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The Extent and Composition of Automatic Stabilization in EU Countries

David Coady, Silvia De Poli, Adrián Hernández, Andrea Papini,
and Alberto Tumino

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The Extent and Composition of Automatic Stabilization in EU Countries
Prepared by David Coady, Silvia De Poli, Adrián Hernández, Andrea Papini, and Alberto Tumino*

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ABSTRACT: This paper analyses the magnitude of automatic income and demand stabilization in EU Member States between 2011 to 2019. Our analysis finds that automatic income stabilization in 2019 averaged 41.3 percent at the EU level, with considerable variation among Member States. While the extent of stabilization is similar across income groups within countries, the source of stabilization differs, with income taxation (transfers) being more important for high-income (low-income) households. Income stabilization proved stable over time, with a few exceptions driven by major reforms. EU-level demand stabilization averaged 84.7 percent, increasing with household income and reflecting the greater ability of richer households to smooth consumption.

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WORKING PAPERS

The Extent and Composition of Automatic Stabilization in EU Countries

Prepared by David Coady, Silvia De Poli, Adrián Hernández, Andrea Papini, and Alberto Tumino¹

¹ This work is the result of a collaboration between affiliates of the IMF (D. Coady and A. Tumino) and the Joint Research Centre of the European Commission (S. De Poli, A. Hernández and A. Papini). The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission and the IMF. The results presented here are based on EUROMOD version 14.0+. Originally maintained, developed and managed by the Institute for Social and Economic Research (ISER), since 2021, EUROMOD has been maintained, developed and managed by the Joint Research Centre (JRC) of the European Commission in collaboration with Eurostat and national teams from the EU countries. We are indebted to the many people who have contributed to the development of EUROMOD. The results and their interpretation are the authors' responsibility. We acknowledge the fruitful comments of Ana Agúndez, Salvador Barrios, Rodrigo Cerda, Michael Christl, Vitor Gaspar, Raphael Lam, Paolo Mauro, Alexandra Solovyeva and the participants to the IMF-FAD Seminar "The Role of Fiscal Policy in Stabilizing Incomes in the EU before and during the Pandemic: A Microsimulation Approach". The paper is also published as *JRC Working Papers on Taxation and Structural Reforms*, No 01/2023.

Contents

Glossary	3
I. Introduction	4
II. Methodology and Data	5
A. Measuring Income and Demand Stabilization	5
B. EUROMOD and EU-SILC	9
III. Empirical Results	10
A. Income Stabilization	10
B. Demand Stabilization	17
IV. Conclusion	21
Annex I. Formal Derivation	23
Annex II. Additional Tables and Figures	24
References	27

FIGURES

1. ISC for EU Countries, by Income Quintile, 2019	12
2. ISC Estimates for 2011 - 2019	13
3. ISC Changes Over 2011 – 2019 for Selected EU Countries	14
4. ISC Over Years 2011 – 2019, by Quintile	15
5. Elasticities of Disposable Income with Respect to Market Income, 2019	16
6. Elasticities (Households with Positive Market Income) vs ISC, 2019	17
7. MPC for EU Countries, Total.....	18
8. ISCs and DSCs for EU Countries, by Income Quintile, 2019.....	19
9. Share of Savings and Borrowings and ISC for EU Countries, 2019	20
10. MPCs and MPCISC=0 for EU Countries, 2019.....	21

Glossary

AS = Automatic Stabilizers

EU SILC = European Statistics on Income and Living Conditions

ISC= Income Stabilization Coefficient

DSC= Demand Stabilization Coefficient

MPC= Marginal Propensity to Consume

I. Introduction

Automatic stabilizers (AS) are fiscal policy features that operate countercyclically on household income and consumption, cushioning the transmission of economic shocks in the absence of further discretionary government intervention. Personal income tax, means-tested benefits, and unemployment benefits are typical examples of AS as these tax liabilities and benefit entitlements automatically adjust to changes in market income (i.e., income before direct taxes and transfers), including due to changes in labor market status (Auerbach and Feenberg, 2000; Dolls et al., 2012; European Commission, 2017). Strong AS can improve the efficiency of resource allocation through reducing the need for excessive household precautionary savings while enabling consumption smoothing by households, especially low-income households with limited access to savings and borrowings. AS can strengthen the economic resilience of a country during an economic downturn. The COVID-19 pandemic has been a timely reminder of the importance of the shock absorption properties of the tax-benefit system for stabilizing both household incomes (the micro level) and the overall economy (the macro level).¹

Using the EU microsimulation model EUROMOD and household-level data from the European Statistics on Income and Living Conditions (EU-SILC), this paper analyzes the extent and composition of AS in EU countries at the micro level. To ensure comparability across countries, the analysis assesses the stabilization properties of countries' tax-benefit systems in response to a common 5 percent negative shock to market income affecting all households in all EU Member States. In contrast to macroeconomic estimates of AS, which are typically based on aggregate models of the economy (European Commission 2020), micro-based approaches can more easily quantify how the overall tax-benefit system automatically limits the transmission of a market income shock to disposable household income across countries, as well as the contributions of separate tax and benefit policy components. They also allow an analysis of how the level and composition of AS differs across household income groups within countries, including the relative contributions of various tax and benefit policies.²

This paper makes various contributions to the existing literature. First, it provides new estimates of income and demand stabilization coefficients in the EU for 2019, providing a detailed analysis of the roles of tax-benefit policies and of households' marginal propensities to consume out of a transitory income shock.³ Second, it provides an overview of income stabilization over the 2010s, highlighting the changes caused by major tax-

¹ Ensuring a resilient society is at the center of the EU policymaking. In 2021, the European Commission adopted the Recovery and Resilience Facility that aims at strengthening EU economies while making them more resilient to future socioeconomic challenges. In fact, the resilience dashboards (https://ec.europa.eu/info/strategy/strategic-planning/strategic-foresight/2020-strategic-foresight-report/resilience-dashboards_en consulted on 05/10/2022) monitors the evolution of the resilience capacities of EU countries including, among many other indicators, an index of automatic income stabilization.

² While micro-based approaches allow for a more disaggregated study of AS, they capture only first-round (or "direct") impacts on household incomes. Macro-based models, on the other hand, allow for second-round (or "indirect") impacts, for example, arising from household behavioral responses (e.g., labor supply or savings responses) and general equilibrium responses in product and factor markets (European Commission 2020).

³ The marginal propensity to consume is defined as the change in household consumption following a transitory shock in household disposable income.

benefit reforms across countries. Third, after setting out a formal framework for the analysis of income and demand stabilization, it sheds light on the relationship between demand stabilization, income stabilization, and marginal propensity to consume.

The main findings of the paper are as follows. We find that country-level automatic income stabilization in 2019 averaged 41.3 percent at the EU level but with considerable variation among Member States. While the extent of stabilization is similar across household income groups within countries, the source of stabilization differs, with income taxation (transfers) being more important for high-income (low-income) households. Most countries did not experience significant changes between 2011 and 2019, with a few exceptions driven by major reforms to taxes and social contributions. We find that EU-level demand stabilization averages 84.7 percent, increasing with household income and reflecting the greater ability of high-income households to smooth consumption.

The paper is organized as follows. Section 2 presents the conceptual framework and describes the data and the methodology used to assess automatic stabilization. Section 3 presents the results. Section 4 concludes.

II. Methodology and Data

A. Measuring Income and Demand Stabilization

In this analysis, AS measure the shock absorption properties of the tax-benefit system in absence of further government intervention. They are estimated via the calculation of the so-called Income Stabilization Coefficient (ISC) and Demand Stabilization Coefficient (DSC), which measure the income and consumption stabilization properties of a country's tax-benefit system respectively. We start by formally deriving these indicators. Household disposable income (Y_h) is defined as the sum of market income (M_h), net income-related transfers (NT_h), and other net transfers whose amount is not related to current levels of market income (\overline{NT}_h), e.g., pensions and non-means-tested benefits. NT_h is further decomposed into social benefits received (B_h) and taxes and social insurance contributions paid (T_h).

$$Y_h = M_h + NT_h + \overline{NT}_h = M_h + B_h - T_h + \overline{NT}_h \quad (1)$$

The marginal propensity to consume out of a transitory income shock (MPC_h) measures the change to household consumption (ΔC_h) caused by a marginal change in Y_h (ΔY_h) so that:

$$\Delta C_h = MPC_h * \Delta Y_h \quad (2)$$

The ISC measures the share of a shock to market incomes (i.e., income before direct taxes and transfers) that is absorbed by fiscal policies, thus reducing the impact on household disposable incomes (i.e., incomes after direct taxes and transfers).⁴ The size of the ISC is therefore a measure of the implicit insurance of disposable income by the tax-benefit system in the event of an economic shock. A common 5 percent negative shock across all countries and households is assumed to facilitate the comparability of the extent and composition of AS across countries. A household-level *ISC* can be computed as follows:

$$ISC_h = 1 - \frac{\Delta Y_h}{\Delta M_h} = \frac{\Delta T_h}{\Delta M_h} - \frac{\Delta B_h}{\Delta M_h} \quad (3)$$

Intuitively, ISC_h is equal to one if no change in disposable income is observed following the shock (i.e., fiscal policies fully absorb the shock) and equals zero if the change in market income is fully transmitted to disposable income. Therefore, the higher the coefficient, the higher the stabilization effect of fiscal systems on income. The calculation of ISC_h using microsimulation models allows for the interactions between the different components of a given tax-benefit system, and it can be decomposed to analyze the stabilization role of specific income-related fiscal policy instruments, e.g., taxes and social insurance contributions (T) versus benefits (B). Being independent of market incomes, $\overline{\Delta NT}_h$ will equal to zero since net transfers whose value does not vary with market income have no stabilization role.

