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Fiscal Consolidation and Automatic Stabilization: New Results*

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We analyze how the combined effect of automatic stabilizers and discretionary changes in tax-benefit systems have affected the cushioning of income shocks in the Euro zone and the EU-27 in the period 2007–2014. We propose a new summary measure of the combined effect of automatic stabilizers and discretionary policy changes based on micro data and counter-factual simulation. Discretionary fiscal policy supported the effects of automatic stabilizers in the years 2008 and 2009 but then became much more restrictive. For the Euro zone as a whole, the share of income shocks absorbed by the tax and transfer system declined from 48 percent in 2008 to 24 percent in 2011. For some of the countries most affected by the crisis, the stabilization effect was even negative in some years of the crisis, implying that the tax and transfer system amplified income shocks. We also compare our measure of stabilization to estimates based on macro data.

JEL classification: E63, E62, H31, H12 **Keywords:** Automatic Stabilizers, Fiscal Consolidation, Fiscal Policy

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1. Introduction

In economic downturns, it is an important function of tax and benefit systems to stabilize disposable incomes. This helps liquidity constrained households to smooth consumption and thus boosts aggregate demand. The extent to which fiscal policy achieves this depends on i) automatic stabilizers and ii) discretionary policy measures. In the Euro zone debt crisis, fiscal policy was widely criticized because, especially in 2011 and 2012, discretionary fiscal policy focused on fiscal consolidation, working against the cushioning effect of automatic stabilizers ('austerity'). While fiscal stabilization was important in the last crisis, it may even be more important in the next because monetary policy is constrained by the 'zero lower bound' (McKay and Reis, 2016).

In this paper, we analyze and quantify the way in which discretionary fiscal policy has counteracted the workings of automatic stabilizers in Europe in the years 2007–2014. We propose a new summary measure of the combined effect of automatic stabilizers and discretionary policy changes. Our measure is based on micro data and counter-factual simulation. Our key results are as follows. Overall, discretionary fiscal policy measures supported the effects of automatic stabilizers in the years 2008 and 2009, when the financial crisis triggered a global recession. But in the following years fiscal policy became more restrictive and partly neutralized the effects of the automatic stabilizers. For the Euro zone as a whole, we show that the share of income shocks absorbed by the tax and transfer system declined from 48 percent in 2008 to 24 percent in 2011. After that it recovered and reached 49 percent in 2014. For some of the countries most affected by the crisis, the stabilization effect was even negative in some years of the crisis. For instance, in Greece the stabilization effect reached -93 percent in 2010, implying that each Euro households lost in gross incomes was amplified by an additional loss of 93 cents due to higher taxes and cuts in benefits. Some of the Baltic countries faced similar challenges. For instance in Latvia, in 2010, our stabilization metric falls to -72 percent.

Previous work on automatic stabilizers has mostly relied on macro data (see, e.g., Fatás and Mihov, 2001; in't Veld et al., 2013; Di Maggio and Kermani, 2016) or structural models (McKay and Reis, 2016). Approaches based on macro data typically use aggregate variables on government revenue and spending to estimate automatic stabilizers. However, these variables are endogenous to changes in household incomes as tax payments decrease (for a given progressive tax system) or (unemployment) benefits increase when households earn lower incomes or become unemployed. Therefore, studies based on macro regressions (e.g. regressing changes in fiscal variables on the growth rate of GDP), such as Sala-i-Martin and Sachs (1992) and Bayoumi and Masson (1995), can be biased from endogenous regressors and, moreover, cannot distinguish automatic stabilizer effects from discretionary policy measures.[1]

To circumvent these problems, we follow the approach of Auerbach and Feenberg (2000) and Dolls et al. (2012) in using micro data and counterfactual simulation techniques for our analysis.[2] Specifically, we analyze how changes in tax-benefit systems over the period 2007–2014 have affected the workings of automatic stabilizers in the EU-27. We combine 2007 pre-crisis micro data from the EU Statistics on Income and Living Conditions (EU-SILC) with the different tax-benefit rules in the period under investigation. Our analysis allows to disentangle *automatic* effects from those that take place after explicit government legislature (*discretionary* changes). This is important for assessing the shock-absorption capacity of the tax and transfer system. Making this distinction is difficult or impossible in ex-post or macro data studies, as automatic stabilizers cannot be disentangled from discretionary fiscal or monetary policy nor from behavioral responses. By holding the micro datasets fixed at 2007 incomes, we can isolate the effect of the policy change on the magnitude of automatic stabilizers, abstracting from behavioral responses and discretionary policy changes.[3]

We use the *income stabilization coefficient* proposed by Dolls et al. (2012), which is an extension of the *normalized tax change* (Pechman, 1973, 1987; Auerbach and Feenberg, 2000), as a metric for automatic stabilization. Following Dolls et al. (2012), this measure of the stabilizing effect of the tax and transfer system is calculated for two counterfactual scenarios. The first is a stylized proportional shock of 5 percent to household gross incomes. The shock is the same in all countries and affects all households equally. The second scenario is an idiosyncratic unemployment shock leading to an increase in the national unemployment rate and the same aggregate income loss as in the first scenario. For both scenarios, we compute how direct taxes, social insurance contributions as well as transfers change in response to the simulated income change. Relating the change in taxes and benefits to the income change yields the *income stabilization coefficient* as a measure of automatic stabilization.

Our results show that automatic stabilizers are heterogeneous across EU countries. Income stabilization coefficients range from 20-30 percent in some Eastern and Southern European countries to around 60 percent in Belgium, Germany, and Denmark. Changes

[1]Other macro studies focus on the relation between output volatility, public sector size and openness of the economy (Galí, 1994; Fatás and Mihov, 2001; Auerbach and Hassett, 2002).

[2]Other micro studies include Kniesner and Ziliak (2002a,b); Mabbett and Schelkle (2007).

[3]Another advantage of using micro data is that of being able to exploit the full heterogeneity of the data. Moreover, Dolls et al. (2012) show that the results from the micro data based approach are highly correlated with those derived from macro approaches.

in tax-benefit systems in recent years have led to a slight reduction the dispersion in income stabilization coefficients. That is, countries with relatively low (high) stabilization coefficient in 2007 have been more likely to raise (reduce) taxes and social insurance contributions. Our analysis shows further that automatic stabilizers could operate freely in the early phase of the financial and economic crisis, but have been constrained in some EU countries by subsequent fiscal consolidation measures. In some countries, the counter-cyclical effect of automatic stabilizers has been completely offset by pro-cyclical benefit cuts or tax hikes, in particular during the period 2010–2012. We compare our estimates of automatic stabilizers to changes in the cyclical and the cyclically-adjusted budget balance. This reveals that, by providing more precise information about the degree of household income stabilization, micro-based estimates can provide valuable complementary information to the macro measures. This has policy relevance, for instance, for the EU fiscal governance framework.

Relative to the existing literature, this paper makes four contributions. First, we extend the work of Dolls et al. (2012), who assess the effectiveness of automatic stabilizers for 19 EU countries, by using more recent data and a larger set of countries and policy years. Second, we analyze the effects of tax-benefit policy changes on automatic stabilizers over time after the Great Recession.[4] Third, we make a methodological contribution by introducing the *short-term stabilization coefficient* to shed light on the short-term effects of policy changes on household income stabilization. This new measure takes into account that the actual stabilization provided by the tax-benefit system can be weaker (stronger) than in steady-state if tax hikes or cuts in benefits (tax reductions or benefit extensions) coincide with macroeconomic shocks. This analysis shows to what extent automatic stabilizers could operate freely over the period under consideration or were constrained by fiscal consolidation measures. Fourth, our paper provides new evidence on the relationship between our micro-based estimates of automatic stabilizers and more conventional macro measures which are used in the EU fiscal governance framework (Deroose et al., 2008; Mourre et al., 2014). We show that micro-based estimates provide complementary information to the macroeconomic indicators.

The paper proceeds as follows. Section 2 presents the theoretical framework. In section 3 we discuss the data and our empirical approach. Section 4 presents the results and section 5 concludes.

[4] Callan et al. (2018) and Paulus and Tasseva (2018) analyze the automatic stabilization effect of tax-benefit systems on the income distribution for a subset of countries we focus on.

2. Framework to measure automatic stabilizers

2.1. Income Stabilization

Household income stabilization provided by tax-benefit systems is measured by a coefficient showing how household disposable income varies with respect to changes in gross income. The literature based on micro data typically uses the *normalized tax change* proposed by Pechman (1973, 1987) the measure the tax system's built-in flexibility (see, e.g., Auerbach and Feenberg, 2000; Mabbett and Schelkle, 2007). Dolls et al. (2012) extended this measure to account for social insurance contributions and benefits in addition to direct taxes. Their *income stabilization coefficient* measures the ratio of changes in disposable income to changes in gross income.[5]

The mechanism behind automatic stabilizers is as follows. Consider a household that has to pay a proportional tax of 30 percent and faces a decline in gross income of 100 Euro. Then 30 percent of the shock would be absorbed by the proportional tax, leaving a decline of 70 Euro of disposable income. For a progressive tax system, as is in place in the majority of the European countries, the stabilizing effect would be larger (Dolls et al., 2012) due to the drop in the marginal tax rate after a decline in income. This effect provides an additional cushioning of the decline in disposable income.

Market income which is equal to gross income in our context is defined as

$$Y_i^M = Y_i^E + Y_i^Q + Y_i^I + Y_i^P + Y_i^O, \tag{2.1}$$

where Y_i^E denotes labor income, Y_i^Q business income, Y_i^I capital income, Y_i^P property income, and Y_i^O other income. Disposable income is equal to market income minus net government intervention, which consists of direct taxes $T(Y_{it}^M, X_i, \chi_t)$, social insurance contributions $S(Y_{it}^M, X_i, \chi_t)$ and social benefits $B(Y_{it}^M, X_i, \chi_t)$, for example unemployment benefits. We define tax payments, social insurance contributions and

[5]Dolls et al. (2012) also estimate a stabilization effect on the demand for goods and services (*demand stabilization coefficient*). It depends on how households adjust consumption expenditure to fluctuations in disposable income. However, McKay and Reis (2016) find the demand stabilization effect to be small over the business cycle, and the income stabilization effect to be quantitatively more important. Therefore, in this paper we focus on the income stabilization coefficient only. An alternative measure is the elasticity of taxes with respect to income changes (see Auerbach and Feenberg, 2000), with a proportional tax system having an elasticity of one, and progressive taxes having an elasticity greater than one. The magnitude of this elasticity serves as a measure of the degree of progressivity of the tax system. The drawback of using it as an indicator of the stabilizing effect is its definition as a relative measure, relating the percent change of taxes to a one-percent change in income. The elasticity neglects information on the share of income to be payed as taxes. This information, however, is important, as a large share of taxes relative to aggregate income means that taxes can serve as a more effective automatic stabilizer.

benefit payments to be functions of market income Y_i^M and its components[6], household characteristics X_i (e.g. number of children, marital status, age) and parameters of the tax-benefit system χ_t (e.g. tax rate, bracket thresholds, deductions). Defining net government intervention as $G(Y_{it}^M, X_i, \chi_t) = T(Y_{it}^M, X_i, \chi_t) + S(Y_{it}^M, X_i, \chi_t) - B(Y_{it}^M, X_i, \chi_t)$, disposable income can be written as

$$Y^D(Y_{it}^M, X_i, \chi_t) = Y_i^M - G(Y_{it}^M, X_i, \chi_t) \tag{2.2}$$

$$= Y_i^M - \Big(T(Y_{it}^M, X_i, \chi_t) + S(Y_{it}^M, X_i, \chi_t) - B(Y_{it}^M, X_i, \chi_t)\Big). \tag{2.3}$$

The income stabilization coefficient is denoted by τ^I and measures how changes in market income ΔY^M translate into changes in households' disposable income ΔY^D. In the empirical analysis, we follow Dolls et al. (2012) and consider two stylized scenarios where gross incomes are reduced (cf. section 3):

$$\sum_i \Delta Y_i^D = \sum_i \Big(Y^D(0.95Y_{it}^M, X_i, \chi_t) - Y^D(Y_{it}^M, X_i, \chi_t)\Big) = \Big(1 - \tau^I\Big) \sum_i \Delta Y^M$$

The income stabilization coefficient can be written as

$$\sum_i \Delta Y_i^D = (1 - \tau^I) \sum_i \Delta Y_i^M$$

$$\Leftrightarrow \tau^I = 1 - \frac{\sum_i \Delta Y_i^D}{\sum_i \Delta Y_i^M}.$$

τ^I can be interpreted as the fraction of a shock that is absorbed by the tax-benefit system.

Using (2.2), it is possible to decompose the income stabilization coefficient into the stabilizing effects provided by taxes, social insurance contributions and benefits:

$$\tau^I = \tau_T^I + \tau_S^I + \tau_B^I = \frac{\sum_i \Delta T_i}{\sum_i \Delta Y_i^M} + \frac{\sum_i \Delta S_i}{\sum_i \Delta Y_i^M} - \frac{\sum_i \Delta B_i}{\sum_i \Delta Y_i^M}. \tag{2.4}$$

Throughout the paper, we will make the assumption that all taxes and transfers are borne by employees and that employers have to bear their share of the social insurance contributions. Hence, employers' social insurance contributions are assumed not to be shifted to employees, so that they will not affect employees' wages. The stabilizing effects of social insurance contributions will thus only reflect employees' social insurance

[6]Note that, for ease of notation, we write a dependence on market income Y_i^M only and not a dependence on each of its components (see equation (2.1)), although our simulations based on EUROMOD respect the different income types (see section 3.1).

contributions.[7]

2.2. Short-Term Effects of Discretionary Policy Changes

The income stabilization coefficient presented above measures the cushioning effect of the tax-benefit system under the assumption of constant policy, i.e., it relates the change in taxes, social insurance contributions and benefits following the shock to market income to the change in market income. It does not take into account the additional effect on household disposable incomes that may occur when the income shock coincides with changes in the tax and transfer system.

