimed to reduce the total welfare bill and included increases in the state pension age (Greece, Italy and Ireland), cuts to unemployment benefits (Ireland, Spain, Greece and Portugal) and more stringent eligibility criteria for unemployment benefits (Greece and Portugal). However, as market income, wages and CPI fell or increased very slowly over the recession period, some of these cuts in welfare payments would have seen welfare incomes fall in line with other incomes. Our estimations show that, relative to other factors, these discretionary benefit measures had little effect on inequality measures although they undoubtedly reduced average income.

To summarise, we find that countries in which disposable income inequality changed little or decreased over the course of the crisis are not necessarily those with the least change to market income inequality. Rather, the combination of the existing welfare system (ABS) and, to a lesser extent, changes in taxation rules (DTP), counteracted increased market income inequality more in some countries than others. This highlights the importance of the automatic stabilisation properties of tax-benefit systems in alleviating unexpected market shocks to income inequality. It is noteworthy that this finding applies both to countries which have been characterised as having a distinctive Southern European variant of the welfare state, and to Ireland, which is often seen as closer to the liberal model of the UK.

5.2 The role of benefits in stabilising inequality

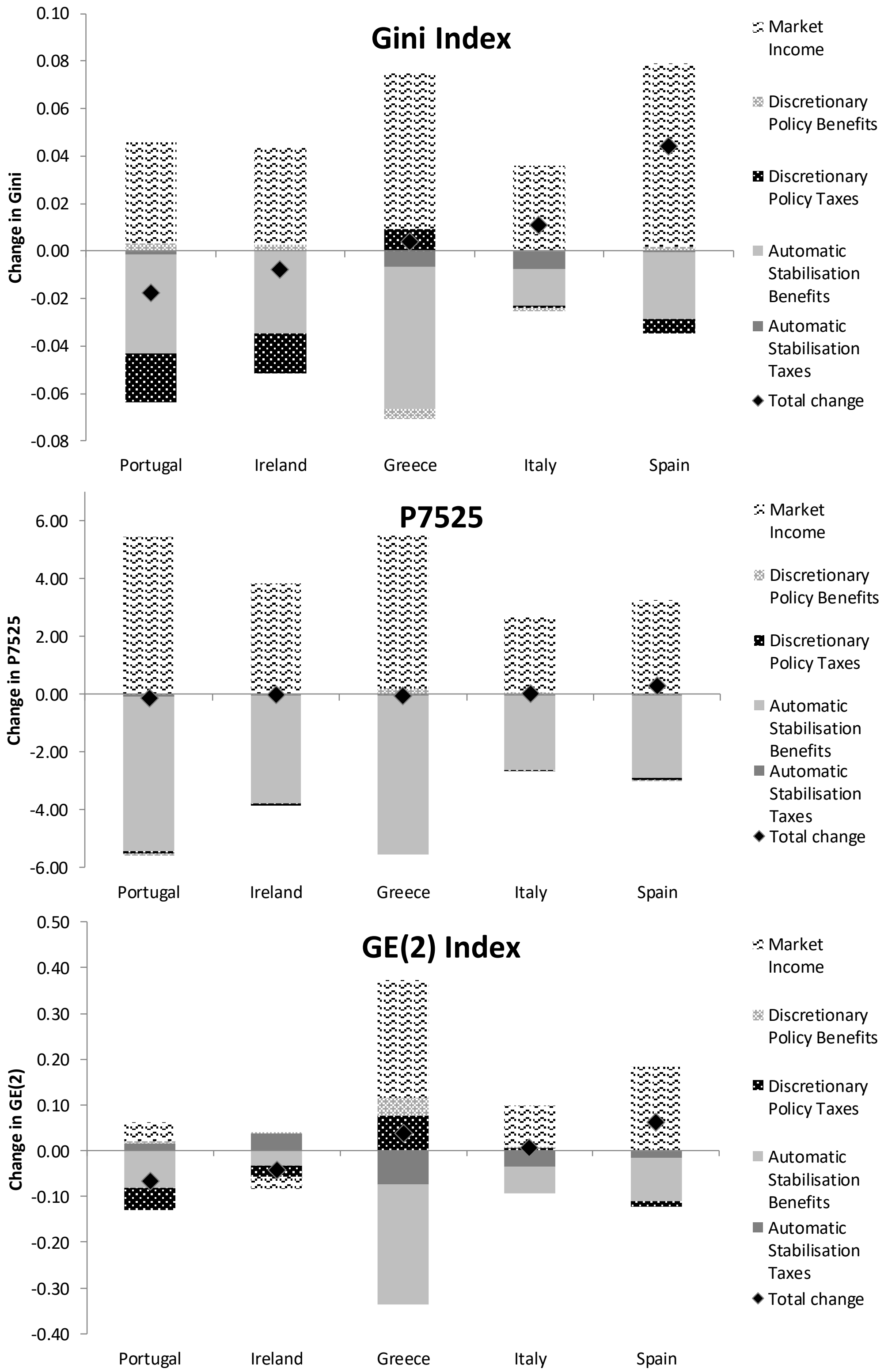
Results from the previous section indicate that the automatic stabilisation property of benefits played the largest role in cushioning inequality during the crisis. In this section, we investigate the relative role of the two main benefits in operation in the countries examined, old age benefits and unemployment benefits. From Table 4, we note that unemployment benefits and old-age benefits account for the vast majority of benefits across countries and time. The exception to this is Ireland, a country in which a larger proportion of social protection expenditure is used for family transfers (universal child benefit, in-work benefits, lone parent allowance, etc.). However, even in Ireland old-age benefits and unemployment benefits combined account for around half of all transfers. In our analysis, unemployment benefits include both contributory and non-contributory benefits but exclude social assistance (minimum income style benefits). Old age benefits also included both contributory and non-contributory pensions, including disability pensions and survivor's benefits. Private pensions are not included in this category as they form part of market income. All other benefits are captured by the "other" category.