A country-level *ISC* can be computed as a weighted average of household-level ISCs, with each household (or household income group) share in the total market income shock as weights.⁵

$$ISC = 1 - \frac{\sum_{h=1}^N \Delta Y_h}{\sum_{h=1}^N \Delta M_h} = 1 - \frac{\sum_{h=1}^N \Delta M_h * (1 - ISC_h)}{\sum_{h=1}^N \Delta M_h} = \frac{\sum_{h=1}^N \Delta M_h * ISC_h}{\sum_{h=1}^N \Delta M_h} \quad (4)$$

Similar to ISC_h , the country-level ISCs can be decomposed to study the separate stabilization roles of taxes and benefits.

It should be noted that, within each country-year combination, the ISC measures the income stabilization properties of the tax-benefit system in the absence of further policy intervention. The indicator does not distinguish between the stabilization offered by permanent or temporary features of the tax benefit system, nor between pre-existing and recently implemented policies, although the latter could be imputed to discretionary policy interventions rather than AS. The reasons are that non-temporary policy interventions do affect AS and that the period analyzed (2011-19) only includes a few examples of temporary policies implemented in response to the global financial crisis. The distinction would certainly be more relevant for the analysis of the year 2020,

⁴ The concepts of income and demand stabilization used in this analysis are consistent with those used in European Commission (2017) and Christl et al. (2021; 2022c), among others.

⁵ For a common shock across all households, as simulated in this paper, the household weight would be equivalent to the household share of total market income.

when various Member States adopted a vigorous policy response to the COVID-19 pandemic, in some cases temporary in nature.

Similarly to the ISC, we calculate a *DSC*, which measures the share of a market income shock that translates into a demand shock for each household:

$$DSC_h = 1 - \frac{MPC_h * \Delta Y_h}{\Delta M_h} \quad (5)$$

Intuitively, DSC_h is equal to one if no change in consumption is observed following the shock. This can happen if either the fiscal policies fully absorb the shock (i.e., $\Delta Y_h=0$) or if the household is able to perfectly smooth consumption by running down savings or through short-term borrowing (i.e., $MPC=0$). As for the country-level ISC, the country-level DSC can be computed as a weighted average of the household level DSCs:

$$DSC = 1 - \frac{\sum_h MPC_h * \Delta Y_h}{\sum_h \Delta M_h} = \frac{\sum_{h=1}^N \Delta M_h * DSC_h}{\sum_{h=1}^N \Delta M_h} \quad (6)$$

The relationship between household-level income and demand stabilization coefficients can be seen from the following reformulation of (5):

$$DSC_h = 1 - \frac{MPC_h * \Delta Y_h}{\Delta M_h} = 1 - MPC_h * (1 - ISC_h) = (1 - MPC_h) + MPC_h * ISC_h \quad (7)$$

Defining country level MPCs as the aggregate change in household consumption divided by the total change in disposable income, it follows that:

$$MPC = \frac{\sum_h MPC_h * \Delta Y_h}{\sum_h \Delta Y_h} \quad (8)$$

$$DSC = 1 - MPC * \frac{\sum_h \Delta Y_h}{\sum_h \Delta M_h} = 1 - MPC * (1 - ISC) = (1 - MPC) + MPC * ISC \quad (9)$$

The above equations can also be used to establish useful properties of the DSC and its relationship with MPC and ISC. In particular:

- i. $DSC_h = 1$ if $MPC_h = 0$. If the marginal propensity to consume is equal to 0, i.e., household consumption does not respond to transitory income shocks, household consumption is fully stable. The result also holds at the country level, i.e., if $MPC_h = 0$ for all households, then $MPC = 0$ and $DSC = 1$.

- ii. $DSC_h = ISC_h$ if $MPC_h = 1$. If consumption adjusts fully following a shock, the demand stabilization coefficient will be equal to the income stabilization coefficient. The result also holds at the country level, i.e., if $MPC_h = 1$ for all households, then $MPC = 1$ and $DSC = ISC$. Therefore, the ISC represents a lower bound for DSC and the difference between DSC and ISC is inversely correlated to the marginal propensity to consume.
- iii. $DSC_h = 1$ if $ISC_h = 1$. Full income stabilization implies full demand stabilization. The result also holds at the country level, i.e., if $ISC_h = 1$ for all households then $ISC = 1$ and $DSC = 1$ independently of the value of MPC .
- iv. $DSC_h = (1 - MPC_h)$ if $ISC_h = 0$. In the absence of income stabilization, household consumption stabilization will be equal to the share of the disposable income shock that is cushioned by savings. The relationship also holds at the country level, although the country-level MPC is a function of both MPC_h and disposable income ΔY_h (Equation 8).⁶ It follows that the country-level MPC is not exogenous, and it is influenced by ISC . In particular, if $ISC_h = 0$ for all households, it follows that $ISC = 0$ and $DSC = (1 - MPC_{ISC=0})$, where $MPC_{ISC=0} = \frac{\sum_h MPC_h * \Delta M_h}{\sum_h \Delta M_h} \neq \frac{\sum_h MPC_h * \Delta Y_h}{\sum_h \Delta Y_h} = MPC_{ISC>0}$. The value of $MPC_{ISC=0}$ can be determined numerically.
- v. $\frac{\partial DSC_h}{\partial ISC_h} = MPC_h$. A households' marginal propensity to consume MPC_h determines the extent to which an increase in ISC_h influences DSC_h . It implies that the higher MPC_h , the more effective changes in ISC_h will be in stabilizing demand, and that income stabilization provided to households with low MPC_h will only marginally affect their demand stabilization.

Since the country-level MPC is dependent on ISC , calculations are more complicated at the aggregate level and the solution can be found numerically, modifying marginally the household level ISC_h and recomputing ISC and MPC .⁷

Nevertheless, for a uniform change of ISC_h across all households it is possible to show that:

$$\frac{d DSC}{d ISC} = \frac{\sum_{h=1}^N \Delta M_h MPC_h}{\sum_{h=1}^N \Delta M_h} = MPC_{ISC=0}$$

See Appendix 1 for the formal derivation. The results confirm that the effectiveness of income stabilization in stabilizing demand is proportional to the marginal propensity to consume.

The ISC and DSC measure the extent to which taxes and benefits automatically smooth the transmission of a market income shock to disposable income. However, these indicators do not capture the stabilizing role played by net transfers whose value does not vary with current market income values, e.g., old-age pension or non-means-tested benefits. Nevertheless, many countries have sizeable non-means tested transfers that constitute a significant share of disposable income for many households, thus also providing important protection from income shocks. The larger the share of such transfers in a household's disposable income, the less important

⁶ Take two countries, formed by households that are equivalent to each other in terms of household level MPC_h and market income, and subject to the same shock. These two countries will have different country-level MPC if the ISC s are different.

⁷ $\frac{\partial DSC}{\partial ISC} = -\frac{\partial MPC}{\partial ISC} + \frac{\partial MPC}{\partial ISC} * ISC + MPC = \frac{\partial MPC}{\partial ISC} * (1 - ISC) + MPC$

are shocks to market income. The stabilizing role of such transfers can be captured by calculating the percentage change in Y_h associated with a one percentage change in M_h , i.e., the household-level and country-level elasticities, $E(Y_h, M_h)$ and $E(Y, M)$ respectively:

$$E_h(Y_h, M_h) = \frac{\Delta Y_h}{\Delta M_h} * \frac{M_h^0}{Y_h^0} = (1 - ISC_h) * \frac{M_h^0}{Y_h^0} \quad (10)$$

$$E(Y, M) = \frac{\sum_{h=1}^N \Delta Y_h}{\sum_{h=1}^N \Delta M_h} * \frac{\sum_{h=1}^N M_h^0}{\sum_{h=1}^N Y_h^0} = (1 - ISC) * \frac{\sum_{h=1}^N M_h^0}{\sum_{h=1}^N Y_h^0} \quad (11)$$

B. EUROMOD and EU-SILC

The analysis makes use of the microsimulation model EUROMOD and of underlying microdata from the EU-SILC. The EU microsimulation model EUROMOD covers all the EU Member States in a consistent manner. The model is a static tax-benefit calculator that facilitates the simulation of the effect of taxes and benefits (and their reforms) on income distribution, work incentives, and the government budget. The scope of EUROMOD simulations in their standard configurations focus on direct taxes, social insurance contributions, and cash benefits. Depending on the country, EUROMOD simulations cover years ranging from 2005 to 2022. The main simulated tax and benefit rules correspond to those in place as of 30 June (Sutherland and Figari, 2013) of each year.

In this paper, we use the version I4.0+ of EUROMOD and we restrict our analysis to the policy years 2011 to 2019 for all the EU 27 countries. As such, our study focuses on the pre-pandemic period, leaving aside the analysis of the extraordinary circumstances of the COVID-19 pandemic (see Christl et al., 2022c, for an extensive study on the cushioning effects of tax and benefit systems in 2020). Table A.1 in Appendix 2 shows the different combination of policy years and EU-SILC data for the period under analysis. Each policy year in EUROMOD usually runs on EU-SILC input data for the same income reference period—for instance, 2011 systems work with 2012 EU-SILC data whose income reference period is 2011. When this is not the case, uprating factors are used to bring the income values from the income reference period to the policy year. Noticeably, our simulations in EUROMOD assume full compliance and full take-up to the existing policy rules, meaning that the estimated automatic stabilization effects should be interpreted as the intended effect of the tax-benefit systems, especially in countries where the phenomenon of tax evasion or the extent of benefit non-take-up are of particular concern.⁸

⁸ In principle, ISC would be lower if tax non-compliance and benefit non-take up were to be considered. Tax-avoidance would reduce marginal tax rates in presence of progressive taxation, hence reducing income stabilization. Benefit non-take up would reduce the benefit component of the income stabilization coefficient.