Consider as an illustration a tax hike which is introduced as a fiscal consolidation measure in an economic downturn with declining market incomes. The income stabilization coefficient estimated after the policy change has been implemented would indicate an increase in the automatic stabilization capacity of the tax system. If the tax hike coincides with the decline in market incomes, however, the overall fiscal impulse is less counter-cyclical than the effect of automatic stabilizers alone.[8] Arguably, the income stabilization coefficient can be interpreted as measuring the long-term ('steady state') stabilization capacity of a tax and transfer system.

In the short-run, discretionary fiscal policy may constrain the ability of the tax system to act as an automatic stabilizer. We therefore complement the income stabilization coefficient by a new measure which takes into account that taxes, social insurance contributions and benefits may change at the same time as market incomes. More precisely, we calculate the difference in disposable incomes for household i when subject to tax policy in period t (before the change in market income) and when subject to tax policy in period $t+1$ (after the change in market income). Again, let $T(Y_{it}^M, X_i, \chi_t)$ be the tax function. We can write the *short-term stabilization coefficient* as

$$\theta_t^{I,T} = \frac{\sum_i \Big(T(0.95Y_i^M, X_i, \chi_t) - T(Y_i^M, X_i, \chi_{t-1})\Big)}{\sum_i \Delta Y_i^M} \tag{2.5}$$

$$= \frac{\sum_i \Big(T(0.95Y_i^M, X_i, \chi_t) - T(Y_i^M, X_i, \chi_{t-1})\Big)}{\sum_i 0.05Y_i^M} \tag{2.6}$$

[7] Dolls et al. (2012) calculate income stabilization coefficients with and without social insurance contributions by employers and find that the inclusion of employers' social insurance contributions does change the country ranking only slightly. Results including employers' social insurance contributions are available upon request.

[8] See for example Deroose et al. (2008) or Fatás and Mihov (2009) for a discussion how the overall fiscal impulse can be decomposed into discretionary fiscal policy and automatic stabilizers.

Using shorthand notation for the equations above, we can write:

$$\begin{aligned}
\theta_t^I &= \frac{\sum_i (T_{i,t}^1 - T_{i,t-1}^0) + \sum_i (S_{i,t}^1 - S_{i,t-1}^0) - \sum_i (B_{i,t}^1 - B_{i,t-1}^0)}{\sum_i \Delta Y_{i,t-1}^M} \qquad (2.7)\\
&= \frac{\sum_i \left(T_{i,t}^1 + S_{i,t}^1 - B_{i,t}^1\right) - \sum_i \left(T_{t-1}^0 + S_{t-1}^0 - B_{t-1}^0\right)}{\sum_i \left(Y_{i,t-1}^{M1} - Y_{i,t-1}^{M0}\right)}\\
&= \frac{\sum_i \left(Y_{i,t}^{M1} - Y_{i,t}^{D1}\right) - \sum_i \left(Y_{i,t-1}^{M0} - Y_{i,t-1}^{D0}\right)}{\sum_i \left(Y_{i,t-1}^{M1} - Y_{i,t-1}^{M0}\right)}\\
&= \frac{\sum_i \left(Y_{i,t}^{M1} - Y_{i,t-1}^{M0}\right) - \sum_i \left(Y_{i,t}^{D1} - Y_{i,t-1}^{D0}\right)}{\sum_i \left(Y_{i,t-1}^{M1} - Y_{i,t-1}^{M0}\right)}
\end{aligned}$$

Analogously to the decomposition of the income stabilization coefficient, we decompose the short-term stabilization coefficient θ_t^I into its components:

$$\begin{aligned}
\theta_{i,t}^I &= \frac{\sum_i (T_{i,t}^1 - T_{i,t-1}^0) + \sum_i (S_{i,t}^1 - S_{i,t-1}^0) - \sum_i (B_{i,t}^1 - B_{i,t-1}^0)}{\sum_i \Delta Y_{i,t-1}^M}\\
&= \theta_{i,t}^T + \theta_{i,t}^S - \theta_{i,t}^B \qquad (2.8)
\end{aligned}$$

The short-term stabilization coefficient reflects how discretionary policy changes affect the cushioning effect of the tax-benefit system, or in other words, to what extent automatic stabilizers can operate freely. In an economic downturn, the following stylized scenarios can be differentiated (symmetrically in an economic upswing).

Automatic stabilizers operate freely. If there is no policy change from one year to the other, the government allows for inter-temporal stabilization by incurring debt. The automatic stabilizers of the tax-benefit system typically lead to a reduction in tax revenue if taxable income declines or to an increase in benefit expenditure if unemployment goes up ($T_t^1 < T_{t-1}^0$ or $B_t^1 > B_{t-1}^0$). In such a situation, the short-term stabilization coefficient equals the income stabilization coefficient: $\theta_t^T = \tau_{t-1}^T$. If governments pursue expansionary fiscal policy, for example by cutting taxes or raising benefits, the short-term stabilization coefficient will exceed the income stabilization coefficient: $\theta_t^T > \tau_{t-1}^T$.

Automatic stabilization channel constrained or shut down. If governments pursue contractionary fiscal policy, but still allow for a reduction in tax revenue or an increase in benefit expenditure from one year to the other, the short-term stabilization coefficient will be larger than zero, but smaller than the income stabilization coefficient:

$0 < \theta_t^T < \tau_{t-1}^T$. If governments are credit-constrained and have to keep tax revenue or benefit expenditure constant from one year to the other ($T_t^1 = T_{t-1}^0$ or $B_t^1 = B_{t-1}^0$), the automatic stabilization channel is shut down through discretionary policy changes: $\theta_t^T = 0$. In the most severe scenario of contractionary fiscal policy, discretionary policy changes lead to an increase in revenue or a decrease in benefit expenditure even though the economy experiences a slump ($T_t^1 > T_{t-1}^0$ or $B_t^1 < B_{t-1}^0$). It can be seen that in this case $\theta_t^T < 0$.

3. Data and Empirical Approach

In the empirical analysis, we analyze the workings of automatic stabilizers in the EU-27 over the period 2007–2014 and how they were affected by discretionary changes in tax-benefit systems.

3.1. EUROMOD and EU-SILC data

In our simulations, we use EUROMOD (version G4.0) in order to calculate household disposable incomes (see Sutherland and Figari, 2013; Sutherland, 2018). EUROMOD contains the tax and benefit rules present in the EU-27 for different years and takes EU-SILC data as input. EU-SILC is a harmonized, cross-sectional household micro dataset for the EU member states provided by Eurostat (2012). We supplement EUROMOD with an unemployment benefit calculator that incorporates all important policy rules such as replacement rates, eligibility criteria and maximum benefit duration.[9] EU-SILC data contain rich information about the different income sources (e.g. employment income, capital income, income from self-employment) and household demographics that may influence tax and transfer policies (for instance marital status, number of children or age).

The microsimulation approach allows us to separate the dataset containing market incomes and demographics from the rules of the tax and transfer systems. We use EU-SILC household data with an income reference period of 2007 for the whole analysis, and simulate income taxes, social insurance contributions and benefits following the

[9]The EUROMOD version used in this paper does not simulate unemployment benefits, but takes unemployment benefits from the input data. As explained below, we aim at simulating counterfactual disposable incomes for different years and therefore need to make use of an unemployment benefit calculator. Detailed policy rules are collected from country chapters of the OECD series "Benefits and Wages" (http://www.oecd.org/social/benefits-and-wages.htm) and from the EU's MISSOC-Comparative Tables Database (http://ec.europa.eu/social/main.jsp?langId=en&catId=815).

tax-benefit policy parameters of the years 2007–2014.[10] That is, we hold household characteristics X_i and market income Y_i^M constant (through the use of the same baseline dataset), and only vary the parameters of the tax-benefit system χ_t over time, yielding counterfactual disposable incomes that would have prevailed if household demographics and market incomes would not have changed over time.[11] This approach provides us – for each EU-27 country – with a sample of repeated cross-sections reflecting market incomes and household demographics from 2007 and disposable incomes based on tax-benefit policies of the period 2007–2014.

Keeping market incomes and demographics constant at their pre-crisis level allows us to isolate the effect of policy changes on the automatic stabilization effect of tax-benefit systems.[12] If both input data and tax-benefit policies were changed at the same time, it would not be possible to disentangle the effect of changing market incomes and demographics from the effect of changing tax-benefit policy parameters. In contrast, our simulation analysis allows conducting a controlled experiment by changing the parameters of interest while holding everything else constant (Bourguignon and Spadaro, 2006). We therefore do not have to deal with endogeneity problems when identifying the effects of the policy reform under consideration.

3.2. Scenarios to measure automatic stabilization

Following Dolls et al. (2012), we simulate two stylized shocks: First, a proportional decline of household gross incomes by 5% affecting all households equally (*income shock*), and second, an idiosyncratic shock affecting only some individuals who lose their job. This *unemployment shock* is calibrated such that total household income decreases by 5% as well. Thereby, the severity of the two shock scenarios is comparable in terms of the aggregate income loss. Both shocks are simulated on the same (pre-crisis) household micro datasets reflecting market incomes and household demographics as of 2007, but with tax-benefit policies spanning the period 2007–2014 (see section 3.1). The unemployment shock is modeled by increasing (decreasing) the weight of unemployed (employed) individuals in our sample, while the aggregate counts of individual and household characteristics are kept constant (Immervoll et al., 2006). The implicit assumption behind this approach is that

[10]The EUROMOD version used in this paper allows for some countries the simulation of tax-benefit systems up until 2015. For France and Malta, the 2006 and 2008 EU-SILC versions are used, respectively. Croatia is excluded from the analysis as no pre-crisis data have been available to us.

[11]Changes in tax-benefit systems include both structural changes and uprating of monetary parameters according to the rules in each country (Paulus et al., 2019).

[12]See e.g. Bargain and Callan (2010), Bargain et al. (2015) or Paulus et al. (2017) who use similar simulation techniques to estimate distributional effects of changes in tax-benefit systems.

the socio-demographic characteristics of the newly unemployed correspond to the existing pool of unemployed. This is done on purpose to avoid capturing changes in unemployment benefit eligibility over time which are induced by changes in the characteristics of the unemployed, for example a larger share of long-term unemployed in some countries in the more recent years of the simulation period. Instead, our results solely reflect changes in tax-benefit policy parameters over time.

Note that we do not strive to replicate actual changes in income and unemployment as observed over the simulation period. Economic conditions are endogenous to the overall fiscal impulse (discretionary fiscal policy and automatic stabilizers). The aim of the paper is to explore how effective built-in automatic stabilizers are to cushion (stylized and exogenous) income and unemployment shocks that are comparable across countries and to assess to what extent discretionary policy changes have had an impact on the workings of automatic stabilizers.

4. Results

We first present income stabilization coefficients for the period 2007–2014 and then show how discretionary changes in tax-benefit parameters have affected the degree to which automatic stabilizers could operate over this period.

4.1. Income Stabilization Coefficients

Income shock. Figure 1 depicts the change in the income stabilization coefficient from 2007 to 2014 on the x-axis and its 2007 level on the y-axis. Focusing first on the *levels* of the income stabilization coefficients in 2007, we find strong differences across countries with coefficients ranging from 0.22 in Cyprus to 0.54 in Belgium. The (population-weighted) average EA-19 (EU-27) income stabilization coefficient amounts to 0.38 (0.39) as shown in Table 1 in the Appendix. Generally, coefficients tend to be higher in Western European and Nordic countries and lower in Baltic, Eastern and Southern European countries, with Hungary being a notable exception.

The largest *change* occurred in Hungary with a reduction in the income stabilization coefficient of 0.16 percentage points from 2007 to 2014. During this period, Hungary adopted a flat tax which reduced the stabilizing effect of the income tax considerably from 0.34 in 2007 to 0.16 in 2014 (cf. Table 1). On the other side of the spectrum, countries such as Ireland, Greece, Portugal and Cyprus raised taxes and/or social insurance contributions which led to an increase in the income stabilization coefficient.[13] The

[13]The European Commission's LABREF database provides an overview of tax-benefit reforms undertaken