A decomposition of the ABS effect into the role of specific benefits is shown in Figure 4 and detailed in Table 7 in the Appendix. The diamond points in Figure 4 show the size of the ABS effect, represented by the light grey bar in Figure 3. From the top panel of Figure 4, we see that base-period benefits stabilised the Gini index by between 1 and 6 percentage points across countries. The drivers of this stabilisation effect vary. Portugal, Greece and Italy, whose spending on old-age benefits is high relative to other supports (Figure 2 and Table 4) owe most of this effect to old-age benefits. In Ireland and Spain, where unemployment supports represented a large and increasing proportion of social protection during the crisis, unemployment benefits are more important in redistribution. Similar patterns can be observed in the middle and lower panels of Figure 4 which depict the effect of ABS on the P75/25 ratio and the GE(2) index respectively. Old-age benefits prove to be the main source of stabilisation of both the P75/25 ratio and the GE(2) in Portugal, Greece and Italy. Looking at the P75/25 index, unemployment benefits and old-age benefit play an equally important role in stabilising income inequality in Ireland and Spain. The same is true for the GE(2) index for Spain while unemployment benefits do all the work in stabilising this index in Ireland.

5.3 The working age population

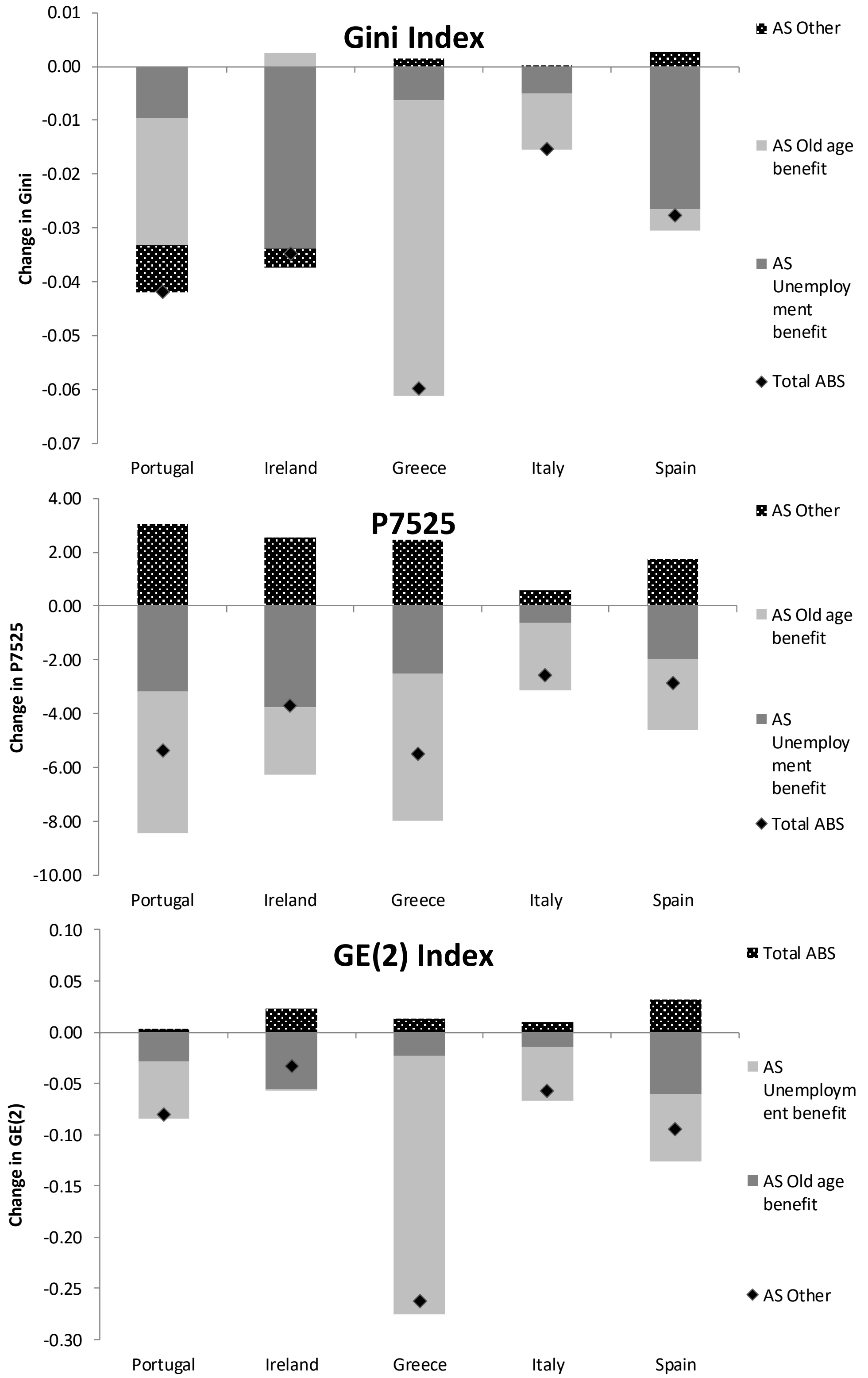
Given the crisis was one that greatly impacted employment rates and market income, the finding that old-age benefits cushioned its effect on income inequality in several crisis countries deserves a little more attention. We judge that this finding is likely to be at least partly due to difference in household composition across countries, with southern European households more likely to have at least one pensioner in each household (Table 4).

Figure 3: Decomposition of the change in inequality indices into the contribution of market income, discretionary policy and automatic stabilisation over the crisis period



Note: Own calculations from base year EUROMOD policies and income data (2007 for all countries) and end year EUROMOD policies and income data (2013 for all countries except Ireland, for which the end year is 2011).

Figure 4 Decomposition of the automatic stabilisation effect of benefits into its relevant components over the crisis period



Note: Own calculations from base year EUROMOD policies and income data (2007 for all countries) and end year EUROMOD policies and income data (2013 for all countries except Ireland, for which the end year is 2011).