Finally, and as mentioned in section 2.I, the computation of the *ISC* follows the simulation of a hypothetical negative market income shock of 5%, applying simultaneously and symmetrically to all individuals with any source of market income. This approach follows in essence previous studies (Dolls et al., 2012; Dolls et al., 2022) and aims to facilitate comparability of results. Market income includes employment and self-employment incomes, investment and property incomes, pensions from individual private plans, and regular net inter-household transfers, with all these income sources reported in gross terms.

III. Empirical Results

A. Income Stabilization

The extent of automatic stabilization from fiscal policies in EU countries is estimated to be large on average, albeit with substantial variation across countries. Country-level automatic income stabilization in 2019 averaged 41.3 percent at the EU level^{9,10}, ranging from 18.9 percent in Bulgaria to 57.2 percent in Belgium (Figure 1; top-left panel). Direct income taxes represent the largest source of income stabilization with an *ISC* of 29.3 percent at the EU level, followed by Social Insurance Contributions (SICs) at 10.2 percent, and social benefits at 1.8 percent. Stabilization from direct taxes range from 42.7 percent in Denmark to 7.8 percent in Romania. In 20 countries, direct income taxes alone comprised more than half of the total *ISC*. Income stabilization from SICs

⁹ Previous microsimulation-based estimates of AS have focused on the US and EU countries and followed a similar strategy. Estimates for the US indicate that the federal income taxes and payroll taxes cushion between 23% and 35% of the simulated shock in market income over the years 1962 to 1995 (Auerbach and Feenberg, 2000) and fluctuated around 25% until the late 2000s (Auerbach, 2009). For later years, and considering social security contributions, state level taxes and benefits, Dolls et al. (2012) find a slightly higher estimate of around 32%. In the case of the EU countries, estimates available for different points in time since the late 1990s are higher than for the US, with EU average values varying between 33% and 43% (see Mabbet and Schelke, 2007; Dolls et al., 2012; and European Commission, 2017).

¹⁰ Other more recent analyses have studied the role of AS in the context of specific (as opposed to common) economic shocks (Covid-19) and for specific countries, while also incorporating the stabilizing impacts of discretionary policy responses. Country-specific studies for Germany (Christl et al., 2022a), Austria (Christl et al., 2022b) and UK (Brewer and Tasseva 2021), as well as EU level studies (Christl et al., 2022c), found a very important role for AS in absorbing the negative shocks in market incomes suffered by households in 2020. At the EU level, AS absorbed 37% of the economic shock due to COVID-19. These were reinforced by additional discretionary measures, which absorbed a further 37.4% of the shock (Christl et al., 2022c). Lam and Solovyeva (2023) analyze the important role of job-retention schemes in stabilizing household incomes during the pandemic across the EU.

varies from 34 percent in Romania to zero in Denmark.¹¹ The importance of social benefits also varies substantially, ranging from less than 0.1 percent in Hungary and Latvia to 3.9 percent in France.¹²

While the level of income stabilization is relatively stable across the household income distribution within countries, its composition varies substantially (Figure 1; top-right and bottom panels). At the EU level, the ISC varies from 41.8 percent at the bottom of the income distribution (Q1) to 39.1 for the median quintile (Q3) and 42.5 at its top (Q5).¹³ However, its composition changes substantially with income levels, with a larger role of direct taxes for richest households and a more prominent role of social benefits at the bottom of the income distribution. Social benefits absorb about 16 percent of the market income shock for households in the lowest quintile compared to only 0.1 percent for households for the top. The progressivity of personal income taxes means they stabilize a higher share of the income shock at the top of the income distribution (34.8 percent) than at the bottom (12.5 percent). Country-level results also highlight significant variation in the stabilizing role of social benefits, with Luxembourg, Slovenia, and Ireland showing the largest income stabilization from social benefits in the lower part of the income distribution.¹⁴

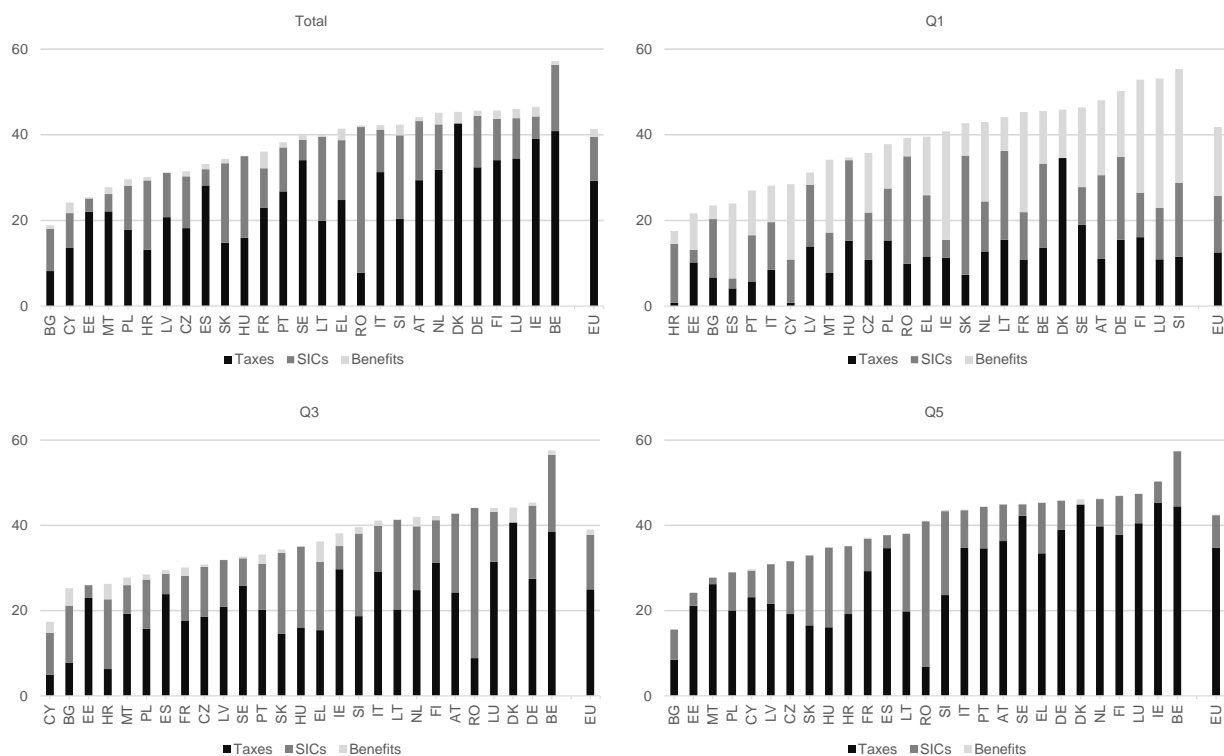
¹¹ The result for Denmark follows from the classification of labor market contributions in EUROMOD as taxes rather than SICs and from the fact that unemployment benefit contributions and supplementary labor market contributions do not depend directly on earnings. Romania reformed the social insurance contribution rate for employees, transferring some of the burden previously on the employer. This explains the high stabilization coefficient on SICs.

¹² To appreciate the stabilization properties of unemployment benefits, Figure A1 in Appendix 2 reports country level ISCs following a 5 percent increase in the number of unemployed on top of the uniform market income shock (Scenario 1). The unemployment increase is simulated through reweighting, i.e., increasing the survey weight of unemployed people in the underlying data and reducing the weight of those in employment, to keep the aggregate population constant. ISC is computed at the aggregate level, according to formula (4). Similar to the main analysis, EU level ISC amounts to 41.5 percent. Stabilization from unemployment benefit amounts to 1 percent at the EU level, ranging from below 0.5 percent in Romania and Slovenia to 2.8 percent in Finland. The small share of the unemployment shock out of the total market income shock explains the relatively low ISC associated to unemployment benefits. Reporting ISC following the unemployment increase only, Figure A2 shows that ISC associated to unemployment benefits amounts to 11 percent at the EU level, ranging from below 1 percent in Romania, Poland and Croatia to 31 percent in Finland. The low ISC related to unemployment benefits in Romania, Poland and Croatia is explained by the small number of observations being in receipt of such benefits in the EUROMOD input datasets. As mentioned, this remains a first-round assessment of the impact of the shock on households' disposable income following the interplay of the tax-benefit system. But the total stabilization effectiveness of these components may be different to their magnitude in the ISC, depending on the size of the tax and spending multipliers. Thus, the automatic stabilization from unemployment insurance, although smaller in total magnitude than that from the tax system, may be more effective because more of the money is spent rather than saved.

¹³ EU-level ISC are computed aggregating changes in market income and disposable incomes across countries. The result is equivalent to a EU level weighted average, with the shares of country specific market income shock out of the total market income shock being used as weighting factor. As a consequence, EU level results in our analysis are more influenced by larger countries.

¹⁴ The EU tax and benefit systems usually provide a larger degree of income stabilization than an equivalent tax and benefit system consisting of a flat rate, which would result in the same level of aggregate disposable income equivalent as the observed one. This result indicates that the tax and benefit systems in the EU Member States are overall progressive, even if there is certain heterogeneity among countries (European Commission, 2017).