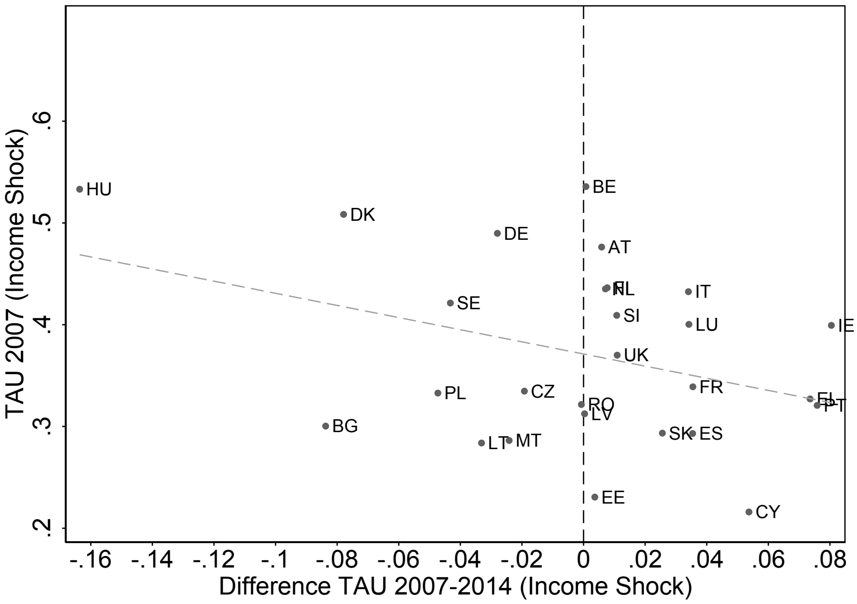


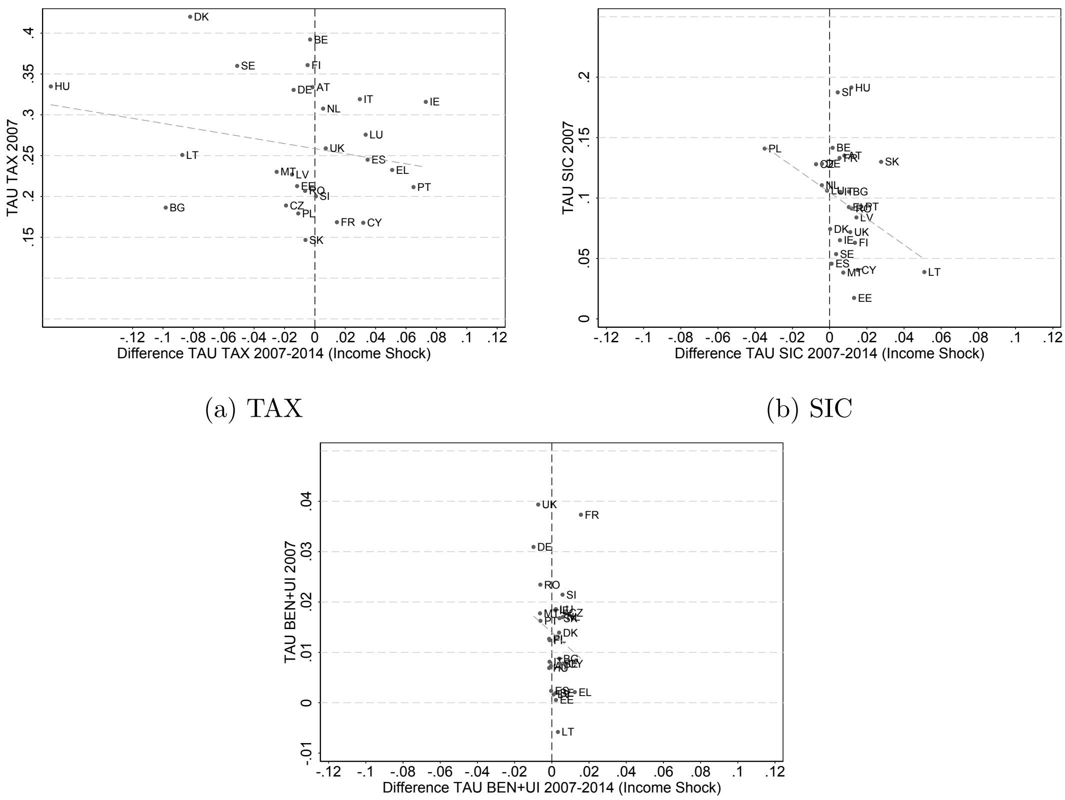
Figure 1: Change in τ (Income Shock Scenario): 2014 vs. 2007

Notes: The graph shows the level of the income stabilization coefficient in 2007 following a proportional income shock on the vertical axis and the change from 2007 to 2014 on the horizontal axis. The dashed line indicates fitted values of a linear regression of the variable on the vertical axis on the variable on the horizontal axis. *Source:* Own calculations using EUROMOD.

negative slope of the regression line in Figure 1 indicates that the dispersion of income stabilization coefficients across countries has become more compressed, that is, countries with a relatively low (high) stabilization coefficient in 2007 have been more likely to raise (reduce) taxes and social insurance contributions.

Next, we decompose the overall change in the income stabilization coefficient into its components. As can be seen in Figure 2, in particular changes in income taxes and to a smaller extent in social insurance contributions have affected the stabilizing potential of tax-benefit systems. Ireland, Portugal, Greece and Spain are the countries with the largest increase in income stabilization provided by the income tax. Benefits are of minor importance in the case of an (intensive margin) income shock. All three categories of the tax-benefit system have contributed to a slight reduction in the dispersion of income stabilization coefficients, as exemplified by the negative slope of the regression lines.

in the period under consideration (see also Turrini et al., 2015, for an overview).



(a) TAX

(b) SIC

(c) Benefits

Figure 2: Change in τ by Component (Income Shock Scenario): 2014 vs. 2007

Notes: The graph shows the level of the income stabilization coefficient by component in 2007 following a proportional income shock on the vertical axis and the change from 2007 to 2014 on the horizontal axis. The dashed line indicates fitted values of a linear regression of the variable on the vertical axis on the variable on the horizontal axis. *Source:* Own calculations using EUROMOD.

Unemployment shock. Figure 3 shows the relation between the income stabilization coefficient in 2007 and its change from 2007 to 2014 for the unemployment shock. Income stabilization coefficients in 2007 range from 0.17 in Cyprus to 0.65 in Belgium. The (population-weighted) average EA-19 (EU-27) income stabilization coefficient amounts to 0.42 (0.44) (cf. Table 3 in the Appendix). As in the income shock scenario, we find highest (lowest) coefficients in Nordic and Western European (Baltic, Southern and Eastern European countries) and a negative relation between the income stabilization coefficient in 2007 and its change from 2007 to 2014.

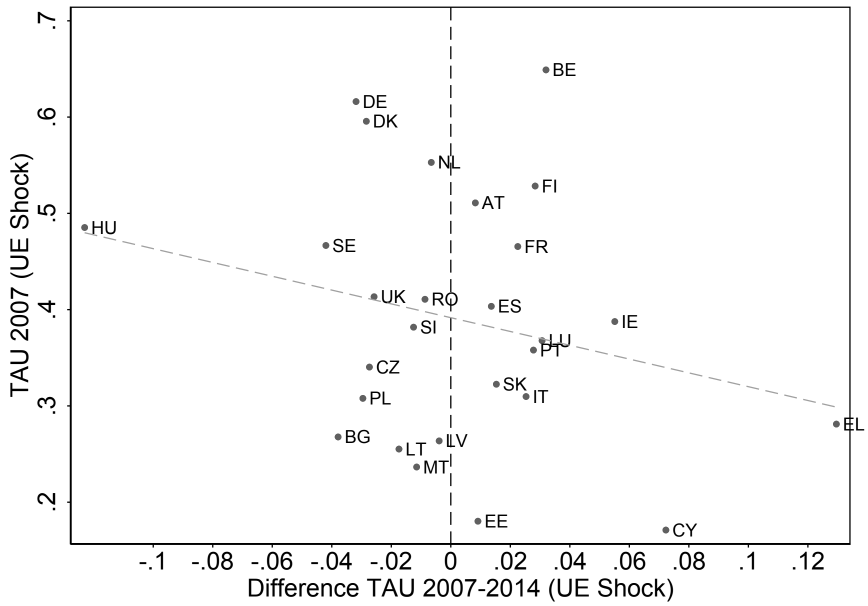
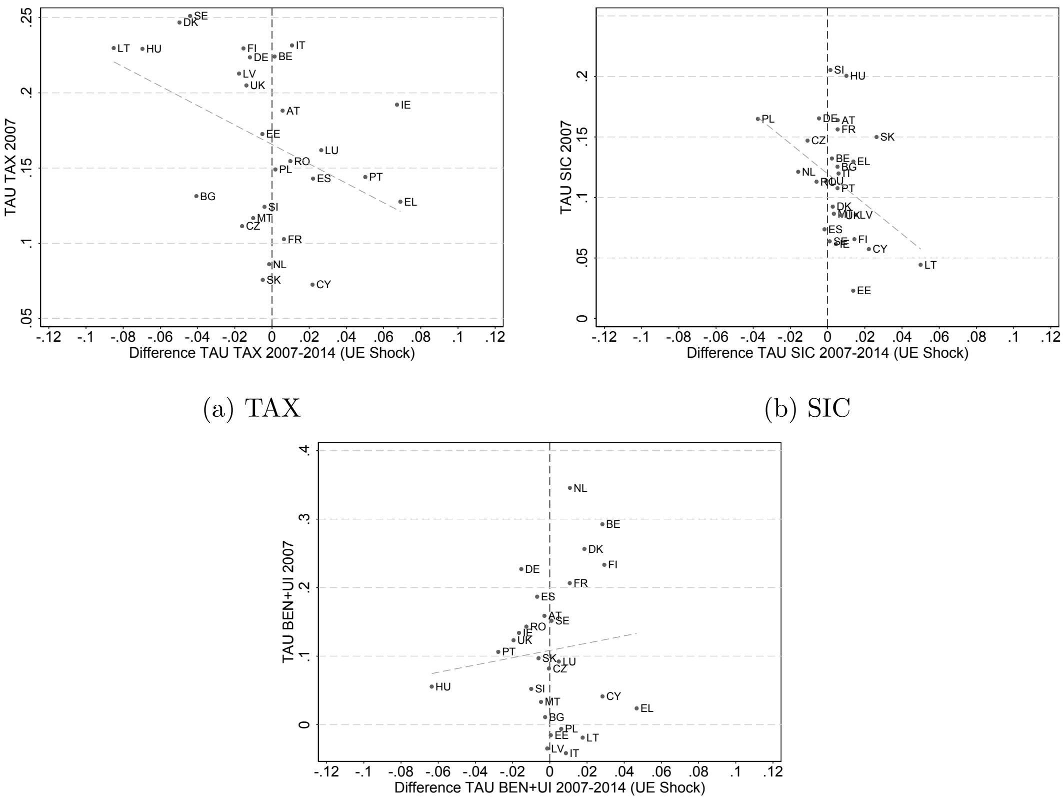


Figure 3: Change in τ (Unemployment Shock Scenario): 2014 vs. 2007

Notes: The graph shows the level of the stabilization coefficient after an unemployment shock on the vertical axis and the change from 2007 to 2014 on the horizontal axis. *Source:* Own calculations using EUROMOD.

Figure 4 plots levels and changes in each component of the tax and transfer system. While income taxes and social insurance contributions play a key role in smoothing intensive margin income shocks (Figure 2), unemployment benefits are much more important in the case of extensive margin unemployment shocks (Dolls et al., 2012; Di Maggio and Kermani, 2016). While our results suggest a compression in the dispersion of income stabilization coefficients for income taxes and social insurance contributions, we find a positive correlation between the level and the change of the stabilization potential through benefits, in particular unemployment benefits. Countries with initially stronger automatic stabilizers in their unemployment insurance system tend to have made them more countercyclical compared to countries with initially weaker automatic stabilizers.



(a) TAX (b) SIC

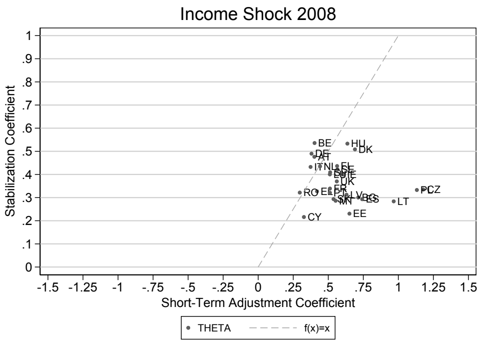
(c) Benefits

Figure 4: Change in τ by Component (Unemployment Shock Scenario): 2014 vs. 2007

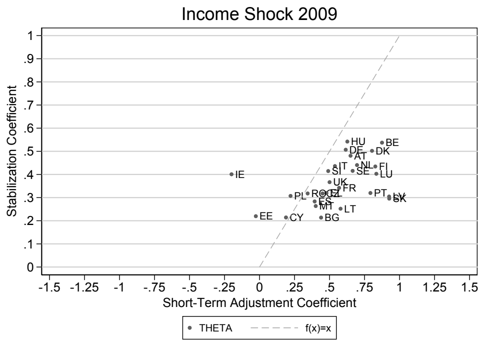
Notes: The graph shows the level of the stabilization coefficient after an unemployment shock by the respective component of net government intervention on the vertical axis and the change from 2007 to 2014 on the horizontal axis. *Source:* Own calculations using EUROMOD.

4.2. The Effect of Discretionary Policy Changes on the Workings of Automatic Stabilizers

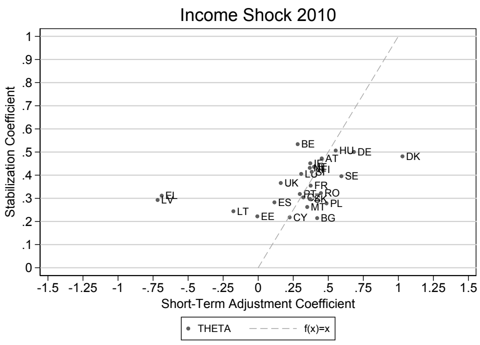
This section first correlates income and short-term stabilization coefficients for the years 2008–2014 in order to show how discretionary policy changes have affected the cushioning effects of tax-benefit systems in the EU-27. In the subsequent analysis, we study the relationship between our micro-based estimates of fiscal stabilization and conventional measures based on macroeconomic variables. For the latter, we consider year-on-year changes in the cyclical and the cyclically-adjusted budget balance which are often used to decompose the overall fiscal impulse into its components, in particular to assess the size of automatic stabilizers and discretionary fiscal policy measures (Deroose et al., 2008; Mourre et al., 2014).