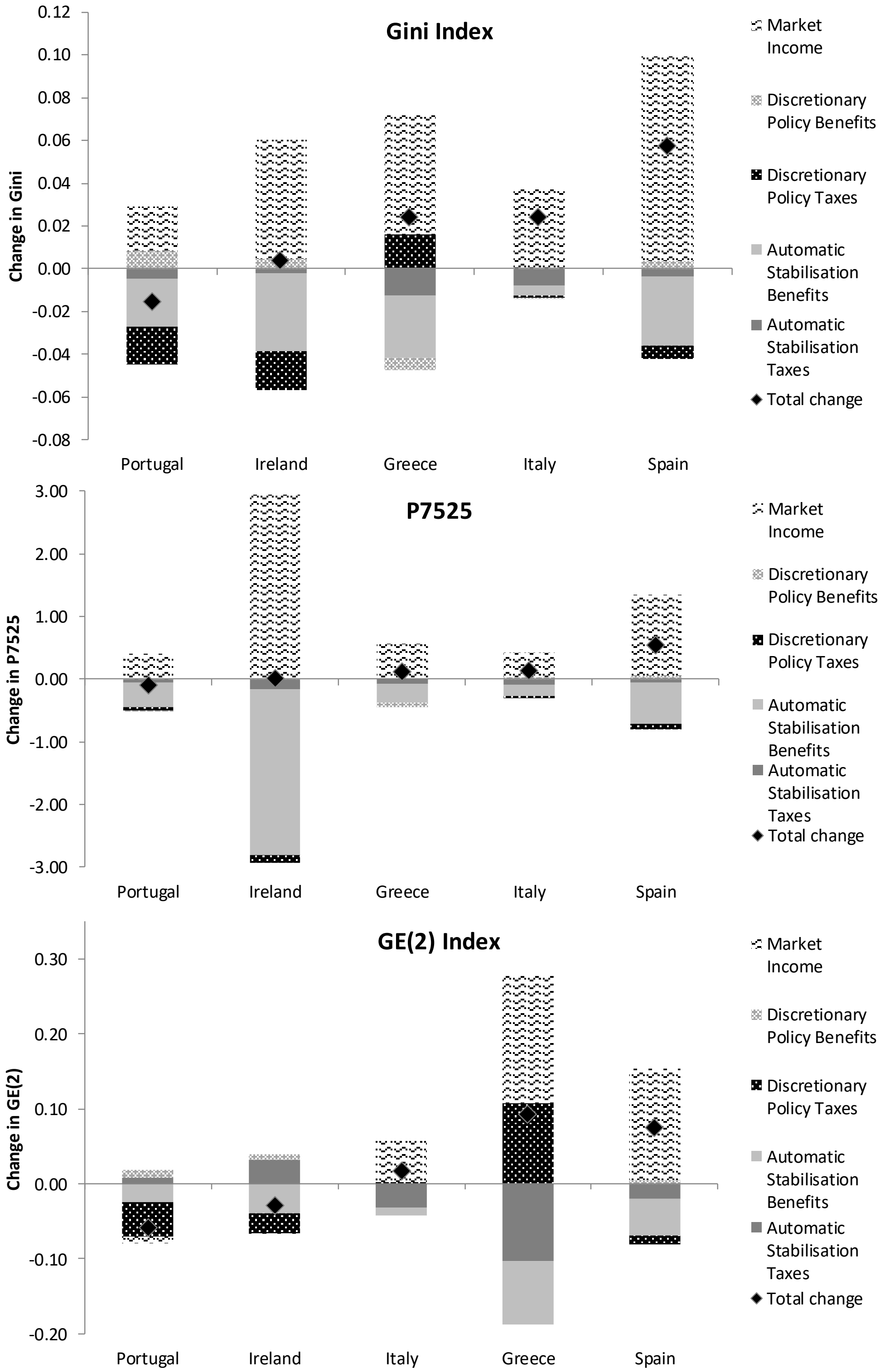
The question of whether household members pool income among themselves is a much debated one but it is generally accepted that ignoring the dynamics within a household can lead to a flawed understanding of inequality in the population as a whole (Chiappori & Meghir, 2014). The majority of analyses of income distribution are carried out at the household level under the assumption that income is fully shared or "pooled" so that all household members enjoy the same standard of living. This unitary model of family behaviour is often an appropriate way to characterise household income sharing but non-unitary models of family behaviour, which posit some form of bargaining or negotiation within the family, challenge this unitary approach and have been shown to have some validity (Lundberg et al., 1997; Browning et al., 2010; Watson et al, 2013). If there is limited income pooling, particularly intergenerational income pooling, within households, the finding that old-age benefits stabilised income inequality in Portugal, Greece and Italy is to be interpreted with caution. We try to abstract from this issue by focusing our attention on the working age population. That is, we repeat the decomposition exercise for those households in which the oldest person is under 60 years of age.[15] This will give a reflection of how inequality changed and through which channels for those generally deemed to have been hardest hit by the recession.

Results are displayed in Figures 5 and 6 (and detailed in Tables 8 and 9 in the Appendix). The top panel of Figure 5 shows that the Gini Index for the working age population decreased by 2 points in Portugal, was stable in Ireland and increased in Greece, Italy and Spain. As was the case for the whole population, market income changes increased inequality in all countries but particularly in Ireland, Greece and Spain. In Portugal and Ireland, DTP and ABS reversed or counteracted this increase. ABS also counteracted some of the increase in market income inequality in Greece and Spain but not by enough to keep the Gini Index constant. Comparing to results for the whole population (Figure 3), we note that the magnitude of ABS is lower for the working age population in Portugal, Greece and Italy and this results in an overall increase in income inequality for this demographic group in these countries.