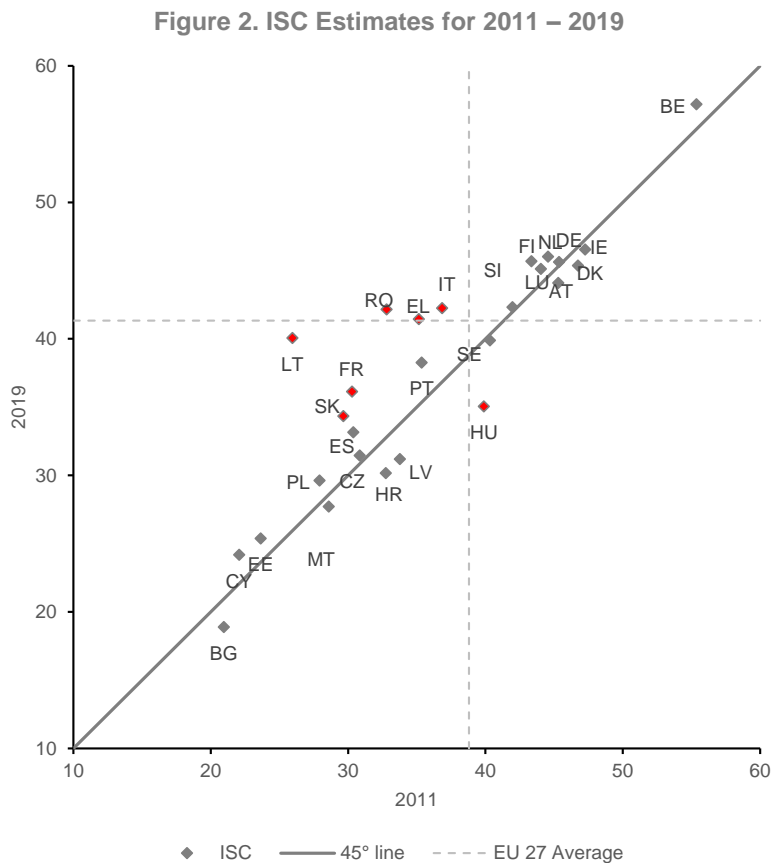
Figure 1. ISC for EU Countries, by Income Quintile, 2019



Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data.

Overall, our results are in line with previous estimates for European countries by Mabbet and Schelkle (2007), Dolls et al. (2012) and European Commission (2017). Most differences in country specific ISCs can be explained mainly by the different time horizons of the analyses (Mabbet and Schelkle, 2007, focus on 1998 policy rules, while Dolls et al., 2012, focus on the years preceding the great recession) and the use of different level of analysis (European Commission, 2017, indicators are calculated at the household level).

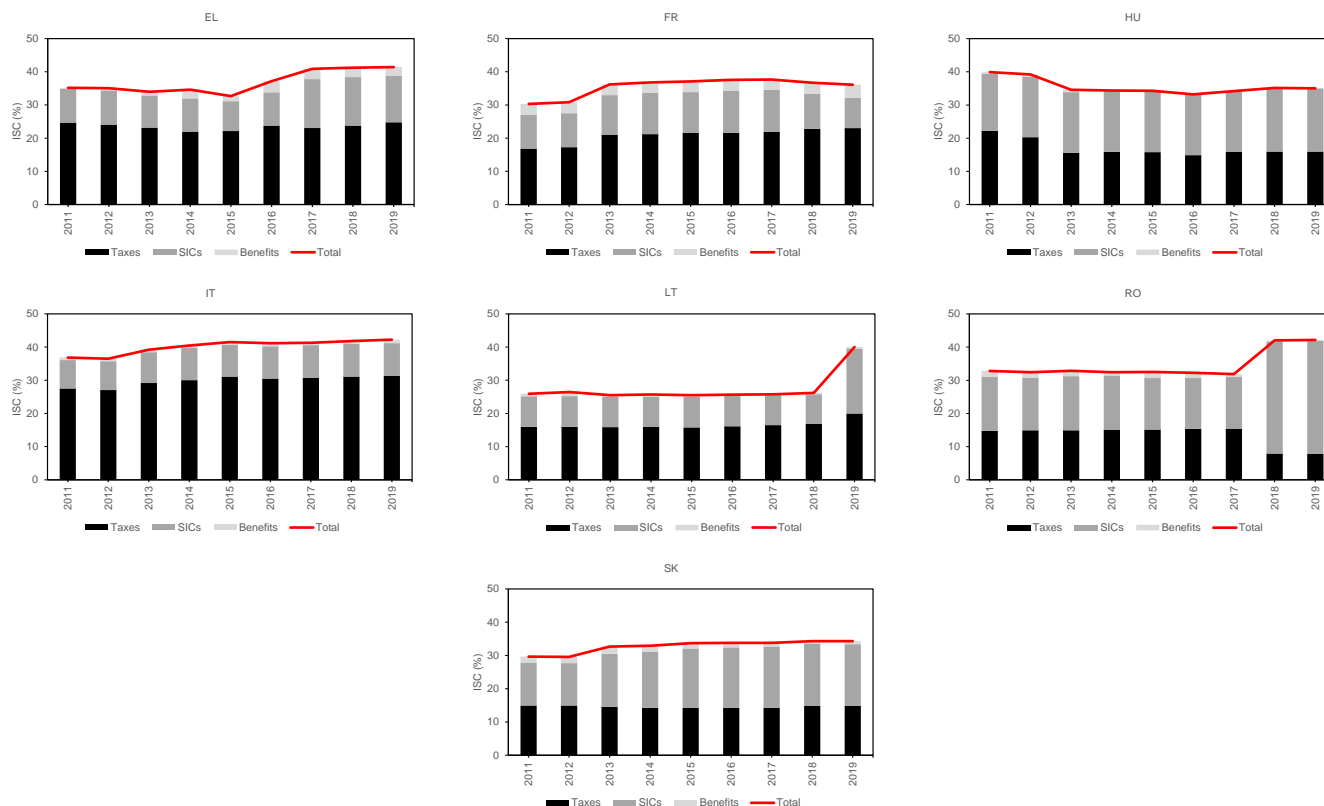
Figure 2 describes how ISCs changed between 2011 and 2019 for all EU countries. Each dot corresponds to an EU Member State. The EU-level ISC for both years are depicted with dashed gray lines. Countries experiencing an absolute change in percentage points above the average absolute difference of the period are highlighted in red. The figure shows that ISC remained rather stable over the last decade. At the EU level, the ISC experienced a slight increase of around 2 percentage points. Despite high heterogeneity in the extent of automatic income stabilization across the EU, most countries did not experience significant changes (countries placed on the diagonal line). There are some exceptions. While, on the one hand, the extent of automatic stabilization increased substantially with respect to 2011 in a few countries (namely Lithuania, Romania, Greece, France, Italy and Slovakia), on the other hand, Hungary experienced a large decrease in the ISC. Noticeably, despite lying below the 2011 EU average, in Lithuania, Romania, Greece and Italy the ISC increased sufficiently to place themselves close or above the 2019 average, whereas the opposite occurs in Hungary, whose ISC now clearly lies below the 2019 EU average.



A detailed analysis of these “outlier” countries (Figure 3) allows us to identify the main sources of changes in AS.¹⁵ First, changes to social insurance contributions were significant in Lithuania, Romania, and Slovakia, leading to an increase in the ISC. In particular, in Lithuania and Romania employers’ contributions were strongly shifted to the employee side, while in Slovakia the maximum social insurance contribution bases were substantially increased. Second, the personal income taxes of Greece, France, and Italy experienced several adjustments throughout this period towards enhancing the progressivity of their systems, also leading to an increase in ISC. For instance, in 2013, France introduced an exceptional tax on high incomes. Conversely, between 2011 and 2014, Hungary gradually implemented a flat personal income tax, replacing the previously existing progressive schedules and leading to a reduction in ISC in this country. Finally, the benefits side did not undergo significant changes sufficient to influence the extent of automatic income stabilization at the country level, although notably in Greece a new guaranteed minimum income entered into force in 2017, replacing some existing means-tested benefits.

¹⁵ For this purpose, we review the information provided in the EUROMOD Country Reports by national experts, which can be consulted at: <https://euromod-web.jrc.ec.europa.eu/resources/country-reports>.