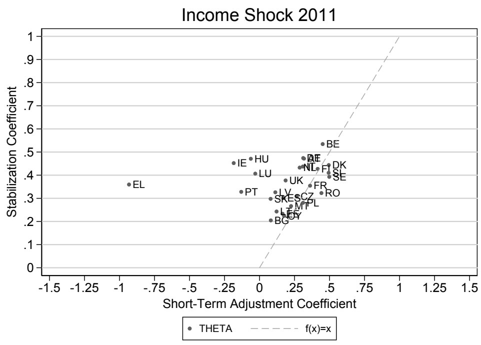
(a) 2008



(b) 2009

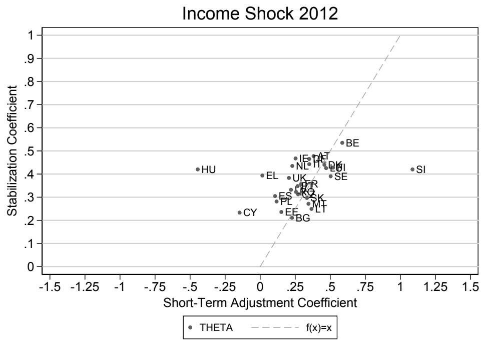


(c) 2010

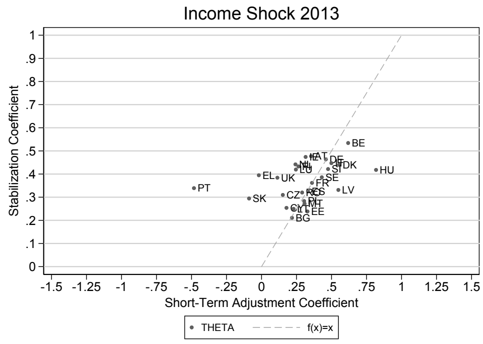


(d) 2011

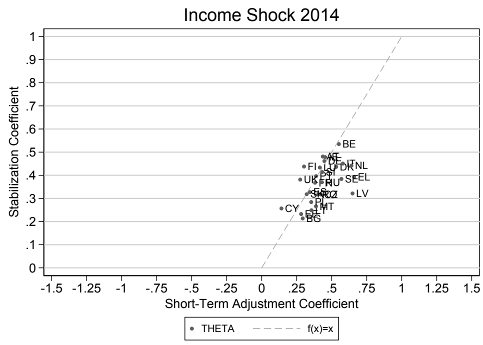
Figure 5: Income vs. Short-Term Stabilization Coefficient: Income Shock



(e) 2012



(f) 2013



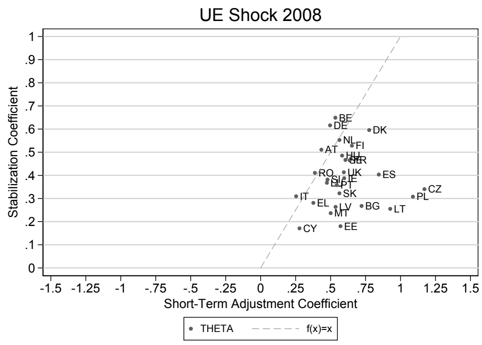
(g) 2014

(Continued) Income vs. Short-Term Stabilization Coefficient: Income Shock

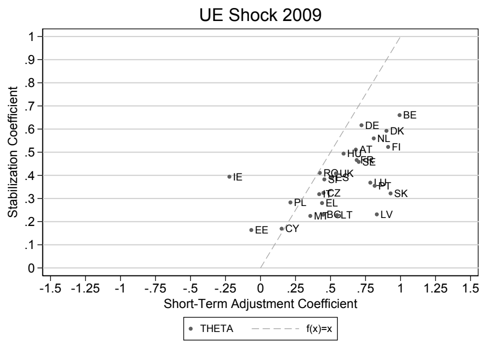
Notes: The figure plots short-term stabilization coefficients on the x-axis and income stabilization coefficients on the y-axis. Short-term stabilization coefficients for year t capture policy changes from $t-1$ to t. Short-term stabilization coefficients to the right (left) of the dashed 45 degree line imply expansionary (contractionary) discretionary changes in the tax-benefit system. *Source:* Own calculations using EUROMOD.

Income vs. short-term stabilization coefficients. Figures 5 and 6 plot the stabilization coefficient against the short-term adjustment coefficient by year for the income shock and the unemployment shock, respectively. Countries to the right (left) of the dashed 45 degree line imply that the short-term adjustment coefficient is larger (smaller) than the stabilization coefficient, pointing to expansionary (contractionary) discretionary changes in the tax-benefit system. Panel (a) shows that in 2008, most countries are relatively close to the dashed line and, in the majority of cases, to the right of the dashed line. The dispersion is somewhat larger in the unemployment shock scenario. Discretionary changes in tax-benefit policies have been expansionary in the early phase of the crisis (European Central Bank, 2010).

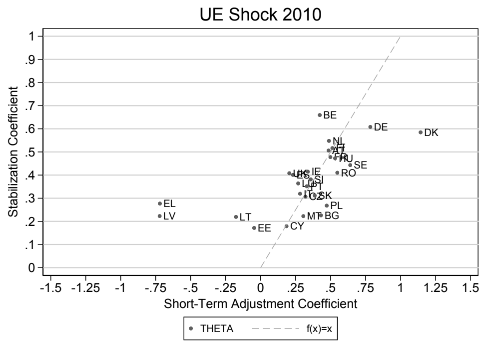
This is confirmed in panel (b), showing that at the height of the economic crisis in 2009, more short-term stabilization coefficients moved further right of the dashed line. Notable exceptions are Ireland, Estonia, Cyprus and Poland. Starting in 2010, the short-term stabilization coefficient becomes smaller than the income stabilization coefficient in a larger number of countries, hinting at contractionary discretionary policy changes. In some countries, the short-term stabilization coefficient even turns negative, for example in Greece in 2010 and 2011, in Latvia in 2010, in Ireland in 2011 and in Portugal in 2013 (both in the income and unemployment shock scenarios), indicating that the workings of automatic stabilizers have been heavily constrained in those years. In more recent years, short-term stabilization coefficients are again close to the dashed 45 degree line.



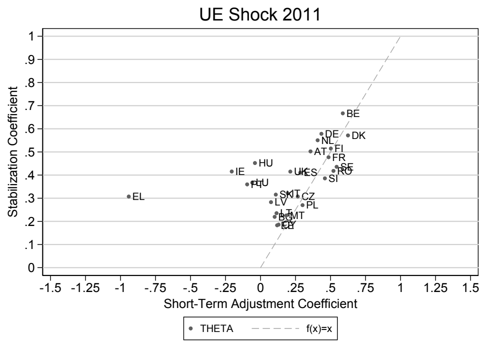
(a) 2008



(b) 2009

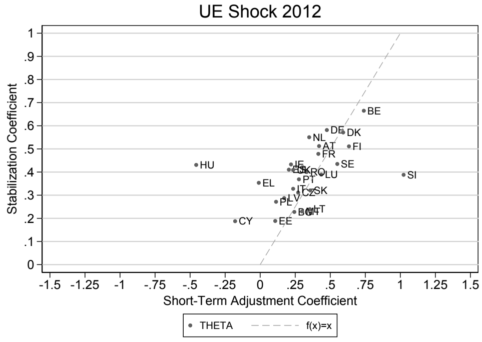


(c) 2010

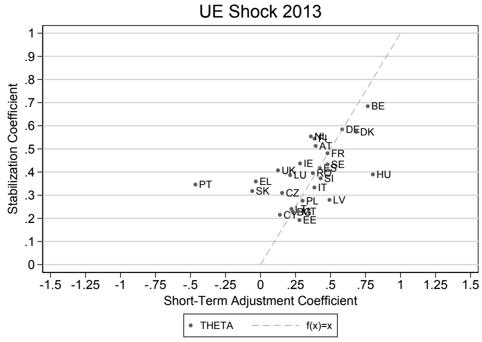


(d) 2011

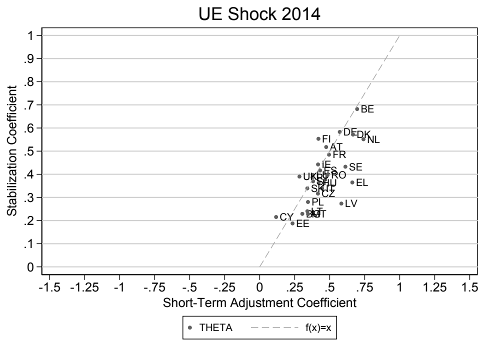
Figure 6: Income vs. Short-Term Stabilization Coefficient: Unemployment Shock



(e) 2012



(f) 2013



(g) 2014

(Continued) Income vs. Short-Term Stabilization Coefficient: Unemployment Shock

Notes: The figure plots short-term stabilization coefficients on the x-axis and income stabilization coefficients on the y-axis. Short-term stabilization coefficients for year t capture policy changes from $t-1$ to t. Short-term stabilization coefficients to the right (left) of the dashed 45 degree line imply expansionary (contractionary) discretionary changes in the tax-benefit system. *Source:* Own calculations using EUROMOD.

Micro vs. macro estimates of fiscal stabilization. Figure 7 sheds light on the question of how our estimates of fiscal stabilization (for the income shock scenario) based on household micro data compare to the overall fiscal impulse.[14] We derive a micro estimate of the degree of fiscal stabilization through changes in the tax-benefit system by calculating the difference between the short-term stabilization coefficient, θ_t^T, and the income stabilization coefficient, τ_t^T.[15] As described in section 2.2, the short-term stabilization coefficient equals the income stabilization coefficient if there are no changes

[14] Results for the unemployment shock are similar, and reported in the appendix, figure 10. The reason for the similarity is that we report the difference between τ and θ which is similar in both scenarios, while their levels differ.

[15] Note that θ_t^T reflects the effect of changes in the tax-benefit system on income stabilization from year $t-1$ to t.

in the tax-benefit system from year $t-1$ to t. In this case, the difference between the two measures is zero and the fiscal impulse stemming from changes in tax-benefit policies can be characterized as being neutral. The short-term stabilization coefficient is larger (smaller) than the income stabilization coefficient and hence the difference between the two is positive (negative) if there are expansionary (contractionary) policy changes in the tax-benefit system.

For the aggregate fiscal impulse, we consider its two sub-components: automatic stabilizers measured by the year-on-year change in cyclical net borrowing[16] and discretionary fiscal policy expressed as the year-on-year change in cyclically-adjusted net borrowing.[17]

In Figure 7 the difference between the short-term and the income stabilization coefficient is depicted on the y-axis, the change in cyclical and cyclically-adjusted net borrowing from year $t-1$ to t on the x-axis, respectively. If both the micro and the macro measure point to expansionary (contractionary) changes in fiscal policy, countries will find themselves in the upper right (lower left) quadrant. If the micro and the macro estimates indicate opposite effects of fiscal policy, country dots will be in the upper left or lower right quadrant.

Panels (a) and (b) show that in 2008 and 2009 the fiscal impulse was expansionary in the majority of member states, exemplified by an increase in both the cyclical and the cyclically-adjusted budget deficit. Our micro-based estimates of fiscal stabilization point in the same direction so that in panels (a) and (b) most countries are in the upper right quadrant. The correlation between the micro and the two macro measures of fiscal stabilization is positive in these two years.

Ireland stands out as a notable exception being in the lower right quadrant both in the left and right figure of panel (b). We find a short-term stabilization coefficient of -0.2 in 2009 and a resulting negative difference between the short-term stabilization coefficient and the income stabilization coefficient of -0.65. While our micro measure of fiscal stabilization suggests for Ireland a fiscal tightening in 2009, changes in the budget balance point to a significant fiscal loosening. From 2008 to 2009, Ireland's cyclical and cyclically-adjusted budget deficit increased by 2.4 and 4.4 percentage points of GDP, respectively.

How can these seemingly contrasting results be reconciled? At the height of the

[16]The cyclical balance, CC, shows the extent to which budgetary revenues and expenditures react to the economic cycle. Formally, CC can be written as $\varepsilon \cdot OG$, where ε stands for the semi-elasticity of the overall budget with respect to changes in output and $OG = \frac{Y-Y^p}{Y^p}$ denotes the output gap. Semi-elasticities are estimated for specific time-periods and are assumed to be time-invariant over this period.

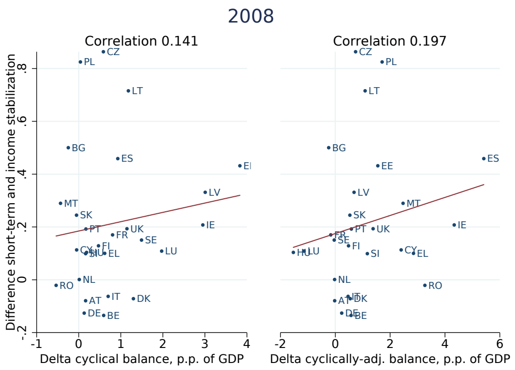
[17]The cyclically-adjusted budget can be derived from the following expression: $CAB = (B/Y) - CC$ where B denotes net borrowing and Y is output.

financial crisis, Ireland experienced the burst of a property bubble and recapitalized its banking system in response. This accounts for a large part of the increase in the budget deficit in the years 2008–2010. While Ireland's budget was balanced in 2007, its deficit had risen to an unprecedented level of 32% of GDP in 2010. At the same time, Ireland started a process of fiscal consolidation in 2009 which lasted until 2013 and included measures such as hikes in income taxes and social insurance contributions as well as cuts in unemployment benefits (Alesina et al., 2015; Devries et al., 2011; Turrini et al., 2015). These fiscal consolidation measures had an adverse impact on household income stabilization explaining why our micro-based results point in the opposite direction compared to the two macro measures.

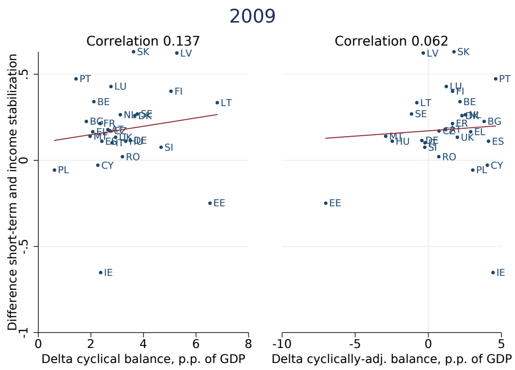
Other interesting examples are Estonia in 2009 and Greece in 2011. Focus first on Estonia in 2009. While cyclical net borrowing rose by 6.5 percentage points of GDP in 2009, the cyclically-adjusted balance improved by 7 percentage points of GDP so that the overall fiscal impulse was contractionary. This contractionary effect is mirrored by a negative short-term stabilization coefficient in 2009. As a consequence, Estonia is displayed in the lower left quadrant in the right figure of panel (b), but in the lower right quadrant in the left figure of panel (b).

A similar picture emerges for Greece. In 2011, Greece was still in a recession, with its cyclical deficit rising from -1.8% to -5%. At the same time, its structural deficit improved from -9.4% to -5.2% so that the overall fiscal impulse was contractionary. In line with the contractionary fiscal stance, our micro-based short-term stabilization coefficient amounts to -0.7 in 2011 (and the difference between the short-term stabilization coefficient and the income stabilization coefficient to -1). It follows that as in the Estonian case in 2009, Greece shows up in the lower left quadrant in the right figure of panel (d), but in the lower right in the left figure. These two examples indicate that automatic stabilizers in Greece (2011) and Estonia (2009) could only operate along the consolidation path. Overall, for the years 2010–2013 we find positive (negative) correlations between our micro-measure of fiscal stabilization and discretionary fiscal policy changes (automatic stabilizers). One interpretation of these correlations is that the workings of automatic stabilizers has been constrained in those years.