The middle panel of Figure 5 shows the contributions of discretionary policy and automatic stabilisation to the evolution of the P75/25 ratio of the working age population. While this was found to be constant for the population as a whole between the beginning and the end of the recession everywhere but Spain, within the working age population, this index has increased slightly for Greece and Italy and more substantially for Spain. In general ABS, which completely counteracts the increase in the p75/25 ratio brought about by market income changes for the whole population, is slightly weaker in counteracting the increase for the working age population, particularly in Spain.

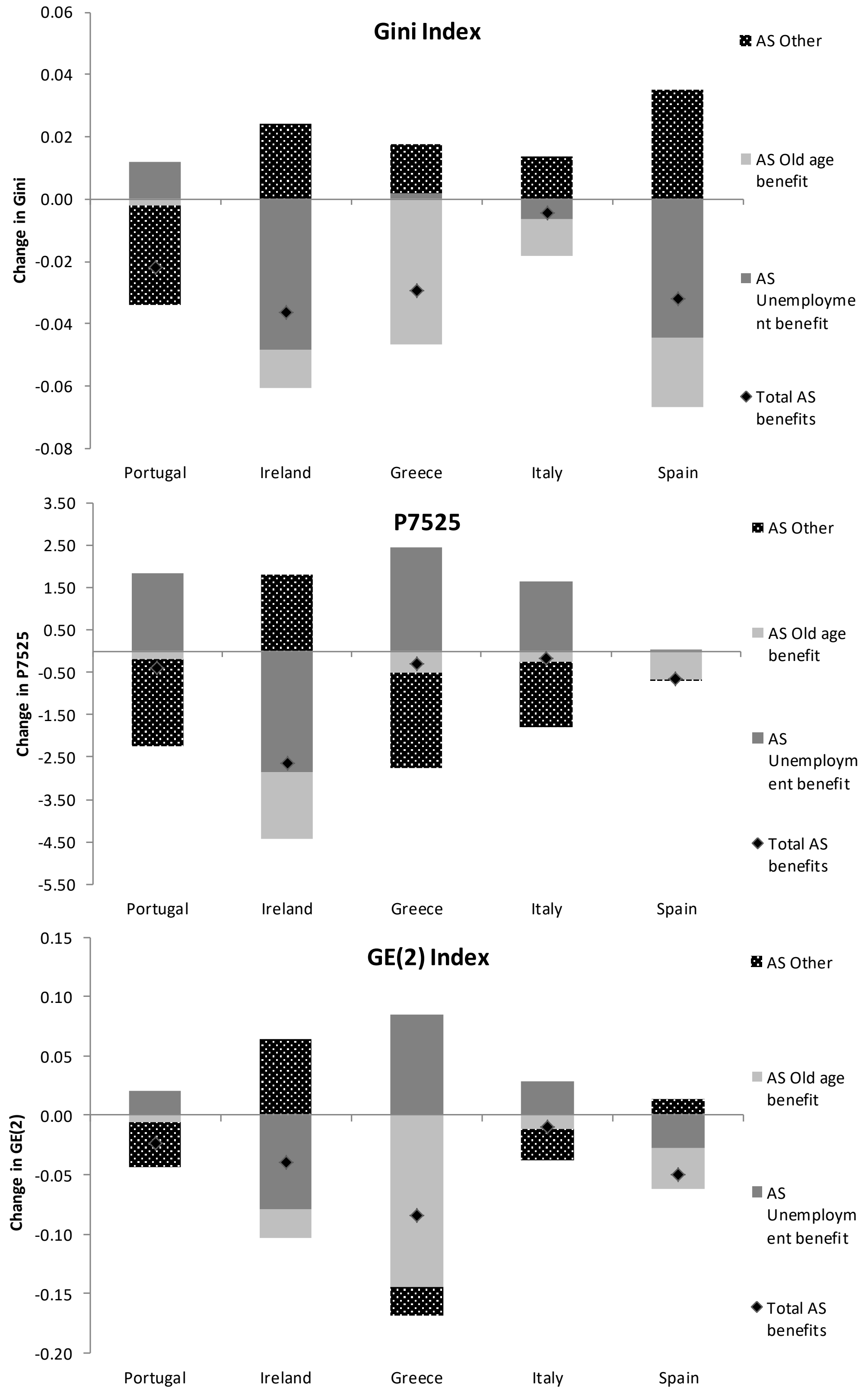
[15] The retirement age in each of the countries studied was as follows. Greece - 65 (men), 60(women); Spain – 65; Ireland – 65; Italy – 65 (men), 60 (women); Portugal – 65.