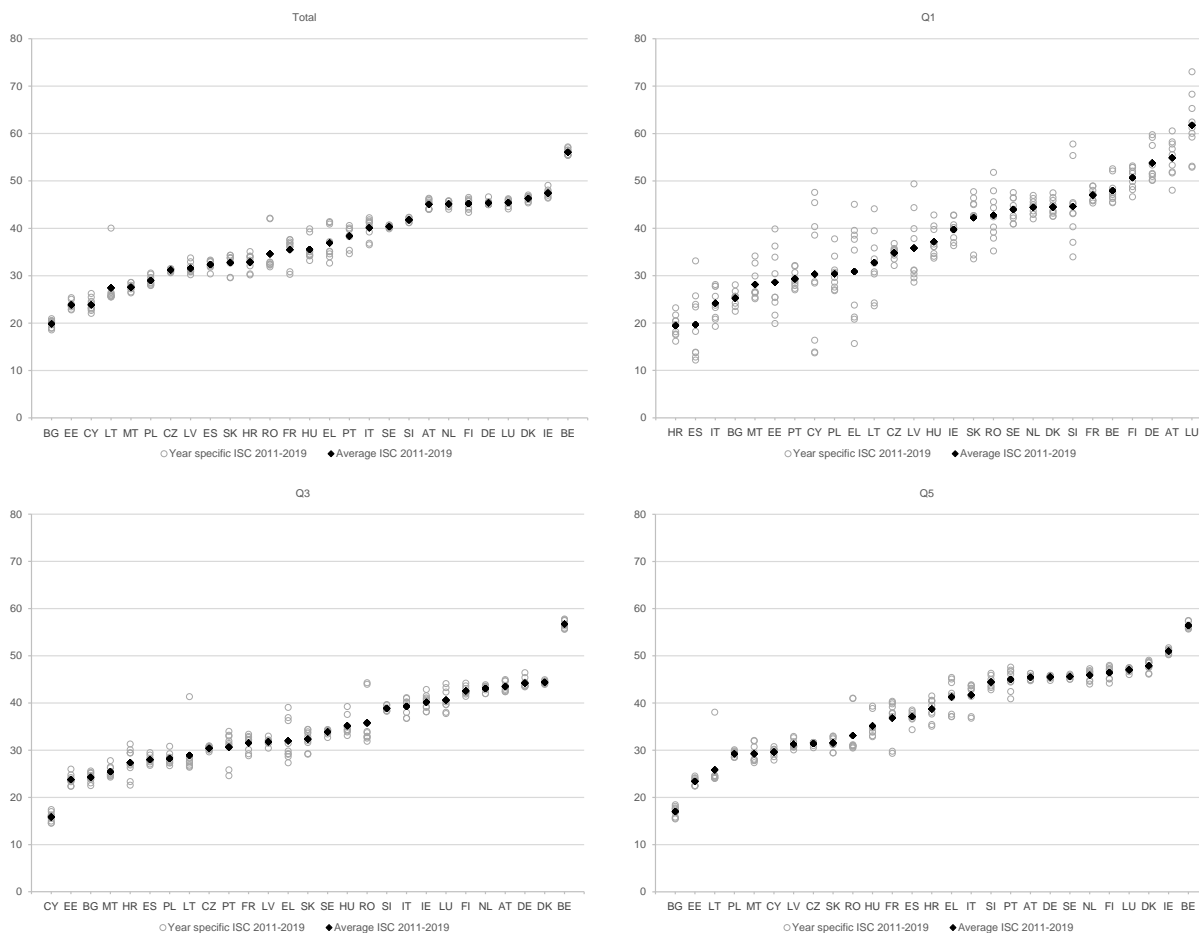
Figure 3. ISC Changes Over 2011 – 2019 for Selected EU Countries



Source: Author’s calculation using EUROMOD 4.0+ and EU-SILC data.

Despite little variation in the extent of automatic income stabilization over the 2011-2019 period for most countries, Figure 4 shows significant variation at the bottom part of the income distribution in many countries. For example, in Greece and Cyprus the standard deviation of the ISC is above 10 in the first quintile, while it is significantly lower in the third and fifth quintiles (about 1 in Cyprus and 4 in Greece). Further analysis confirms that these changes in ISC mostly stem from the means-tested benefits component (Figure A3 in the Appendix 2).

Figure 4. ISC Over Years 2011 – 2019, by Quintile



Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data; Notes: The red diamond corresponds to the country-specific average over the period 2011-2019. Grey dots report the year-specific values.

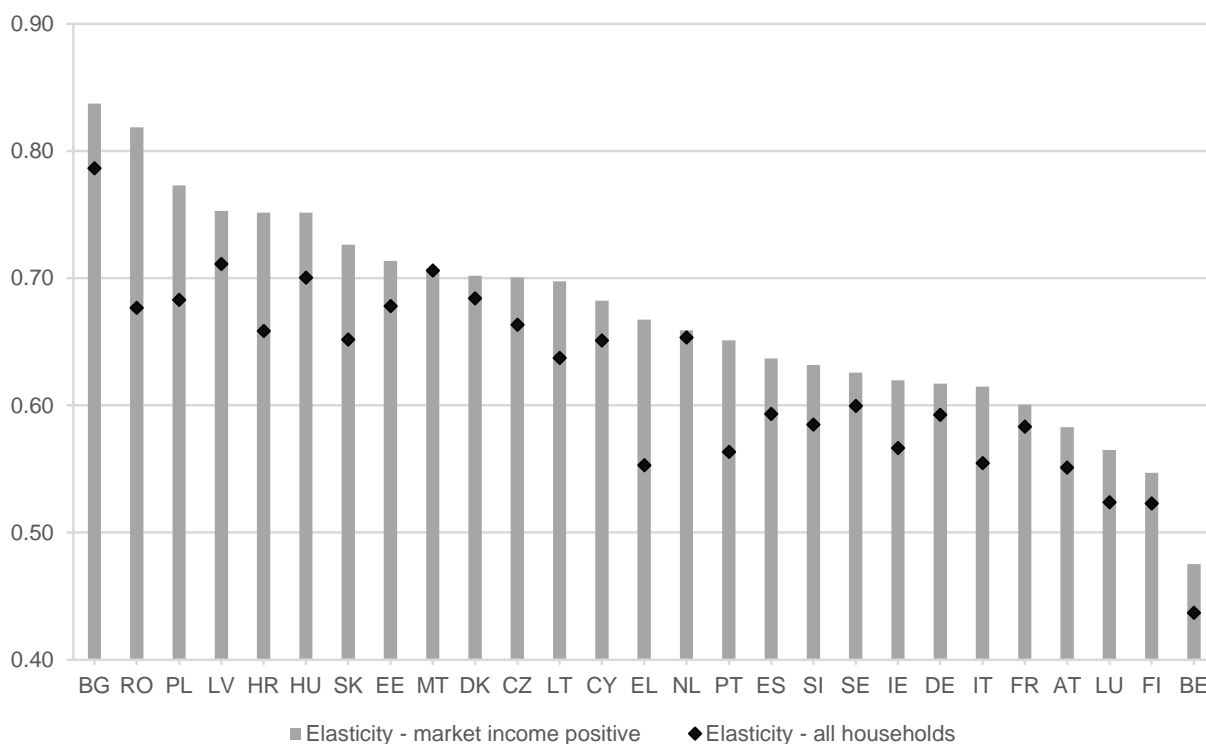
Figures 5 and 6 conclude the analysis of income stabilization by reporting the elasticities of disposable income with respect to market income. Elasticities are computed both for the entire population and for households with positive market incomes.¹⁶ As pointed out in section 2.1, the concept of elasticities is introduced in this context to shed light on the stabilizing role of non-means-tested transfers. Importantly, it should be noted that the interpretation of the coefficient is different from the ISC, as countries with high elasticities stabilize disposable income less than countries with low elasticities. Focusing on households reporting market incomes, the bars in the figure indicates that the elasticities vary from 0.48 in Belgium to 0.84 in Bulgaria.¹⁷ The EU-level elasticity is 0.65. Despite capturing different sources of stabilization, including the stabilization offered by income-independent tax-benefit instruments, the ranking loosely resembles the one reported for the ISC (Figure 6)—the elasticities and ISC have a correlation of -0.72. But the ranking for some countries differs substantially reflecting

¹⁶ It should be noted that the exclusion of households with market income equal to zero does not affect the computation of ISC.

¹⁷ Elasticities are smaller when households with zero market incomes are excluded, varying from 0.79 in Bulgaria to 0.43 in Belgium.

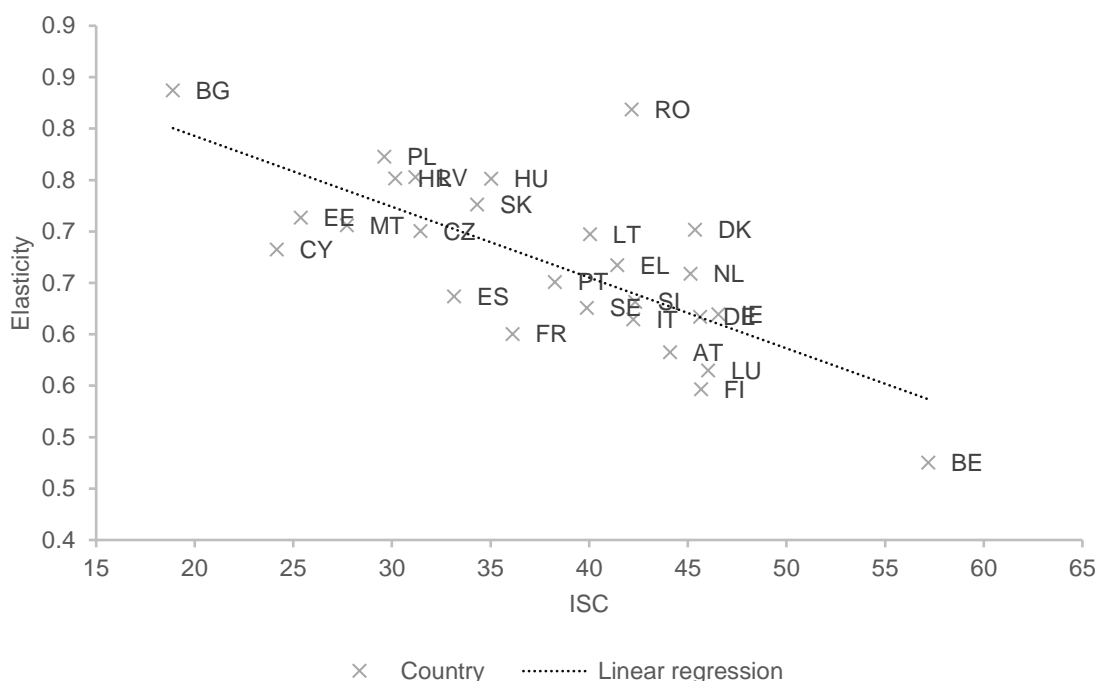
the relative importance of non-means-tested transfers. For example, while Romania ranks toward the middle in terms of ISC, it shows the second highest elasticity, consistent with relying comparatively less than other countries on non-means-tested transfers. On the other hand, while France ranks towards the middle of the distribution of the ISC, it ranks towards the bottom of the distribution of the elasticity, consistent with a relatively high reliance on non-means-tested transfers which helps to provide relatively high stabilization for household disposable incomes.