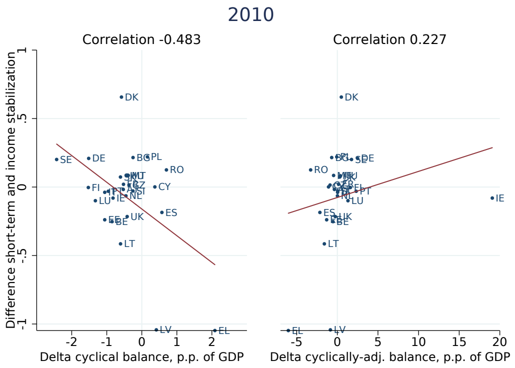
Our results suggest that micro-based estimates of household income stabilization provide valuable and complementary information to conventional macro measures of fiscal stabilization. If one wants to estimate the cushioning effect of (changes in) tax-benefit systems, a sole focus on time-invariant semi-elasticities and changes in the budget balance may provide an incomplete picture. It should be noted, however, that the above comparison of micro and macro-based estimates of fiscal stabilization should be taken with a grain of salt given their conceptual differences, in particular with regard to the limited number of revenue and spending categories included in our simulations.



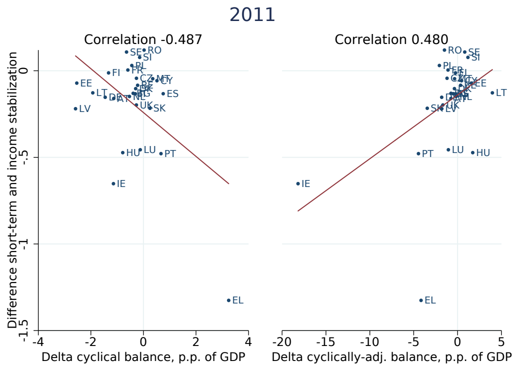
(a) 2008



(b) 2009

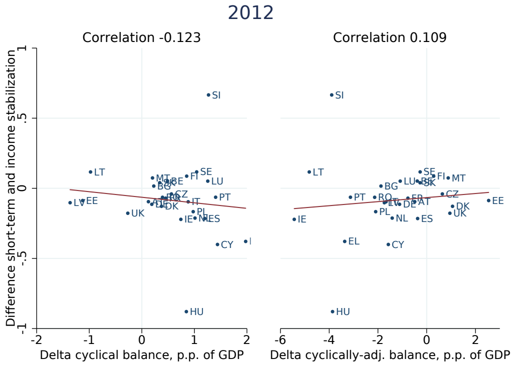


(c) 2010

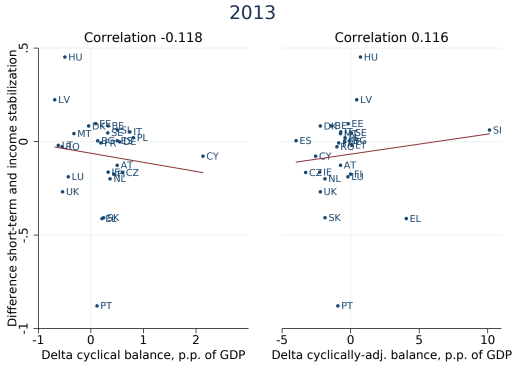


(d) 2011

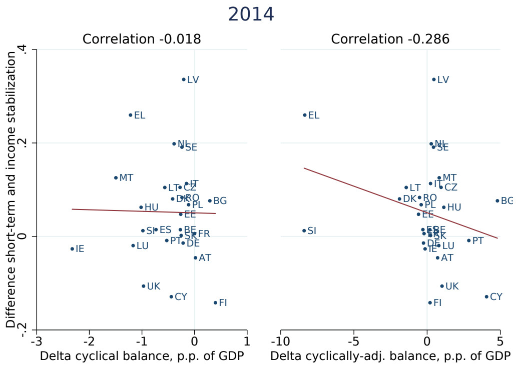
Figure 7: Micro vs. Macro Estimates of Fiscal Stabilization: Income Shock



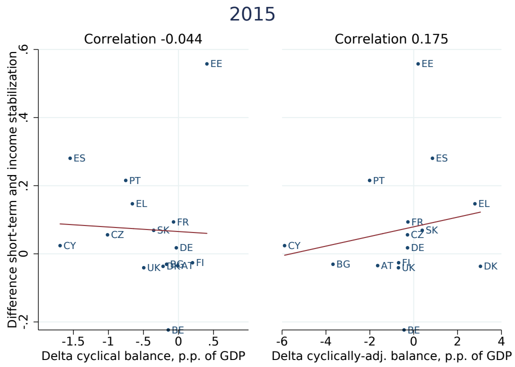
(e) 2012



(f) 2013



(g) 2014



(h) 2015

(Continued) Micro vs. Macro Estimates of Fiscal Stabilization: Income Shock

Notes: The figure plots the difference between short-term and income stabilization coefficients on the y-axis and changes in cyclical and cyclically-adjusted net borrowing on the x-axis. Short-term stabilization coefficients for year t capture policy changes from $t-1$ to t. *Source:* Own calculations using EUROMOD. Data on cyclical and cyclically-adjusted net borrowing are from the AMECO database.

Cyclicality of fiscal effects. To shed light on the cyclicality of changes in tax-benefit systems, we plot the change in GDP against the difference of the short-term and the income stabilization coefficient. This is shown in figure 8 pooling all country-year pairs for the income shock scenario. As in the previous sub-section, a positive (negative) difference between the short-term and the income stabilization coefficient indicates that the overall fiscal impulse from changes in the tax-benefit system is expansionary (contractionary). Figure 8 shows that the contemporaneous effect of fiscal expansions (contractions) on GDP growth is small but positive, with a correlation of 0.117. Figure 9 provides results for selected countries.[18] Country dots in the lower right (expansionary fiscal impulse and

[18]Results for short-term stabilization coefficient (rather than for the difference between the income and the short-term stabilization coefficient) and the simulated unemployment shock scenario are similar

negative GDP growth) and upper left (contractionary fiscal policy and positive GDP growth) quadrant point to years with counter-cyclical fiscal policies, while pro-cyclical episodes are shown in the lower left and upper right quadrant. Our results suggest that in some years with negative GDP growth, the counter-cyclical effect of automatic stabilizers has been completely offset by pro-cyclical changes in the tax-benefit systems (e.g. EL: 2010-13, ES: 2011-12, IE: 2009-10, LV: 2010 or PT: 2011-12).

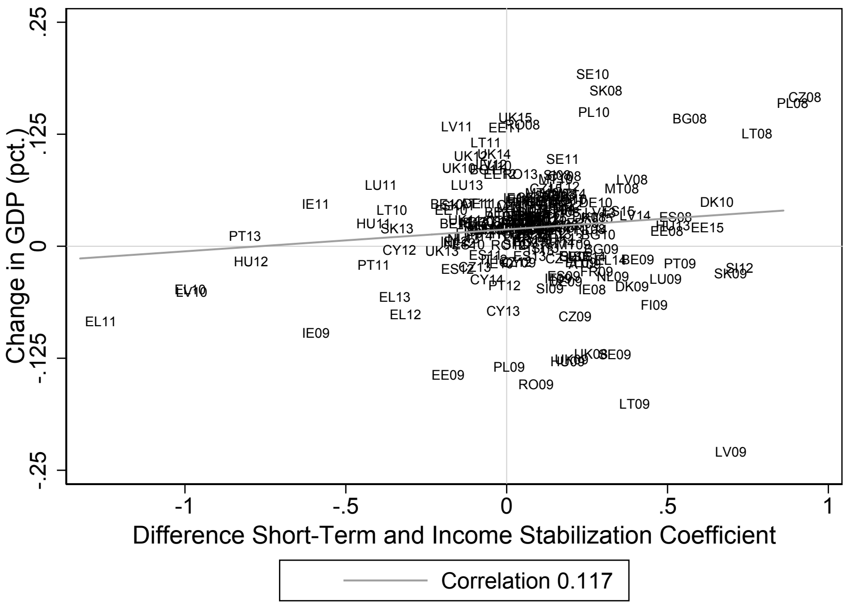
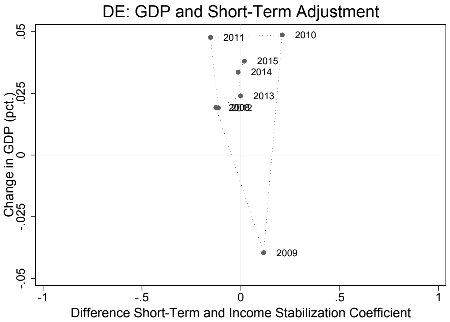


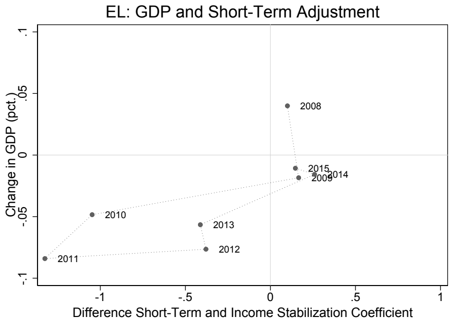
Figure 8: Delta Short-term and Income Stabilization and Change in GDP: Income Shock

Notes: The figure plots changes in GDP on the y-axis and the difference between short-term and income stabilization coefficients on the x-axis. Short-term stabilization coefficients for year t capture policy changes from $t-1$ to t. *Source:* Own calculations using EUROMOD. Data on GDP are at 2010 reference levels from the AMECO database.

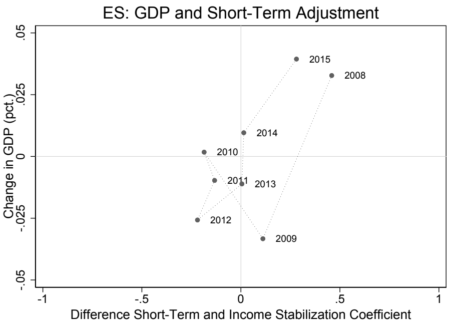
and shown in the appendix section B.



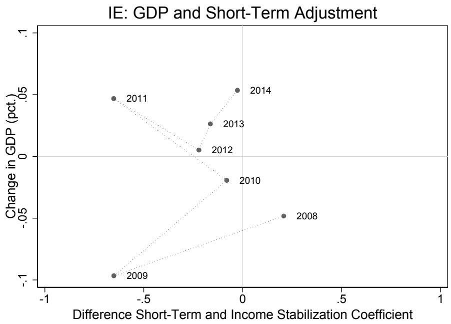
(a) DE



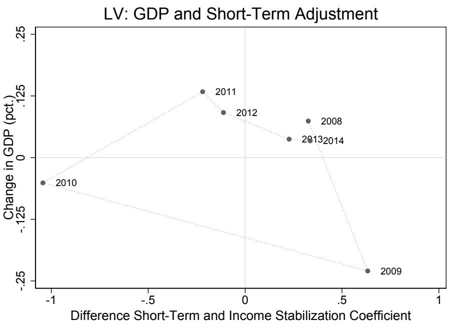
(b) EL



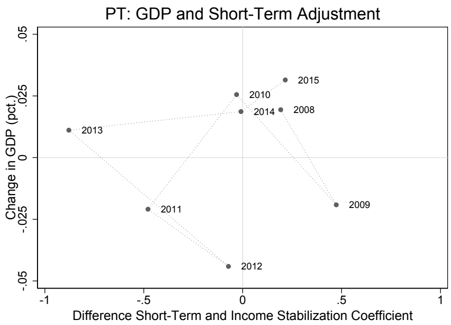
(c) ES



(d) IE



(e) LV



(f) PT

Figure 9: Short-term Adjustment Coefficient and Change in GDP: Income Shock

Notes: The figure plots changes in GDP on the y-axis and the difference between income and short-term stabilization coefficients on the x-axis. Short-term stabilization coefficients for year t capture policy changes from $t-1$ to t. *Source:* Own calculations using EUROMOD. Data on GDP are at 2010 reference levels from the AMECO database.

5. Conclusion

We analyze how reforms of tax-benefit systems in the period 2007–2014 have affected the automatic stabilizers in the EU-27. Based on harmonized European micro data and counterfactual simulation, we isolate the automatic cushioning effect from discretionary fiscal policy measures as well as behavioral responses of households. In our simulations, we hold pre-crisis household income data and demographic characteristics constant, but apply the tax and benefit rules in place during 2007–2014.

We find that the size of automatic stabilizers varies significantly across countries. Income stabilization coefficients range from 20-30 percent in some Eastern and Southern European countries to around 60 percent in Belgium, Germany, and Denmark. We further analyze to what extent EU countries let their automatic stabilizers work during the crisis and its aftermath. Our results suggest that automatic stabilizers could operate freely until 2009, but have been constrained in some countries in subsequent years.

A comparison of our estimates of automatic stabilizers inherent in tax-benefit systems with macro measures such as changes in the cyclical and the cyclically-adjusted budget balance reveals that micro-based estimates can provide more precise information about the degree of household income stabilization and should be used as complements to the macro measures.

A. Stabilization Coefficients

A.1. Income Shock

Table 1: Income Stabilization Coefficients – Income Shock.