Figure 5 Decomposition of the change in inequality indices into the contribution of market income, discretionary policy and automatic stabilisation for the working age population over the crisis period



Note: Own calculations from base year EUROMOD policies and income data (2007 for all countries) and end year EUROMOD policies and income data (2013 for all countries except Ireland, for which the end year is 2011).

Figure 6: Decomposition of the automatic stabilisation effect of benefits into its relevant components for the working age population over the crisis period



Note: Own calculations from base year EUROMOD policies and income data (2007 for all countries) and end year EUROMOD policies and income data (2013 for all countries except Ireland, for which the end year is 2011).

We turn lastly to the GE(2) index in the bottom panel of Figure 5. While the magnitude and patterns of change to this index are generally similar for the whole population and for the working age population, Greece stands out as an exception. The GE(2) index increased more dramatically in Greece for the working age population and this can be attributed to the fact that ABS was weaker at counteracting increases to market income inequality for this group of the population.

The breakdown of the total ABS effect for the working age population into the relative contributions of old age benefits, unemployment supports and other benefits is displayed in Figure 6. In general, old age benefits play a much less important role in ABS for the working age population. This is to be expected as the only pension-type benefits that this population should be entitled to are pre-retirement age disability pensions. Like for the case of the whole population, unemployment supports make up a large part of the ABS effect for Ireland and Spain. However, these types of benefits do not substantially stabilise inequality in Greece, Portugal or Italy. In some cases, they are seen to increase inequality further rather than decrease it.

6. Conclusions

The impact of the Great Recession and associated austerity policies on poverty and inequality in OECD countries is of central interest, not least considering the political turmoil and rise of populism to which it may be contributing. Much of the emphasis in research and debate about inequality and fiscal adjustment focuses on discretionary changes in tax and transfer system parameters, explored via tax-benefit simulation models. However, the 'automatic' stabiliser effects as the tax and transfer systems respond to changes in household incomes and employment levels also play a central role.

Applying and extending a new approach developed by Savage et al. (2017), we show that automatic stabilisation played a large role in shaping income distributions in "crisis" countries over the course of the Great Recession. Disposable income inequality fell or was stable in every country but Spain. This was largely due to the automatic stabilising effect of the benefits system. The effect of old-age benefits and unemployment benefits, which account for most of social protection expenditure in these countries, was found to vary. Countries which devoted more resources to unemployment supports, such as Ireland and Spain, were also those in which unemployment protection played an important role in cushioning inequality. Old–age benefits were important stabilisers in all countries but were most important in countries which devoted a larger share of their social protection expenditure to old-age supports. Ireland and Spain's income distributions were mainly cushioned by unemployment supports while old-age benefits played an important role in Greece, Italy and Portugal. Overall, across countries, automatic stabilisation, particularly through the benefits system, played a larger role than discretionary policy in reducing inequality, highlighting the importance of a well-designed tax-benefit system in dealing with unexpected market shocks. One important implication of this is that, in implementing discretionary policy, policy-makers should consider the extent to which it changes the existing automatic stabilisation property of a tax-benefit system.

Given that the crisis severely impacted employment and market income, the channels through which income inequality for the working age population evolved are also of interest. Focussing on the working age population also negates concerns that old-age benefits may not be subject to similar income pooling to other income sources. Estimations for the working age population find that disposable income inequality increased in Greece, Italy and Spain but was stable in Portugal and Ireland. Cross-country comparisons indicate that discretionary tax policy and a larger degree of automatic benefit stabilisation in Portugal and Ireland cushioned income inequality for the working age population. Due to the lack of a strong unemployment support system, a smaller role was played by benefits in stabilising income inequality in Greece, Italy and Spain for this demographic group. Commonly used inequality measures assume full income pooling between household members. Although it is generally accepted that married couples pool most of their income, less is known about how income is pooled between working age household members and retired household members. Our results invite a more cautious interpretation of the stable headline inequality indices in most of the crisis countries during the Great Recession.