Figure 5. Elasticities of Disposable Income with Respect to Market Income, 2019



Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data.

Figure 6. Elasticities (Households with Positive Market Income) vs ISC, 2019



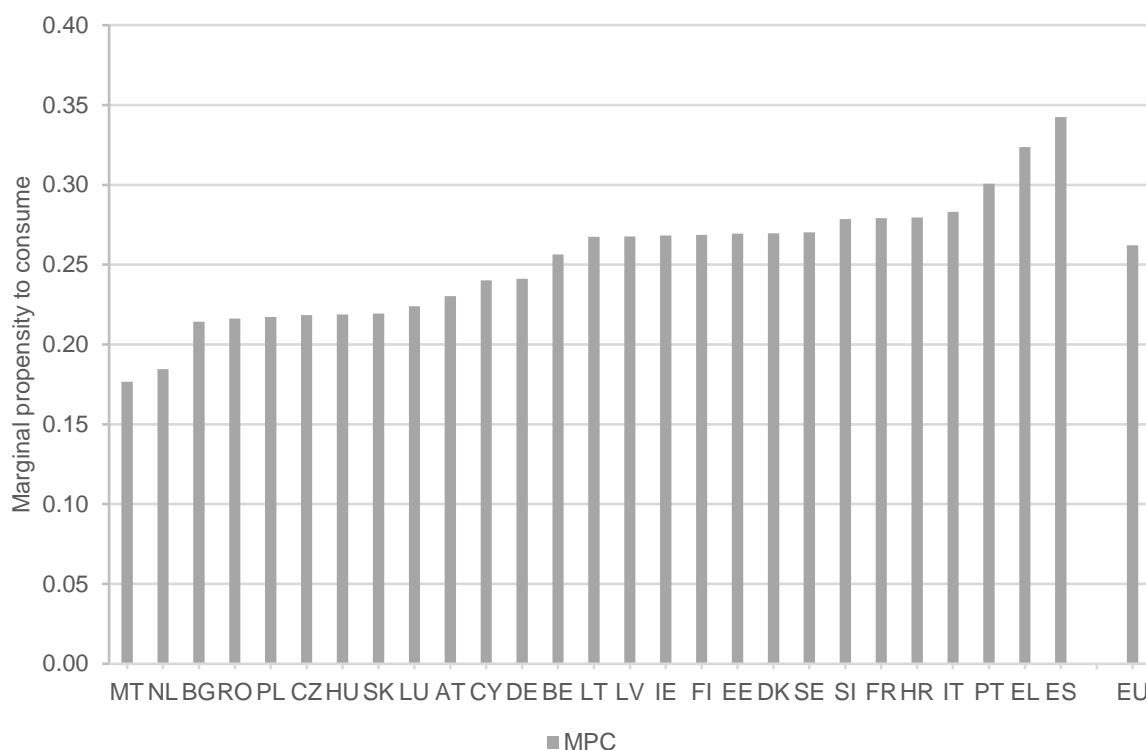
Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data.

B. Demand Stabilization

Marginal propensities to consume are central elements for the calculation of DSCs. This paper makes use of income quintile specific MPCs based on Carroll et al. (2014), which are available for EU-15 countries. We impute MPCs for the remaining countries as the regional average, by quintile, with regions defined according to the "United Nations geoscheme for Europe". Country-level MPCs are computed according to Equation (8). Similarly, the EU-level MPC is computed by dividing the aggregated estimated change in consumption across the EU by the aggregated disposable income shock. The resulting country level MPC varies from 18.2 percent in Netherlands to 34.2 percent in Spain (Figure 7). The EU level MPC is 26.1 percent and varies from 32.5 percent for the poorest quintile to 23.3 percent for the richest quintile.¹⁸

¹⁸ The MPCs used in this analysis refer to a transitory income shock. For prolonged shocks, one expects MPCs to increase over time as households exhaust current savings and exhaust short-term borrowing opportunities.

Figure 7. MPC for EU Countries, Total



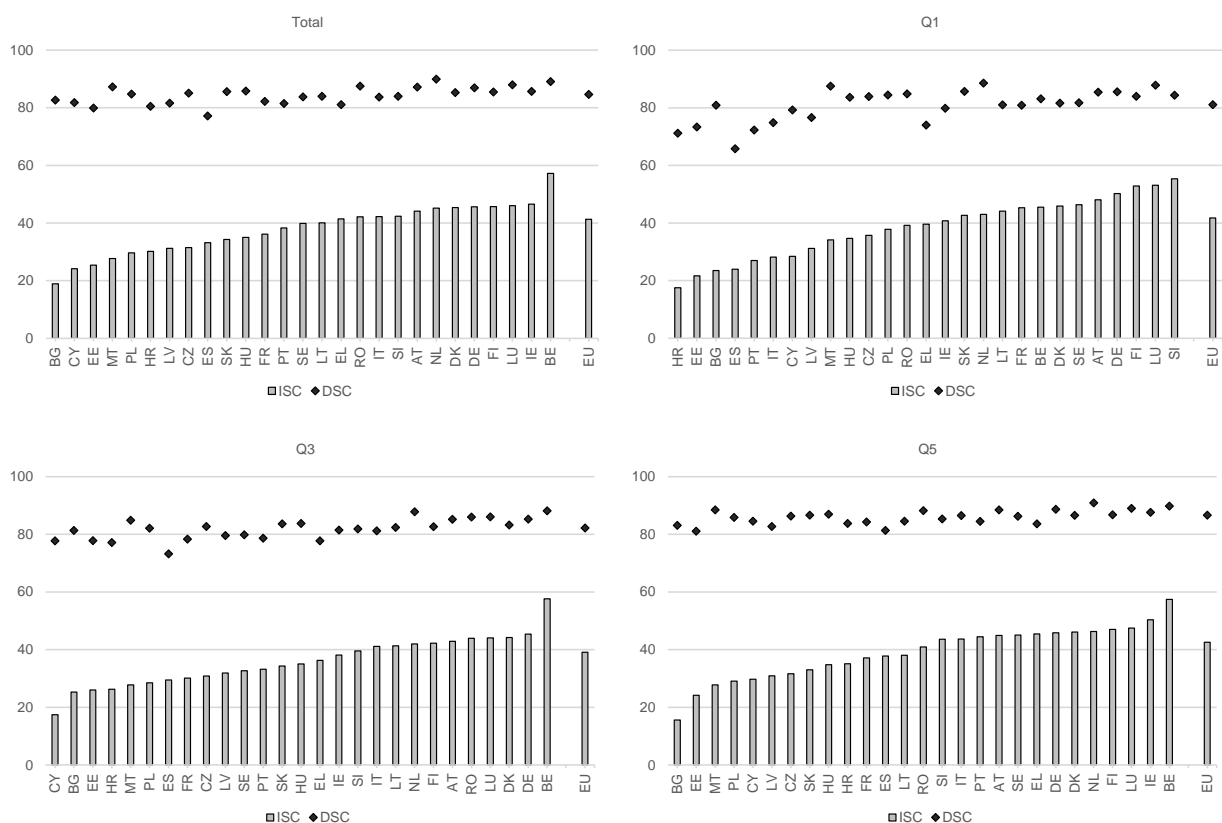
Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data.

As expected, consumption is significantly more stable than income, following a transitory market income shock. Based on these *MPCs*, the EU-level DSC amounts to 84.7 percent (43.3 points larger than corresponding ISC) with country level DSCs ranging from 73.1 percent in Spain to 90.0 percent in the Netherlands (Figure 8).¹⁹ Since *MPCs* tend to decrease with household income, *ceteris paribus* DSCs tend to increase with household income, reflecting the greater ability of high-income households to smooth consumption by running down savings or through short-term borrowing. On average across EU countries, the DSCs increase from 81.1 percent in the poorest quintile of the income distribution to 86.6 percent in the richest quintile. The lower ISCs identified by European Commission (2017) can be mainly explained by the use of different level of analysis (country versus household) and different *MPCs*. Our results are not readily comparable with the ones in Dolls et al. (2012) since they use a different concept of demand stabilization.²⁰

¹⁹ Following a different approach and metric, Auerbach and Feenberg (2000) and Dolls et al. (2012) find qualitatively similar results for the US (between 6 and 17% depending on the period and the definition of liquidity constrained households), whereas Dolls et al. (2012) estimate a larger effect in the EU countries (between 4 and 22%). Using a similar metric to that used in this paper, European Commission (2017) assumes that households adjust their consumption proportionally to a marginal propensity to consume (i.e. the reduction in consumption is assumed to be equal to the reduction in disposable income multiplied by the marginal propensity to consume) and estimate an average demand stabilization coefficient for the EU of about 70%.

²⁰ Our work measures the demand stabilization stemming from both income stabilization and *MPC*. Dolls et al. (2012) focus on DSC stemming from the income stabilization properties of the tax benefit system only. See the discussion on Figure 9 below for a conceptually similar discussion.

Figure 8. ISCs and DSCs for EU Countries, by Income Quintile, 2019



Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data.