		2007	2008	2009	2010	2011	2012	2013	2014	2015
AT	τ^{TAX}	0.334	0.336	0.326	0.324	0.327	0.330	0.331	0.332	0.332
	τ^{SIC}	0.135	0.139	0.140	0.141	0.142	0.140	0.143	0.143	0.145
	τ^{BEN+UI}	0.007	0.006	0.006	0.007	0.009	0.007	0.007	0.007	0.008
	τ	0.476	0.481	0.472	0.471	0.478	0.477	0.481	0.482	0.485
BE	τ^{TAX}	0.392	0.394	0.386	0.390	0.391	0.391	0.388	0.389	0.408
	τ^{SIC}	0.142	0.142	0.145	0.142	0.142	0.141	0.144	0.143	0.138
	τ^{BEN+UI}	0.002	0.002	0.004	0.002	0.002	0.002	0.003	0.004	0.004
	τ	0.536	0.537	0.534	0.534	0.535	0.534	0.535	0.537	0.550
BG	τ^{TAX}	0.186	0.087	0.087	0.088	0.087	0.087	0.087	0.088	0.087
	τ^{SIC}	0.105	0.116	0.114	0.105	0.112	0.111	0.113	0.116	0.118
	τ^{BEN+UI}	0.009	0.011	0.013	0.011	0.012	0.012	0.013	0.013	0.015
	τ	0.300	0.214	0.214	0.205	0.211	0.211	0.214	0.217	0.219
CY	τ^{TAX}	0.168	0.167	0.166	0.169	0.180	0.196	0.199	0.200	0.197
	τ^{SIC}	0.041	0.041	0.045	0.045	0.045	0.047	0.048	0.056	0.056
	τ^{BEN+UI}	0.008	0.007	0.008	0.010	0.008	0.010	0.009	0.014	0.015
	τ	0.216	0.214	0.218	0.224	0.233	0.254	0.257	0.270	0.268
CZ	τ^{TAX}	0.189	0.164	0.163	0.164	0.168	0.165	0.172	0.170	0.169
	τ^{SIC}	0.128	0.132	0.118	0.121	0.122	0.120	0.121	0.121	0.120
	τ^{BEN+UI}	0.018	0.021	0.023	0.024	0.023	0.025	0.025	0.025	0.026
	τ	0.335	0.318	0.304	0.309	0.313	0.310	0.318	0.315	0.315
DE	τ^{TAX}	0.331	0.343	0.339	0.318	0.312	0.314	0.315	0.316	0.316
	τ^{SIC}	0.128	0.134	0.132	0.134	0.130	0.128	0.126	0.124	0.126
	τ^{BEN+UI}	0.031	0.030	0.030	0.022	0.023	0.021	0.020	0.021	0.022
	τ	0.490	0.507	0.500	0.474	0.465	0.464	0.461	0.462	0.463
DK	τ^{TAX}	0.420	0.414	0.393	0.353	0.349	0.349	0.344	0.338	0.339
	τ^{SIC}	0.074	0.074	0.074	0.074	0.074	0.075	0.075	0.075	0.075
	τ^{BEN+UI}	0.014	0.014	0.014	0.017	0.017	0.017	0.018	0.018	0.018

	τ	0.508	0.502	0.481	0.444	0.440	0.440	0.436	0.430	0.431
	τ^{TAX}	0.213	0.202	0.203	0.200	0.200	0.199	0.201	0.201	0.192
	τ^{SIC}	0.017	0.017	0.019	0.033	0.035	0.038	0.031	0.031	0.027
EE	τ^{BEN+UI}	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.005
	τ	0.231	0.220	0.222	0.233	0.236	0.238	0.232	0.234	0.223
	τ^{TAX}	0.232	0.226	0.215	0.268	0.299	0.300	0.284	0.283	0.278
	τ^{SIC}	0.093	0.092	0.092	0.091	0.093	0.095	0.103	0.103	0.099
EL	τ^{BEN+UI}	0.002	0.001	0.004	0.001	0.002	0.001	0.006	0.014	0.009
	τ	0.327	0.320	0.312	0.360	0.394	0.395	0.393	0.401	0.387
	τ^{TAX}	0.245	0.236	0.233	0.251	0.257	0.278	0.279	0.280	0.265
	τ^{SIC}	0.046	0.045	0.046	0.046	0.045	0.045	0.046	0.047	0.047
ES	τ^{BEN+UI}	0.002	0.002	0.004	0.005	0.003	0.002	0.002	0.002	0.003
	τ	0.293	0.283	0.283	0.302	0.305	0.325	0.327	0.329	0.314
	τ^{TAX}	0.361	0.363	0.353	0.349	0.348	0.348	0.355	0.356	0.358
	τ^{SIC}	0.063	0.059	0.059	0.065	0.068	0.072	0.071	0.077	0.078
FI	τ^{BEN+UI}	0.012	0.013	0.014	0.013	0.012	0.013	0.011	0.011	0.011
	τ	0.436	0.434	0.426	0.427	0.428	0.433	0.438	0.444	0.448
	τ^{TAX}	0.168	0.169	0.168	0.170	0.173	0.179	0.181	0.183	0.180
	τ^{SIC}	0.133	0.133	0.134	0.134	0.133	0.134	0.136	0.139	0.140
FR	τ^{BEN+UI}	0.037	0.040	0.053	0.051	0.050	0.049	0.050	0.053	0.056
	τ	0.339	0.342	0.355	0.355	0.357	0.362	0.368	0.374	0.377
	τ^{TAX}	0.335	0.339	0.311	0.271	0.225	0.209	0.161	0.161	.
	τ^{SIC}	0.191	0.196	0.190	0.195	0.191	0.204	0.203	0.203	.
HU	τ^{BEN+UI}	0.007	0.007	0.005	0.005	0.004	0.006	0.006	0.005	.
	τ	0.533	0.542	0.506	0.471	0.420	0.418	0.370	0.369	.
	τ^{TAX}	0.316	0.314	0.330	0.327	0.384	0.388	0.388	0.389	.
	τ^{SIC}	0.065	0.065	0.102	0.101	0.067	0.067	0.070	0.071	.
IE	τ^{BEN+UI}	0.018	0.021	0.019	0.024	0.016	0.019	0.020	0.020	.
	τ	0.399	0.401	0.451	0.452	0.468	0.474	0.478	0.480	.
	τ^{TAX}	0.319	0.322	0.322	0.323	0.329	0.331	0.334	0.349	.
	τ^{SIC}	0.105	0.106	0.106	0.106	0.106	0.109	0.110	0.111	.
IT	τ^{BEN+UI}	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	.
	τ	0.432	0.436	0.436	0.437	0.443	0.447	0.450	0.466	.

LT	τ^{TAX}	0.251	0.226	0.163	0.162	0.161	0.161	0.161	0.163	.
	τ^{SIC}	0.039	0.037	0.087	0.088	0.090	0.090	0.090	0.090	.
	τ^{BEN+UI}	-0.006	-0.011	-0.006	-0.007	-0.001	-0.001	-0.002	-0.003	.
	τ	0.284	0.252	0.244	0.243	0.249	0.250	0.249	0.251	.
LU	τ^{TAX}	0.276	0.280	0.271	0.275	0.297	0.295	0.309	0.309	.
	τ^{SIC}	0.106	0.105	0.108	0.107	0.107	0.105	0.104	0.105	.
	τ^{BEN+UI}	0.019	0.018	0.026	0.025	0.021	0.020	0.021	0.021	.
	τ	0.400	0.403	0.405	0.407	0.426	0.419	0.434	0.435	.
LV	τ^{TAX}	0.227	0.222	0.202	0.235	0.220	0.221	0.212	0.212	.
	τ^{SIC}	0.084	0.081	0.088	0.087	0.108	0.107	0.107	0.098	.
	τ^{BEN+UI}	0.002	0.002	0.003	0.004	0.003	0.004	0.003	0.003	.
	τ	0.312	0.305	0.293	0.326	0.332	0.331	0.322	0.313	.
MT	τ^{TAX}	0.230	0.216	0.213	0.217	0.220	0.222	0.213	0.205	.
	τ^{SIC}	0.038	0.037	0.037	0.036	0.040	0.041	0.045	0.046	.
	τ^{BEN+UI}	0.018	0.011	0.012	0.013	0.012	0.009	0.008	0.011	.
	τ	0.286	0.263	0.262	0.266	0.271	0.272	0.266	0.262	.
NL	τ^{TAX}	0.308	0.313	0.314	0.312	0.314	0.323	0.312	0.313	.
	τ^{SIC}	0.111	0.105	0.089	0.091	0.090	0.089	0.099	0.106	.
	τ^{BEN+UI}	0.017	0.023	0.029	0.029	0.031	0.029	0.031	0.023	.
	τ	0.435	0.440	0.432	0.433	0.435	0.442	0.442	0.442	.
PL	τ^{TAX}	0.179	0.191	0.165	0.166	0.167	0.168	0.169	0.168	.
	τ^{SIC}	0.141	0.105	0.104	0.104	0.104	0.104	0.105	0.106	.
	τ^{BEN+UI}	0.013	0.011	0.010	0.011	0.010	0.011	0.011	0.011	.
	τ	0.333	0.307	0.278	0.281	0.281	0.283	0.284	0.286	.
PT	τ^{TAX}	0.211	0.210	0.204	0.211	0.237	0.218	0.277	0.276	0.273
	τ^{SIC}	0.093	0.093	0.094	0.096	0.093	0.108	0.110	0.110	0.109
	τ^{BEN+UI}	0.016	0.017	0.021	0.021	0.018	0.013	0.009	0.010	0.009
	τ	0.321	0.320	0.319	0.328	0.348	0.339	0.396	0.397	0.392
RO	τ^{TAX}	0.207	0.209	0.199	0.201	0.199	0.200	0.201	0.200	.
	τ^{SIC}	0.091	0.088	0.096	0.096	0.106	0.105	0.102	0.103	.
	τ^{BEN+UI}	0.023	0.021	0.027	0.026	0.018	0.015	0.015	0.017	.
	τ	0.322	0.318	0.322	0.323	0.323	0.320	0.318	0.321	.
SE	τ^{TAX}	0.360	0.354	0.332	0.331	0.328	0.321	0.317	0.309	.

	τ^{SIC}	0.054	0.054	0.055	0.055	0.055	0.056	0.057	0.057	.
	τ^{BEN+UI}	0.008	0.008	0.008	0.008	0.008	0.010	0.010	0.012	.
	τ	0.421	0.415	0.396	0.393	0.390	0.386	0.384	0.378	.
	τ^{TAX}	0.200	0.206	0.204	0.197	0.207	0.209	0.203	0.201	.
	τ^{SIC}	0.187	0.187	0.188	0.189	0.190	0.186	0.185	0.192	.
SI	τ^{BEN+UI}	0.021	0.022	0.023	0.024	0.023	0.026	0.026	0.027	.
	τ	0.409	0.415	0.415	0.410	0.420	0.422	0.414	0.420	.
	τ^{TAX}	0.147	0.147	0.136	0.136	0.147	0.148	0.143	0.141	0.139
	τ^{SIC}	0.130	0.131	0.130	0.131	0.126	0.127	0.156	0.158	0.171
SK	τ^{BEN+UI}	0.017	0.017	0.031	0.031	0.023	0.020	0.020	0.021	0.018
	τ	0.293	0.296	0.297	0.298	0.297	0.294	0.318	0.319	0.327
	τ^{TAX}	0.259	0.249	0.243	0.255	0.263	0.265	0.266	0.266	0.265
	τ^{SIC}	0.072	0.077	0.080	0.080	0.085	0.085	0.083	0.083	0.084
UK	τ^{BEN+UI}	0.039	0.041	0.042	0.042	0.036	0.035	0.032	0.032	0.033
	τ	0.370	0.367	0.366	0.377	0.383	0.384	0.381	0.381	0.381
	τ^{TAX}	0.264	0.263	0.256	0.256	0.260	0.263	0.264	0.266	0.262
	τ^{SIC}	0.104	0.103	0.104	0.104	0.104	0.104	0.105	0.106	0.107
EU	τ^{BEN+UI}	0.020	0.021	0.023	0.022	0.021	0.020	0.020	0.020	0.026
	τ	0.388	0.386	0.383	0.383	0.385	0.388	0.389	0.393	0.395
	τ^{TAX}	0.259	0.258	0.256	0.262	0.270	0.276	0.278	0.282	0.245
	τ^{SIC}	0.102	0.102	0.103	0.103	0.102	0.103	0.106	0.107	0.108
EA	τ^{BEN+UI}	0.016	0.017	0.021	0.021	0.020	0.019	0.020	0.020	0.026
	τ	0.377	0.377	0.380	0.386	0.391	0.398	0.403	0.409	0.379

Note: A missing value in the 2015 column indicates that the tax policy is not available in EUROMOD G4.0. EU and EA averages are population weighted. *Source*: Own calculations using EUROMOD.

Table 2: Short-Term Adjustment Coefficients – Income Shock.

		2008	2009	2010	2011	2012	2013	2014	2015
AT	θ^{TAX}	0.118	0.466	0.272	0.068	0.145	0.186	0.225	0.278
	θ^{SIC}	0.018	0.111	0.072	0.008	0.056	0.031	0.086	0.107
	θ^{BEN+UI}	-0.265	-0.072	-0.109	-0.241	-0.180	-0.137	-0.125	-0.065
	θ	0.401	0.650	0.454	0.317	0.381	0.354	0.436	0.450
BE	θ^{TAX}	0.108	0.641	0.080	0.166	0.305	0.388	0.390	0.083
	θ^{SIC}	-0.024	0.179	0.075	0.058	0.071	0.129	0.127	0.208
	θ^{BEN+UI}	-0.318	-0.054	-0.127	-0.226	-0.211	-0.101	-0.034	-0.035
	θ	0.402	0.875	0.282	0.451	0.586	0.619	0.551	0.326
BG	θ^{TAX}	0.371	0.039	0.017	0.044	0.046	0.083	0.135	0.091
	θ^{SIC}	-0.318	0.108	0.225	-0.120	0.060	0.078	0.127	0.123
	θ^{BEN+UI}	-0.661	-0.293	-0.178	-0.157	-0.121	-0.057	-0.031	0.025
	θ	0.714	0.440	0.421	0.081	0.227	0.218	0.293	0.188
CY	θ^{TAX}	0.133	0.174	0.081	0.019	-0.098	0.148	0.166	0.260
	θ^{SIC}	-0.004	-0.050	0.010	0.007	-0.046	0.031	-0.122	0.072
	θ^{BEN+UI}	-0.197	-0.066	-0.134	-0.149	0.003	0.001	-0.097	0.039
	θ	0.326	0.189	0.224	0.175	-0.147	0.178	0.141	0.292
CZ	θ^{TAX}	0.178	0.279	0.129	-0.062	0.237	0.001	0.260	0.172
	θ^{SIC}	-0.665	0.576	0.054	-0.097	0.180	0.093	0.110	0.106
	θ^{BEN+UI}	-1.665	0.405	-0.140	-0.425	0.147	-0.057	-0.050	-0.092
	θ	1.178	0.450	0.322	0.266	0.270	0.152	0.420	0.371
DE	θ^{TAX}	0.133	0.396	0.589	0.144	0.162	0.215	0.274	0.333
	θ^{SIC}	0.066	0.137	0.094	-0.009	0.074	0.126	0.093	0.096
	θ^{BEN+UI}	-0.182	-0.082	0.001	-0.177	-0.114	-0.118	-0.081	-0.051
	θ	0.381	0.616	0.683	0.312	0.350	0.460	0.448	0.481
DK	θ^{TAX}	0.539	0.615	0.696	0.361	0.289	0.371	0.399	0.283
	θ^{SIC}	0.073	0.060	0.061	0.070	0.060	0.075	0.063	0.069
	θ^{BEN+UI}	-0.078	-0.129	-0.272	-0.064	-0.110	-0.108	-0.070	-0.055
	θ	0.691	0.803	1.029	0.495	0.458	0.554	0.532	0.407
EE	θ^{TAX}	0.226	0.026	0.146	0.002	0.031	0.034	0.194	0.395
	θ^{SIC}	-0.028	-0.027	-0.262	-0.056	-0.049	0.161	0.024	0.097