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Appendix

Table 6: Decomposition of the change in disposable income inequality between 2007 and 2013 (2011 for Ireland)

	Base (2007)	Total change (end - base)	% change	Market Income	Automatic Stabilisation Taxes	Discretionary Policy Taxes	Automatic Stabilisation Benefits	Discretionary Policy Benefits
Gini Index								
Portugal	0.35	-0.02	-5%	0.04	0.00	-0.02	-0.04	0.00
Ireland	0.28	-0.01	-3%	0.04	0.00	-0.02	-0.03	0.00
Greece	0.33	0.00	1%	0.07	-0.01	0.01	-0.06	0.00
Italy	0.31	0.01	4%	0.04	-0.01	0.00	-0.02	0.00
Spain	0.29	0.04	15%	0.08	0.00	-0.01	-0.03	0.00
P90/50								
Portugal	2.27	-0.16	-7%	0.29	-0.01	-0.15	-0.30	0.00
Ireland	1.83	0.06	3%	0.60	-0.09	-0.08	-0.37	0.00
Greece	2.01	2.79	138%	0.42	2.80	0.03	-0.45	-0.01
Italy	1.89	0.00	0%	0.28	-0.08	0.01	-0.19	-0.02
Spain	1.87	0.18	10%	0.80	-0.07	-0.03	-0.52	0.01
P75/25								
Portugal	2.30	-0.15	-6%	5.45	-0.07	-0.09	-5.36	-0.07
Ireland	2.07	-0.02	-1%	3.83	-0.05	-0.10	-3.71	0.02
Greece	2.19	-0.05	-2%	5.31	-0.03	0.00	-5.50	0.17
Italy	2.04	0.03	2%	2.60	-0.04	-0.02	-2.58	0.07
Spain	2.03	0.30	15%	3.28	-0.04	-0.07	-2.86	-0.01
GE(2)								
Portugal	0.31	-0.07	-22%	0.04	0.02	-0.05	-0.08	0.00
Ireland	0.18	-0.04	-24%	-0.03	0.04	-0.02	-0.03	0.00
Greece	0.27	0.04	14%	0.26	-0.07	0.08	-0.26	0.04
Italy	0.22	0.00	2%	0.09	-0.04	0.01	-0.06	0.00
Spain	0.15	0.06	40%	0.18	-0.02	-0.01	-0.09	0.00

Indices are calculated using 2007 EUROMOD policies linked to 2008 data (base period) and 2013 (2011 for Ireland) EUROMOD policies linked to 2014 (2012 for Ireland) data (end period). Incomes are equivalised using the OECD equivalence scale.

Table 7: Decomposition of the automatic stabilising effect of benefits during the crisis into its relevant components

	Automatic Stabilisation Benefits	Unemployment benefit	Old-age benefit	Other
Gini Index				
Portugal	-0.04	-0.01	-0.02	-0.01
Ireland	-0.03	-0.03	0.00	0.00
Greece	-0.06	-0.01	-0.05	0.00
Italy	-0.02	0.00	-0.01	0.00
Spain	-0.03	-0.03	0.00	0.00
P90/50				
Portugal	-0.30	-0.08	-0.27	0.05
Ireland	-0.37	-0.14	-0.25	0.02
Greece	-0.45	0.03	-0.45	-0.03
Italy	-0.19	-0.03	-0.19	0.02
Spain	-0.52	-0.25	-0.45	0.18
P75/25				
Portugal	-5.36	-3.20	-5.22	3.06
Ireland	-3.71	-3.77	-2.49	2.54
Greece	-5.50	-2.51	-5.47	2.48
Italy	-2.58	-0.64	-2.51	0.57
Spain	-2.86	-1.95	-2.65	1.74
GE(2)				
Portugal	-0.08	-0.03	-0.06	0.00
Ireland	-0.03	-0.06	0.00	0.02
Greece	-0.26	-0.02	-0.25	0.01
Italy	-0.06	-0.01	-0.05	0.01
Spain	-0.09	-0.06	-0.07	0.03

Indices are calculated using 2007 EUROMOD policies linked to 2008 data (base period) and 2013 (2011 for Ireland) EUROMOD policies linked to 2014 (2012 for Ireland) data (end period). Incomes are equivalised using the OECD equivalence scale.