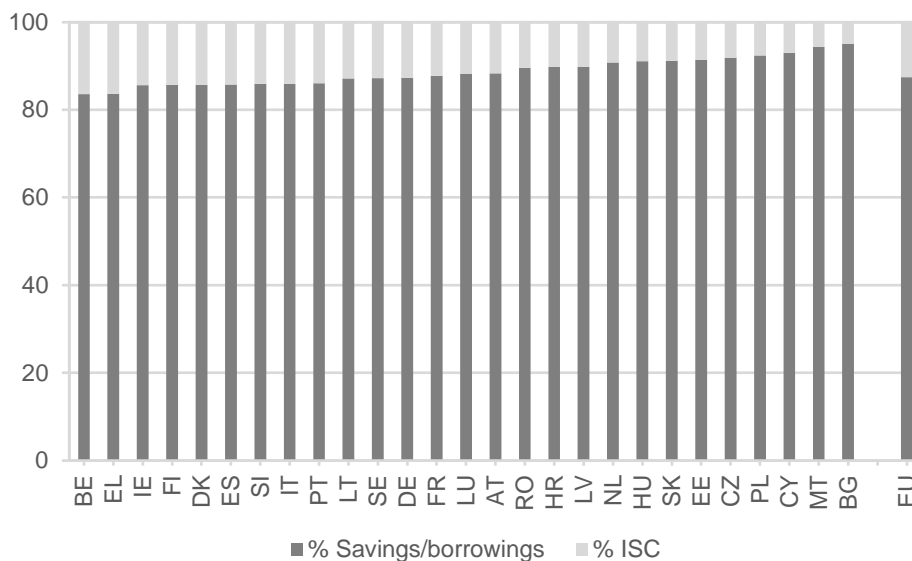
Figure 9 further analyzes the relationship between income and consumption stabilization by plotting the share of DSC associated to ISC equal to zero ($DSC_{ISC=0}$ over DSC), i.e., if the transitory shock was fully passed through to disposable income. Following equation (7):

$$DSC_{ISC=0} = (1 - MPC_{ISC=0}) \quad (12)$$

The figure suggests that about 87% of the demand stabilization at the EU level would be reached even in absence of income stabilization, with country specific values ranging from 83.2 percent in Greece to 94 percent in Malta. The results also suggest that socio-economic groups with low marginal propensity to consume, e.g., richer households, typically would be able to stabilize a larger share of consumption than households with high marginal propensity to consume thanks to the possibility of drawing on savings and/or borrowing. However, note that one expects MPCs to decrease over time for longer-lasting shocks and converge to the higher ISCs, especially for low-income households. In addition, the relatively high DSCs for low-income households may actually be associated with undesirable longer-term social impacts, e.g., arising from incurring high and unsustainable debt thus resulting in a lower ability to self-protect against idiosyncratic economic shocks in the future. Therefore, even

if higher ISCs do not translate into higher DSCs, strengthening fiscal stabilization may still be desirable at the lower end of the income distribution.

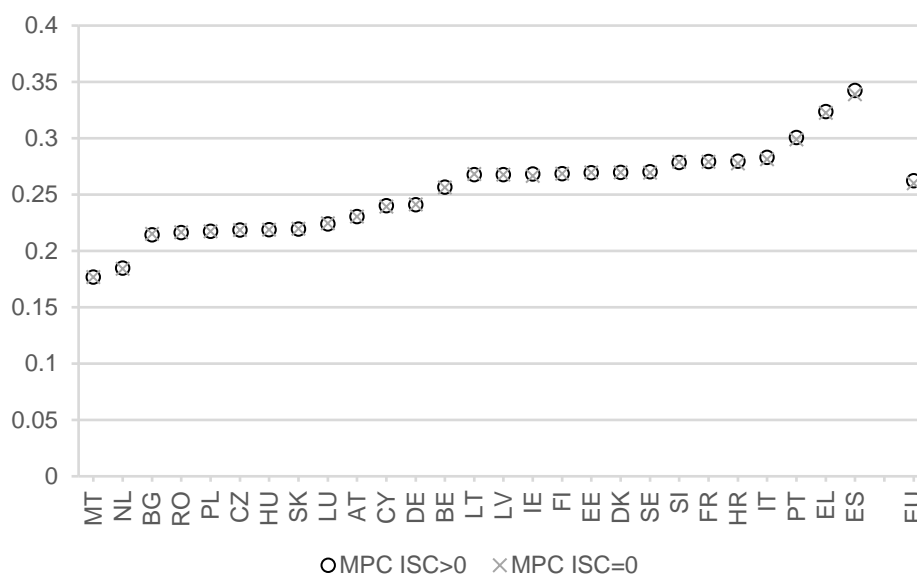
Figure 9. Share of Savings and Borrowings and ISC for EU Countries, 2019



Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data.

As discussed in Section 2.1, $MPC_{ISC=0}$ is also the total derivative of DSC following a uniform variation of ISC across all households. This value captures the impact of a unit change in ISC on DSC and can thus be used as a measure of the cost-effectiveness of fiscal automatic stabilization measures. Figure 10 reports the values of $MPC_{ISC=0}$ comparing them with the values of baseline MPC . It emerges that the values of $MPC_{ISC=0}$ are very close to those of MPC , indicating that the aggregate marginal propensity to consume is affected in a rather limited way by changes in ISC . Consequently, a unit change in ISC at the EU level will lead to an increase in DSC by 0.26 of a percentage point. This captures the fact that AS are less effective in environments where households have significant scope for self-protection of consumption levels through adjusting their savings and borrowings. Note also that if low-income households have higher MPC than high-income households then, ceteris paribus, stabilization achieved through means-tested transfer programs will also be more cost effective in stabilizing consumption than progressive income taxes.

The findings above are strongly driven by the level and economic gradient of the MPC. The values of MPC used in this analysis are based on Carroll et al. (2014), which use a buffer-stock saving model with transitory and permanent income shocks to study the extent to which cross-country differences in the wealth distribution and household income dynamics influence the MPC out of transitory shocks. Although in a range generally accepted by the literature, the MPCs are significantly smaller than measures based on stated preferences (see Drescher et al., 2020 for a recent contribution to estimate MPC in the EU drawing from self-reported data; the authors systematically find larger MPCs with respect to the ones used in our analysis).

Figure 10. MPCs and $MPC_{ISC=0}$ for EU Countries, 2019

Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data.

Notes: The circles represent the MPC from Carroll et al. (2014), the diamonds are the values of $MPC_{ISC=0}$, see equation (7) and (8).

IV. Conclusion

This paper analyses the income and demand stabilization properties of the fiscal systems of the EU Member States during the period 2011 to 2019. We use EUROMOD, the EU tax-benefit microsimulation model, with underlying data from the EU-SILC.

The contribution of this work to the existing literature is twofold. First, this paper contains an EU-wide assessment of the cushioning effects of taxes and social transfers during almost a decade, highlighting the tax and benefit reforms more impactful on the stabilization properties of the fiscal systems. Additionally, we present alternative indicators and explore the properties of the demand stabilization coefficient, shedding light on the relationship between demand stabilization, income stabilization, and the marginal propensity to consume.

Our results show that country level automatic income stabilization in 2019 averaged 41.3 percent at the EU level, with a considerable variation among Member States. Direct income taxes represent the largest source of income stabilization with an ISC of 29.3 percent at the EU level, followed by social insurance contributions with an ISC of 10.2. Instead, social benefits play a more marginal role, with an ISC of 1.8 percent. While the extent of stabilization is similar across household income groups within countries, the source of stabilization differs with income taxation being relatively more important for high-income households and transfers being relatively more important for low-income households.

Furthermore, despite high heterogeneity in the extent of automatic income stabilization across the EU, most countries did not experience significant changes between 2011 and 2019, with few exceptions. Additionally, analyzing ISC by income quintiles, we find a significant variation over time at the bottom of the distribution in most EU countries. This variation is mainly due to changes in means-tested benefits over time.

Finally, we find that the EU-level DSC amounts to 84.7 percent. The country level DSCs range from 73.1 percent in Spain to 90 percent in Netherlands and are increasing in household income, reflecting the greater ability of high-income households to smooth income. However, the results on DSCs depend on the assumption about the transitory nature of the shock and the level and economic gradient of the marginal propensity to consume. Different assumptions on the value of marginal propensity to consume could lead to lower values of DSCs.

Annex I. Formal Derivation

In this case, it can be shown that the total derivative of ISC with respect to ISC_h is equal to 1 (i.e., the country level ISC will also change by the same amount) and that the total derivative of DSC with respect to ISC_h is equal to weighted sum of the household levels marginal propensity to consume. It follows that:

$$\frac{d DSC}{d ISC} = \frac{\sum_{h=1}^N \Delta M_h MPC_h}{\sum_{h=1}^N \Delta M_h} = MPC_{ISC=0}$$

The derivation of this results follows:

$$\frac{d DSC}{d ISC} = \frac{d DSC}{d ISC_h} * \left(\frac{d ISC}{d ISC_h} \right)^{-1}$$

$$d ISC = \sum_{h=1}^N \frac{\partial ISC}{\partial ISC_h} d ISC_h = \frac{\sum_{h=1}^N \Delta M_h d ISC_h}{\sum_{h=1}^N \Delta M_h} = d ISC_h * \frac{\sum_{h=1}^N \Delta M_h}{\sum_{h=1}^N \Delta M_h} \xrightarrow{\text{yields}} \frac{d ISC}{d ISC_h} = 1$$

$$d DSC = \sum_{h=1}^N \frac{\partial DSC}{\partial ISC_h} d ISC_h$$

$$\frac{\partial DSC}{\partial ISC_h} = \frac{\Delta M_h}{\sum_{h=1}^N \Delta M_h} MPC_h$$

note²¹

$$d DSC = \frac{\sum_{h=1}^N \Delta M_h MPC_h d ISC_h}{\sum_{h=1}^N \Delta M_h} \xrightarrow{\text{yields}} \frac{d DSC}{d ISC_h} = \frac{\sum_{h=1}^N \Delta M_h MPC_h}{\sum_{h=1}^N \Delta M_h}$$

$$\frac{d DSC}{d ISC} = \frac{\sum_{h=1}^N \Delta M_h MPC_h}{\sum_{h=1}^N \Delta M_h} = MPC_{ISC=0}$$