	θ^{BEN+UI}	-0.453	0.026	-0.110	-0.219	-0.170	-0.133	-0.064	-0.289
	θ	0.651	-0.026	-0.006	0.165	0.151	0.328	0.282	0.781
EL	θ^{TAX}	0.168	0.312	-0.401	-1.026	0.020	0.319	0.392	0.420
	θ^{SIC}	-0.042	0.035	0.004	-0.070	-0.001	0.039	0.148	0.186
	θ^{BEN+UI}	-0.294	-0.131	0.291	-0.163	0.002	0.377	-0.120	0.073
	θ	0.420	0.478	-0.688	-0.932	0.016	-0.019	0.660	0.534
ES	θ^{TAX}	0.351	0.281	-0.104	0.091	-0.076	0.184	0.302	0.524
	θ^{SIC}	-0.004	0.034	0.021	0.005	0.018	0.023	0.037	0.048
	θ^{BEN+UI}	-0.395	-0.079	-0.199	-0.076	-0.163	-0.125	-0.005	-0.023
	θ	0.742	0.394	0.116	0.172	0.106	0.332	0.343	0.595
FI	θ^{TAX}	0.174	0.640	0.390	0.207	0.265	0.027	0.261	0.382
	θ^{SIC}	0.108	0.026	-0.074	-0.030	-0.059	0.056	-0.042	0.056
	θ^{BEN+UI}	-0.282	-0.161	-0.108	-0.238	-0.314	-0.181	-0.083	0.016
	θ	0.563	0.827	0.424	0.415	0.520	0.264	0.302	0.422
FR	θ^{TAX}	0.088	0.170	0.105	0.045	-0.008	0.133	0.163	0.251
	θ^{SIC}	0.044	0.119	0.086	0.068	0.075	0.067	0.080	0.131
	θ^{BEN+UI}	-0.380	-0.279	-0.183	-0.248	-0.225	-0.160	-0.137	-0.088
	θ	0.512	0.568	0.374	0.361	0.291	0.360	0.381	0.471
HU	θ^{TAX}	-0.148	0.897	0.467	-0.980	-0.083	0.532	0.159	.
	θ^{SIC}	-0.337	0.754	0.080	-0.136	-0.049	0.126	0.264	.
	θ^{BEN+UI}	-1.122	1.025	-0.006	-1.054	0.314	-0.159	-0.006	.
	θ	0.637	0.627	0.553	-0.062	-0.446	0.818	0.430	.
IE	θ^{TAX}	0.239	0.105	0.436	-0.634	0.205	0.388	0.367	.
	θ^{SIC}	0.020	-0.339	0.137	0.559	0.037	-0.023	0.066	.
	θ^{BEN+UI}	-0.350	-0.034	0.202	0.109	-0.011	0.050	-0.021	.
	θ	0.609	-0.200	0.372	-0.184	0.253	0.315	0.453	.
IT	θ^{TAX}	0.018	0.210	0.167	-0.027	0.052	0.247	0.424	.
	θ^{SIC}	0.012	0.086	0.071	0.045	-0.015	0.065	0.084	.
	θ^{BEN+UI}	-0.344	-0.242	-0.160	-0.292	-0.314	-0.187	-0.072	.
	θ	0.374	0.538	0.399	0.309	0.350	0.499	0.580	.
LT	θ^{TAX}	0.127	1.291	0.127	0.040	0.072	0.123	0.261	.
	θ^{SIC}	-0.065	-0.939	0.028	-0.021	0.028	0.056	0.086	.
	θ^{BEN+UI}	-0.904	-0.227	0.333	-0.103	-0.266	-0.050	-0.008	.

	θ	0.967	0.579	-0.177	0.122	0.366	0.229	0.355	.
LU	θ^{TAX}	0.014	0.641	0.090	-0.165	0.196	0.016	0.258	.
	θ^{SIC}	0.006	0.079	0.043	0.001	0.076	0.095	0.083	.
	θ^{BEN+UI}	-0.491	-0.114	-0.173	-0.134	-0.199	-0.134	-0.074	.
	θ	0.511	0.834	0.307	-0.030	0.471	0.245	0.415	.
LV	θ^{TAX}	-0.006	0.466	-0.691	0.398	0.115	0.364	0.344	.
	θ^{SIC}	-0.175	0.004	0.119	-0.372	0.056	0.108	0.199	.
	θ^{BEN+UI}	-0.812	-0.455	0.145	-0.087	-0.048	-0.077	-0.106	.
	θ	0.630	0.926	-0.718	0.113	0.220	0.549	0.649	.
MT	θ^{TAX}	0.260	0.222	0.126	0.118	0.127	0.240	0.253	.
	θ^{SIC}	-0.014	0.006	-0.002	-0.028	-0.036	-0.010	0.019	.
	θ^{BEN+UI}	-0.306	-0.173	-0.226	-0.135	-0.253	-0.078	-0.115	.
	θ	0.553	0.401	0.350	0.225	0.345	0.308	0.388	.
NL	θ^{TAX}	0.180	0.285	0.315	0.239	0.163	0.245	0.350	.
	θ^{SIC}	0.041	0.231	-0.033	-0.080	0.017	-0.097	0.314	.
	θ^{BEN+UI}	-0.220	-0.180	-0.086	-0.128	-0.049	-0.094	0.023	.
	θ	0.441	0.696	0.368	0.287	0.229	0.242	0.640	.
PL	θ^{TAX}	-0.673	1.193	-0.183	-0.148	0.172	0.212	0.021	.
	θ^{SIC}	0.515	0.648	-0.142	-0.127	0.132	0.113	-0.021	.
	θ^{BEN+UI}	-1.290	1.620	-0.813	-0.586	0.187	0.020	-0.354	.
	θ	1.132	0.222	0.488	0.311	0.117	0.304	0.353	.
PT	θ^{TAX}	0.148	0.311	0.069	-0.182	0.503	-0.861	0.301	0.354
	θ^{SIC}	0.040	0.104	0.070	0.007	0.072	-0.058	0.098	0.214
	θ^{BEN+UI}	-0.324	-0.377	-0.158	-0.044	0.308	-0.436	0.010	-0.039
	θ	0.512	0.792	0.297	-0.131	0.267	-0.483	0.388	0.607
RO	θ^{TAX}	0.208	0.341	-0.115	0.057	0.302	0.023	0.131	.
	θ^{SIC}	0.162	0.061	-0.097	0.403	0.139	0.020	0.078	.
	θ^{BEN+UI}	0.073	0.059	-0.660	0.018	0.185	-0.247	-0.194	.
	θ	0.297	0.344	0.448	0.442	0.256	0.290	0.404	.
SE	θ^{TAX}	0.461	1.250	-0.403	0.083	0.123	0.279	0.470	.
	θ^{SIC}	0.048	0.193	-0.148	-0.025	-0.018	0.031	0.054	.
	θ^{BEN+UI}	-0.056	0.778	-1.145	-0.440	-0.398	-0.121	-0.045	.
	θ	0.566	0.665	0.594	0.498	0.503	0.430	0.569	.

SI	θ^{TAX}	0.138	0.232	0.115	0.230	0.152	0.218	0.190	.
	θ^{SIC}	-0.033	0.147	0.084	0.106	0.083	0.109	0.095	.
	θ^{BEN+UI}	-0.409	-0.112	-0.183	-0.157	-0.852	-0.149	-0.147	.
	θ	0.513	0.491	0.382	0.494	1.087	0.475	0.432	.
SK	θ^{TAX}	-0.028	0.370	0.122	-0.189	0.077	0.161	0.174	0.138
	θ^{SIC}	-0.240	0.004	0.089	0.087	0.027	-0.364	0.126	0.271
	θ^{BEN+UI}	-0.805	-0.553	-0.159	-0.182	-0.230	-0.115	-0.021	0.012
	θ	0.538	0.926	0.371	0.079	0.333	-0.089	0.321	0.396
UK	θ^{TAX}	0.875	0.534	-0.199	0.502	-0.324	0.494	-0.034	-0.134
	θ^{SIC}	0.200	0.132	-0.050	0.116	-0.142	0.138	-0.048	-0.114
	θ^{BEN+UI}	0.513	0.166	-0.411	0.432	-0.671	0.519	-0.356	-0.588
	θ	0.561	0.500	0.161	0.186	0.205	0.113	0.275	0.340
EU	θ^{TAX}	0.182	0.440	0.108	0.069	0.050	0.224	0.224	0.233
	θ^{SIC}	0.068	0.135	0.025	0.036	0.030	0.071	0.066	0.067
	θ^{BEN+UI}	-0.314	0.055	-0.229	-0.144	-0.192	-0.033	-0.132	-0.153
	θ	0.563	0.520	0.362	0.250	0.272	0.328	0.422	0.452
EA	θ^{TAX}	0.136	0.300	0.215	0.023	0.081	0.192	0.293	0.336
	θ^{SIC}	0.026	0.094	0.064	0.029	0.040	0.057	0.092	0.111
	θ^{BEN+UI}	-0.315	-0.167	-0.098	-0.189	-0.177	-0.125	-0.072	-0.048
	θ	0.477	0.561	0.377	0.242	0.299	0.373	0.457	0.494

Note: A missing value in the 2015 column indicates that the tax policy is not available in EUROMOD G4.0. EU and EA averages are population weighted. *Source*: Own calculations using EUROMOD.

A.2. Unemployment Shock

Table 3: Income Stabilization Coefficients – Unemployment Shock.

		2007	2008	2009	2010	2011	2012	2013	2014	2015
AT	τ^{TAX}	0.188	0.192	0.185	0.182	0.186	0.190	0.192	0.194	0.194
	τ^{SIC}	0.164	0.165	0.166	0.166	0.167	0.166	0.169	0.169	0.170
	τ^{BEN+UI}	0.159	0.155	0.156	0.154	0.159	0.157	0.157	0.156	0.156
	τ	0.511	0.511	0.506	0.502	0.512	0.513	0.518	0.519	0.521
BE	τ^{TAX}	0.224	0.227	0.218	0.227	0.229	0.228	0.226	0.226	0.239
	τ^{SIC}	0.132	0.135	0.135	0.135	0.135	0.135	0.134	0.135	0.129
	τ^{BEN+UI}	0.293	0.299	0.307	0.305	0.301	0.322	0.321	0.321	0.318
	τ	0.649	0.660	0.659	0.667	0.665	0.685	0.682	0.681	0.686
BG	τ^{TAX}	0.131	0.091	0.091	0.092	0.091	0.091	0.091	0.091	0.091
	τ^{SIC}	0.125	0.133	0.130	0.120	0.128	0.128	0.129	0.131	0.132
	τ^{BEN+UI}	0.011	0.006	0.005	0.007	0.009	0.009	0.009	0.009	0.009
	τ	0.268	0.230	0.226	0.220	0.228	0.228	0.229	0.230	0.231
CY	τ^{TAX}	0.073	0.071	0.070	0.074	0.077	0.093	0.092	0.094	0.092
	τ^{SIC}	0.057	0.057	0.063	0.063	0.063	0.068	0.069	0.079	0.080
	τ^{BEN+UI}	0.041	0.041	0.047	0.049	0.048	0.054	0.054	0.070	0.070
	τ	0.171	0.169	0.179	0.186	0.188	0.215	0.215	0.243	0.242
CZ	τ^{TAX}	0.111	0.089	0.089	0.089	0.094	0.092	0.099	0.095	0.095
	τ^{SIC}	0.147	0.149	0.135	0.136	0.137	0.136	0.136	0.136	0.136
	τ^{BEN+UI}	0.082	0.086	0.084	0.083	0.080	0.082	0.082	0.081	0.079
	τ	0.340	0.324	0.307	0.307	0.311	0.310	0.316	0.313	0.311
DE	τ^{TAX}	0.224	0.228	0.223	0.206	0.208	0.211	0.212	0.212	0.211
	τ^{SIC}	0.165	0.164	0.162	0.163	0.165	0.164	0.161	0.161	0.161
	τ^{BEN+UI}	0.227	0.225	0.223	0.210	0.209	0.210	0.211	0.212	0.213
	τ	0.616	0.617	0.608	0.578	0.582	0.585	0.583	0.584	0.585
DK	τ^{TAX}	0.247	0.240	0.229	0.210	0.207	0.207	0.201	0.197	0.196
	τ^{SIC}	0.092	0.093	0.093	0.094	0.094	0.095	0.095	0.095	0.095
	τ^{BEN+UI}	0.256	0.259	0.263	0.268	0.270	0.272	0.276	0.275	0.280
	τ	0.596	0.592	0.585	0.571	0.571	0.574	0.571	0.567	0.572
EE	τ^{TAX}	0.173	0.158	0.165	0.163	0.164	0.165	0.168	0.167	0.158