Table 8: Decomposition of the change in disposable income inequality for the working age population between 2007 and 2013 (2011 for Ireland)

	Base (2007)	Total change (end - base)	% change	Market Income	Automatic Stabilisation Taxes	Discretionary Policy Taxes	Automatic Stabilisation Benefits	Discretionary Policy Benefits
Gini Index								
Portugal	0.35	-0.02	-4%	0.02	0.00	-0.02	-0.02	0.01
Ireland	0.28	0.00	1%	0.06	0.00	-0.02	-0.04	0.00
Greece	0.35	0.02	7%	0.06	-0.01	0.02	-0.03	-0.01
Italy	0.31	0.02	8%	0.04	-0.01	0.00	0.00	0.00
Spain	0.30	0.06	19%	0.10	0.00	-0.01	-0.03	0.00
P90/50								
Portugal	2.23	-0.18	-8%	-0.03	-0.06	-0.12	0.03	0.01
Ireland	1.78	0.19	11%	0.55	-0.15	-0.08	-0.15	0.03
Greece	1.97	0.15	8%	0.31	-0.04	0.09	-0.18	-0.03
Italy	1.86	0.03	2%	0.15	-0.07	-0.01	-0.02	-0.02
Spain	1.85	0.25	13%	0.52	-0.11	-0.02	-0.15	0.00
P75/25								
Portugal	2.27	-0.10	-4%	0.41	-0.05	-0.05	-0.40	-0.02
Ireland	2.07	0.01	0%	2.91	-0.17	-0.12	-2.64	0.02
Greece	2.29	0.12	5%	0.54	-0.07	0.02	-0.32	-0.07
Italy	2.05	0.13	6%	0.39	-0.09	-0.04	-0.17	0.03
Spain	2.03	0.55	27%	1.30	-0.05	-0.08	-0.67	0.05
GE(2)								
Portugal	0.29	-0.06	-21%	-0.01	0.01	-0.05	-0.02	0.01
Ireland	0.18	-0.03	-17%	0.00	0.03	-0.03	-0.04	0.01
Greece	0.30	0.09	30%	0.17	-0.10	0.11	-0.08	0.00
Italy	0.21	0.02	8%	0.06	-0.03	0.00	-0.01	0.00
Spain	0.15	0.07	49%	0.15	-0.02	-0.01	-0.05	0.00

Indices are calculated using 2007 EUROMOD policies linked to 2008 data (base period) and 2013 (2011 for Ireland) EUROMOD policies linked to 2014 (2012 for Ireland) data (end period). Incomes are equivalised using the OECD equivalence scale. The working age population is defined as all households in which the eldest member is less than 60 years of age.

Table 9: Decomposition of the automatic stabilising effect of benefits during the crisis into its relevant components

	Automatic Stabilisation Benefits	Unemployment benefit	Old-age benefit	Other
Gini Index				
Portugal	-0.02	0.01	0.00	-0.03
Ireland	-0.04	-0.05	-0.01	0.02
Greece	-0.03	0.00	-0.05	0.02
Italy	0.00	-0.01	-0.01	0.01
Spain	-0.03	-0.04	-0.02	0.04
P90/50				
Portugal	0.03	0.25	0.06	-0.27
Ireland	-0.15	-0.09	-0.20	0.14
Greece	-0.18	0.15	-0.34	0.01
Italy	-0.02	0.13	-0.03	-0.13
Spain	-0.15	0.02	-0.17	0.00
P75/25				
Portugal	-0.40	1.84	-0.19	-2.04
Ireland	-2.64	-2.85	-1.57	1.79
Greece	-0.32	2.45	-0.52	-2.24
Italy	-0.17	1.63	-0.25	-1.55
Spain	-0.67	0.03	-0.67	-0.03
GE(2)				
Portugal	-0.02	0.02	-0.01	-0.04
Ireland	-0.04	-0.08	-0.02	0.06
Greece	-0.08	0.08	-0.15	-0.02
Italy	-0.01	0.03	-0.01	-0.03
Spain	-0.05	-0.03	-0.03	0.01

Indices are calculated using 2007 EUROMOD policies linked to 2008 data (base period) and 2013 (2011 for Ireland) EUROMOD policies linked to 2014 (2012 for Ireland) data (end period). Incomes are equivalised using the OECD equivalence scale. The working age population is defined as all households in which the eldest member is less than 60 years of