²¹ $DSC = 1 - MPC * \frac{\sum_h \Delta Y_h}{\sum_h \Delta M_h} = 1 - \frac{\sum_h \Delta Y_h * MPC_h}{\sum_h \Delta Y_h} * \frac{\sum_h \Delta Y_h}{\sum_h \Delta M_h} = 1 - \frac{\sum_h \Delta Y_h * MPC_h}{\sum_h \Delta M_h} = 1 - \frac{\sum_h \Delta M_h (1 - ISC_h) * MPC_h}{\sum_h \Delta M_h}$

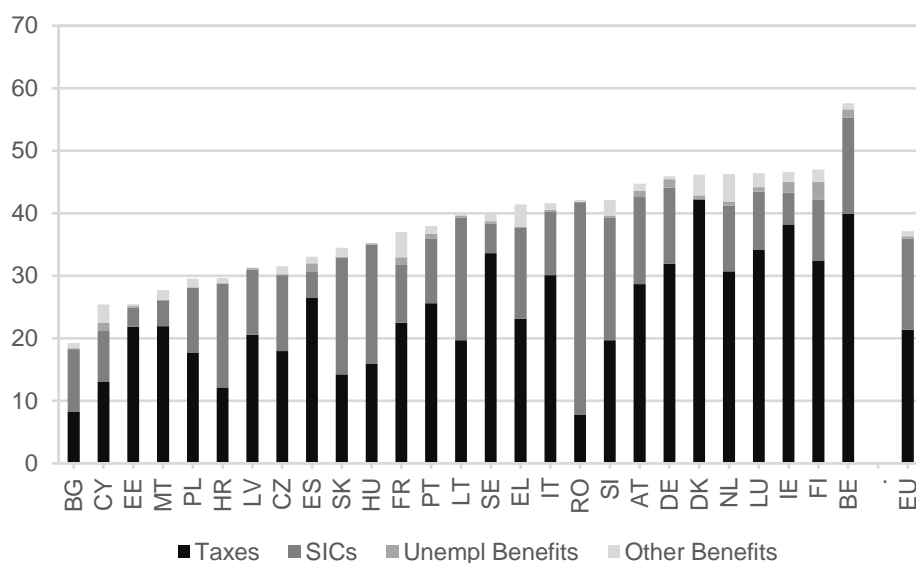
Annex II. Additional Tables and Figures

Table A1. Combination of Policy Years (2011 – 2019) and EU-SILC Data in EUROMOD I4.0+

Country	EUROMOD policy years								
	2011	2012	2013	2014	2015	2016	2017	2018	2019
AT	2012	2012	2014	2015	2016	2017	2018	2019	2019
BE	2012	2012	2012	2015	2016	2017	2018	2019	2019
BG	2012	2012	2014	2015	2016	2017	2018	2019	2019
CY	2012	2012	2014	2015	2016	2017	2018	2019	2019
CZ	2012	2012	2012	2015	2016	2017	2018	2019	2019
DE	2012	2012	2014	2015	2016	2017	2018	2019	2019
DK	2012	2012	2012	2015	2016	2017	2018	2019	2019
EE	2012	2012	2012	2015	2016	2017	2018	2019	2019
EL	2012	2012	2014	2015	2016	2017	2018	2019	2019
ES	2012	2012	2014	2015	2016	2017	2018	2019	2019
FI	2012	2012	2014	2015	2016	2017	2018	2019	2019
FR	2012	2012	2012	2015	2016	2017	2018	2019	2019
HR	2012	2013	2014	2015	2016	2017	2018	2019	2019
HU	2012	2012	2012	2015	2016	2017	2018	2019	2019
IE	2012	2012	2012	2015	2016	2017	2018	2019	2019
IT	2012	2012	2014	2015	2016	2017	2018	2019	2019
LT	2012	2012	2014	2015	2016	2017	2018	2019	2019
LU	2012	2012	2012	2015	2016	2017	2018	2019	2019
LV	2012	2012	2012	2015	2016	2017	2018	2019	2019
MT	2012	2012	2014	2015	2016	2017	2018	2019	2019
NL	2012	2012	2012	2015	2016	2017	2018	2019	2019
PL	2012	2012	2014	2015	2016	2017	2018	2019	2019
PT	2012	2012	2014	2015	2016	2017	2018	2019	2019
RO	2012	2012	2014	2015	2016	2017	2018	2019	2019
SE	2012	2012	2012	2015	2016	2017	2018	2019	2019
SI	2012	2012	2014	2015	2016	2017	2018	2019	2019
SK	2012	2012	2014	2015	2016	2017	2018	2019	2019

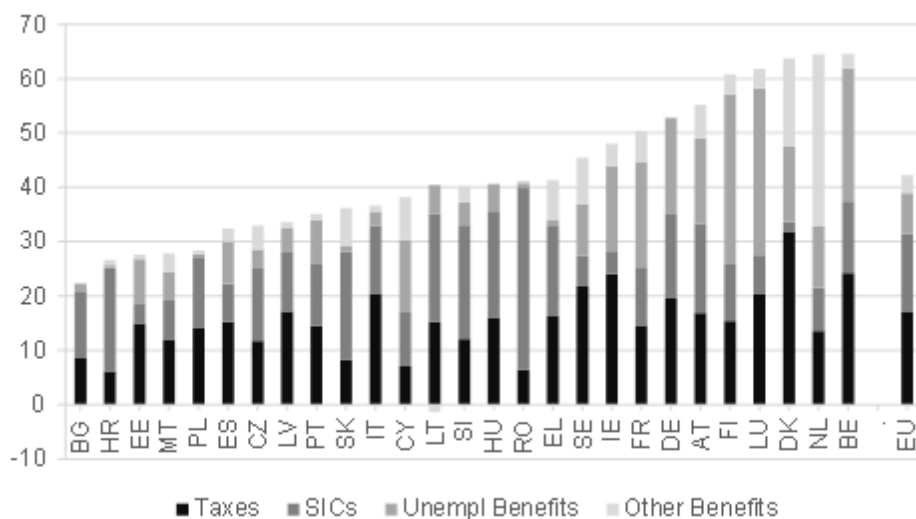
Note: base-year simulations are highlighted in gray (i.e. systems in which the policy year matches the EU-SILC income reference period). The remaining policy years, therefore, use uprating factors to account for income growth between the income reference period and the policy year.

Figure A1. ISC Following Unemployment and Income Shock (Scenario 1), 2019



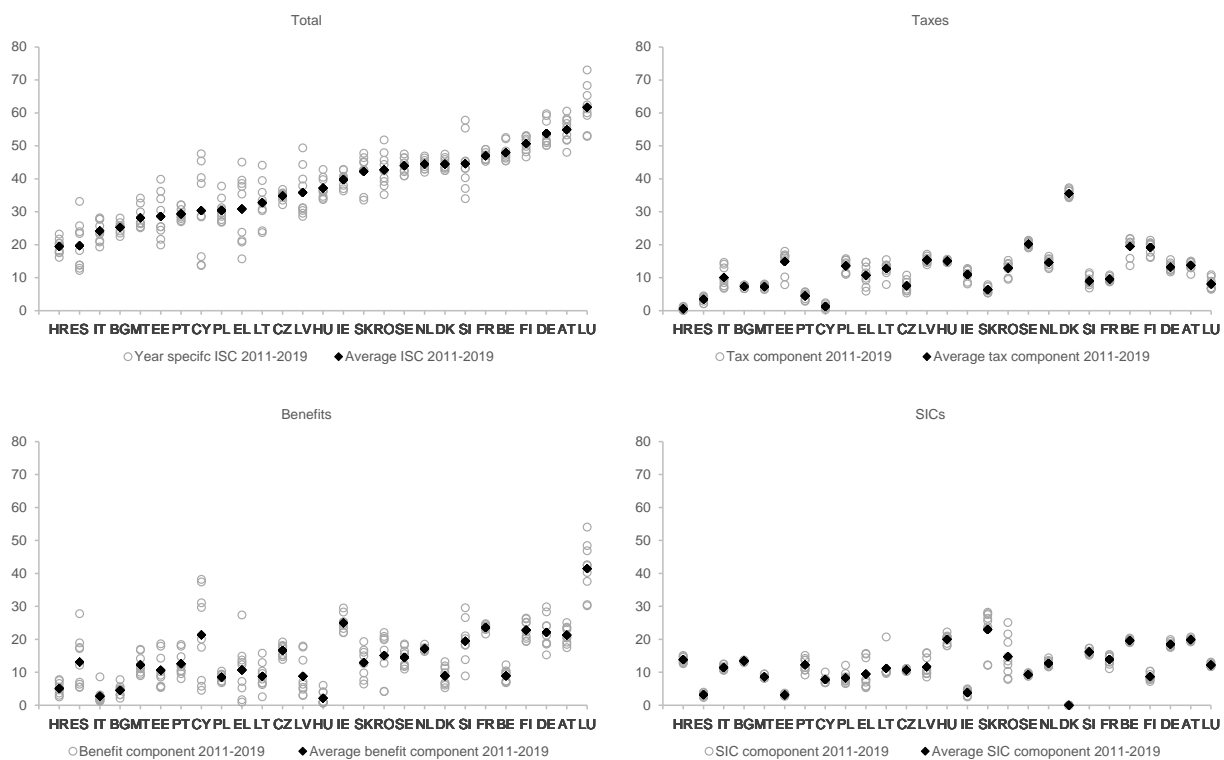
Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data.

Figure A2. ISC Following Unemployment Shock (Scenario 2), 2019



Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data.

Figure A3. Changes in ISC by Component, Q1, 2011 - 2019



Source: Author's calculation using EUROMOD 4.0+ and EU-SILC data.

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PUBLICATIONS

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