	τ^{SIC}	0.023	0.023	0.023	0.037	0.040	0.044	0.037	0.037	0.033
	τ^{BEN+UI}	-0.015	-0.017	-0.016	-0.017	-0.016	-0.017	-0.017	-0.015	-0.020
	τ	0.180	0.164	0.172	0.183	0.189	0.192	0.188	0.189	0.171
EL	τ^{TAX}	0.128	0.125	0.119	0.152	0.196	0.198	0.198	0.197	0.191
	τ^{SIC}	0.130	0.131	0.132	0.131	0.135	0.138	0.144	0.144	0.141
	τ^{BEN+UI}	0.024	0.024	0.026	0.024	0.023	0.024	0.023	0.070	0.072
	τ	0.281	0.280	0.277	0.307	0.354	0.360	0.365	0.411	0.404
ES	τ^{TAX}	0.143	0.132	0.129	0.144	0.148	0.163	0.166	0.165	0.153
	τ^{SIC}	0.074	0.073	0.074	0.074	0.074	0.071	0.071	0.072	0.073
	τ^{BEN+UI}	0.187	0.186	0.197	0.192	0.188	0.183	0.180	0.180	0.181
	τ	0.403	0.391	0.401	0.410	0.410	0.417	0.417	0.417	0.406
FI	τ^{TAX}	0.230	0.232	0.218	0.215	0.214	0.208	0.213	0.214	0.216
	τ^{SIC}	0.065	0.061	0.062	0.068	0.071	0.075	0.075	0.080	0.081
	τ^{BEN+UI}	0.233	0.230	0.237	0.232	0.227	0.261	0.265	0.263	0.264
	τ	0.528	0.523	0.517	0.515	0.511	0.545	0.553	0.557	0.561
FR	τ^{TAX}	0.103	0.103	0.103	0.103	0.105	0.108	0.109	0.109	0.107
	τ^{SIC}	0.156	0.156	0.157	0.157	0.157	0.157	0.160	0.162	0.162
	τ^{BEN+UI}	0.207	0.207	0.218	0.217	0.217	0.216	0.216	0.217	0.218
	τ	0.466	0.466	0.478	0.477	0.479	0.481	0.485	0.488	0.487
HU	τ^{TAX}	0.229	0.233	0.218	0.194	0.177	0.187	0.160	0.160	.
	τ^{SIC}	0.201	0.205	0.196	0.202	0.197	0.212	0.211	0.211	.
	τ^{BEN+UI}	0.056	0.056	0.059	0.056	0.057	-0.008	-0.008	-0.008	.
	τ	0.485	0.494	0.473	0.452	0.431	0.390	0.363	0.362	.
IE	τ^{TAX}	0.192	0.191	0.206	0.203	0.255	0.259	0.259	0.259	.
	τ^{SIC}	0.061	0.062	0.091	0.090	0.061	0.062	0.066	0.066	.
	τ^{BEN+UI}	0.134	0.141	0.118	0.122	0.117	0.117	0.118	0.117	.
	τ	0.388	0.394	0.415	0.416	0.433	0.437	0.442	0.443	.
IT	τ^{TAX}	0.232	0.235	0.236	0.238	0.244	0.247	0.247	0.242	.
	τ^{SIC}	0.120	0.121	0.121	0.121	0.121	0.124	0.125	0.126	.
	τ^{BEN+UI}	-0.042	-0.037	-0.037	-0.037	-0.038	-0.038	-0.033	-0.033	.
	τ	0.310	0.319	0.319	0.321	0.328	0.333	0.339	0.335	.
LT	τ^{TAX}	0.230	0.211	0.146	0.147	0.147	0.148	0.148	0.145	.
	τ^{SIC}	0.044	0.045	0.092	0.091	0.094	0.094	0.094	0.094	.

	τ^{BEN+UI}	-0.019	-0.027	-0.019	-0.002	-0.002	-0.001	-0.002	-0.001	.
	τ	0.255	0.228	0.219	0.235	0.240	0.241	0.240	0.238	.
	τ^{TAX}	0.162	0.168	0.159	0.163	0.178	0.177	0.188	0.188	.
	τ^{SIC}	0.114	0.114	0.115	0.115	0.115	0.114	0.113	0.113	.
LU	τ^{BEN+UI}	0.092	0.087	0.090	0.090	0.096	0.096	0.096	0.097	.
	τ	0.368	0.368	0.364	0.367	0.389	0.387	0.397	0.398	.
	τ^{TAX}	0.213	0.200	0.182	0.225	0.209	0.210	0.202	0.195	.
	τ^{SIC}	0.086	0.086	0.088	0.087	0.107	0.107	0.107	0.101	.
LV	τ^{BEN+UI}	-0.035	-0.055	-0.047	-0.029	-0.029	-0.037	-0.035	-0.036	.
	τ	0.264	0.231	0.223	0.283	0.287	0.280	0.273	0.260	.
	τ^{TAX}	0.117	0.109	0.107	0.110	0.112	0.113	0.111	0.107	.
	τ^{SIC}	0.087	0.085	0.085	0.085	0.086	0.087	0.089	0.090	.
MT	τ^{BEN+UI}	0.033	0.030	0.031	0.031	0.031	0.029	0.028	0.029	.
	τ	0.237	0.225	0.223	0.226	0.230	0.230	0.228	0.225	.
	τ^{TAX}	0.086	0.090	0.090	0.088	0.090	0.096	0.085	0.085	.
	τ^{SIC}	0.121	0.117	0.100	0.102	0.101	0.102	0.108	0.105	.
NL	τ^{BEN+UI}	0.346	0.352	0.358	0.361	0.359	0.357	0.359	0.356	.
	τ	0.553	0.560	0.548	0.550	0.550	0.554	0.551	0.546	.
	τ^{TAX}	0.149	0.161	0.147	0.146	0.147	0.151	0.152	0.151	.
	τ^{SIC}	0.165	0.124	0.125	0.124	0.125	0.126	0.127	0.127	.
PL	τ^{BEN+UI}	-0.006	-0.002	-0.004	0.000	-0.001	-0.001	0.002	0.000	.
	τ	0.308	0.283	0.268	0.270	0.272	0.276	0.280	0.278	.
	τ^{TAX}	0.144	0.143	0.138	0.143	0.161	0.145	0.195	0.194	0.189
	τ^{SIC}	0.108	0.108	0.108	0.108	0.110	0.112	0.113	0.113	0.112
PT	τ^{BEN+UI}	0.106	0.105	0.106	0.109	0.098	0.088	0.078	0.079	0.078
	τ	0.358	0.355	0.352	0.360	0.369	0.346	0.386	0.386	0.379
	τ^{TAX}	0.155	0.158	0.148	0.151	0.161	0.163	0.164	0.164	.
	τ^{SIC}	0.113	0.110	0.122	0.122	0.107	0.107	0.107	0.107	.
RO	τ^{BEN+UI}	0.143	0.142	0.141	0.145	0.132	0.125	0.126	0.131	.
	τ	0.411	0.411	0.410	0.418	0.400	0.396	0.397	0.402	.
	τ^{TAX}	0.251	0.243	0.227	0.222	0.221	0.217	0.216	0.207	.
	τ^{SIC}	0.064	0.064	0.064	0.064	0.064	0.064	0.065	0.065	.
SE	τ^{BEN+UI}	0.152	0.151	0.151	0.150	0.150	0.152	0.152	0.153	.

	τ	0.467	0.458	0.443	0.436	0.435	0.433	0.433	0.425	.
	τ^{TAX}	0.124	0.126	0.123	0.122	0.123	0.123	0.120	0.120	.
	τ^{SIC}	0.205	0.206	0.206	0.207	0.207	0.207	0.207	0.207	.
SI	τ^{BEN+UI}	0.052	0.052	0.052	0.057	0.058	0.043	0.043	0.042	.
	τ	0.382	0.383	0.381	0.386	0.388	0.373	0.370	0.369	.
	τ^{TAX}	0.076	0.076	0.061	0.061	0.074	0.075	0.073	0.071	0.071
	τ^{SIC}	0.150	0.152	0.151	0.152	0.149	0.149	0.174	0.176	0.175
SK	τ^{BEN+UI}	0.097	0.094	0.099	0.102	0.098	0.094	0.092	0.091	0.091
	τ	0.323	0.322	0.312	0.316	0.321	0.318	0.339	0.338	0.336
	τ^{TAX}	0.205	0.198	0.193	0.200	0.200	0.198	0.193	0.191	0.187
	τ^{SIC}	0.085	0.088	0.089	0.090	0.093	0.093	0.093	0.093	0.093
UK	τ^{BEN+UI}	0.123	0.123	0.125	0.124	0.116	0.116	0.104	0.104	0.104
	τ	0.413	0.408	0.408	0.415	0.409	0.408	0.390	0.388	0.383
	τ^{TAX}	0.177	0.176	0.170	0.170	0.175	0.178	0.177	0.176	0.168
	τ^{SIC}	0.125	0.122	0.123	0.123	0.123	0.123	0.124	0.125	0.129
EU	τ^{BEN+UI}	0.134	0.135	0.137	0.135	0.133	0.132	0.131	0.132	0.174
	τ	0.436	0.432	0.430	0.429	0.431	0.433	0.433	0.433	0.471
	τ^{TAX}	0.157	0.157	0.155	0.160	0.167	0.172	0.173	0.172	0.146
	τ^{SIC}	0.121	0.121	0.121	0.121	0.121	0.121	0.123	0.124	0.128
EA	τ^{BEN+UI}	0.137	0.138	0.143	0.142	0.141	0.141	0.141	0.143	0.192
	τ	0.415	0.415	0.419	0.424	0.429	0.434	0.438	0.439	0.466

Note: A missing value in the 2015 column indicates that the tax policy is not available in EUROMOD G4.0. EU and EA averages are population weighted. *Source*: Own calculations using EUROMOD.

Table 4: Short-Term Adjustment Coefficients – Unemployment Shock.

		2008	2009	2010	2011	2012	2013	2014	2015
AT	θ^{TAX}	-0.027	0.322	0.129	-0.072	0.004	0.047	0.087	0.141
	θ^{SIC}	0.047	0.138	0.099	0.037	0.085	0.060	0.113	0.133
	θ^{BEN+UI}	-0.414	-0.221	-0.257	-0.392	-0.330	-0.287	-0.274	-0.213
	θ	0.434	0.681	0.485	0.357	0.420	0.394	0.475	0.487
BE	θ^{TAX}	-0.060	0.468	-0.081	0.003	0.140	0.224	0.226	-0.080
	θ^{SIC}	-0.028	0.169	0.068	0.053	0.066	0.120	0.118	0.198
	θ^{BEN+UI}	-0.621	-0.356	-0.435	-0.531	-0.534	-0.421	-0.352	-0.350
	θ	0.534	0.993	0.423	0.587	0.739	0.766	0.696	0.468
BG	θ^{TAX}	0.369	0.044	0.023	0.049	0.050	0.087	0.136	0.095
	θ^{SIC}	-0.289	0.125	0.238	-0.098	0.079	0.095	0.142	0.137
	θ^{BEN+UI}	-0.642	-0.278	-0.170	-0.150	-0.115	-0.052	-0.027	0.030
	θ	0.722	0.447	0.431	0.101	0.244	0.233	0.304	0.201
CY	θ^{TAX}	0.034	0.078	-0.016	-0.085	-0.199	0.042	0.062	0.155
	θ^{SIC}	0.014	-0.031	0.029	0.026	-0.023	0.053	-0.095	0.095
	θ^{BEN+UI}	-0.229	-0.104	-0.171	-0.187	-0.044	-0.044	-0.150	-0.016
	θ	0.278	0.151	0.185	0.129	-0.179	0.138	0.117	0.266
CZ	θ^{TAX}	0.083	0.208	0.053	-0.137	0.164	-0.070	0.184	0.098
	θ^{SIC}	-0.627	0.582	0.070	-0.076	0.195	0.110	0.126	0.123
	θ^{BEN+UI}	-1.716	0.340	-0.198	-0.479	0.087	-0.114	-0.106	-0.144
	θ	1.171	0.449	0.321	0.266	0.271	0.154	0.416	0.365
DE	θ^{TAX}	0.019	0.279	0.470	0.042	0.060	0.112	0.170	0.228
	θ^{SIC}	0.098	0.168	0.125	0.029	0.111	0.162	0.130	0.132
	θ^{BEN+UI}	-0.380	-0.274	-0.190	-0.364	-0.304	-0.309	-0.272	-0.242
	θ	0.496	0.721	0.784	0.435	0.476	0.583	0.572	0.602
DK	θ^{TAX}	0.363	0.446	0.546	0.219	0.148	0.227	0.257	0.142
	θ^{SIC}	0.091	0.079	0.081	0.090	0.080	0.095	0.084	0.090
	θ^{BEN+UI}	-0.322	-0.375	-0.517	-0.316	-0.364	-0.365	-0.326	-0.317
	θ	0.776	0.899	1.144	0.625	0.592	0.686	0.666	0.549
EE	θ^{TAX}	0.177	-0.004	0.111	-0.026	0.003	0.007	0.161	0.351
	θ^{SIC}	-0.019	-0.020	-0.244	-0.047	-0.039	0.161	0.030	0.101

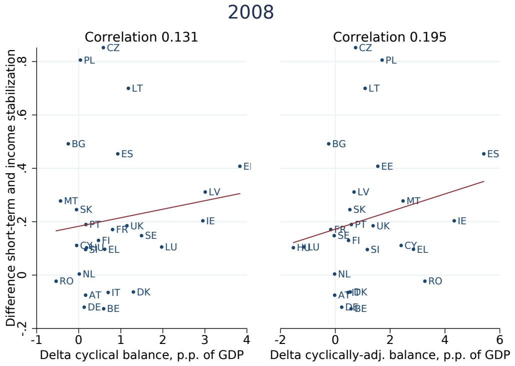
	θ^{BEN+UI}	-0.413	0.042	-0.086	-0.191	-0.143	-0.109	-0.044	-0.251
	θ	0.571	-0.066	-0.046	0.118	0.107	0.278	0.234	0.703
EL	θ^{TAX}	0.064	0.213	-0.508	-1.100	-0.076	0.235	0.302	0.330
	θ^{SIC}	0.000	0.076	0.048	-0.023	0.045	0.081	0.187	0.225
	θ^{BEN+UI}	-0.312	-0.151	0.261	-0.181	-0.021	0.350	-0.172	0.009
	θ	0.377	0.439	-0.720	-0.941	-0.010	-0.034	0.661	0.546
ES	θ^{TAX}	0.241	0.177	-0.206	-0.017	-0.185	0.071	0.187	0.407
	θ^{SIC}	0.026	0.062	0.051	0.035	0.045	0.049	0.062	0.074
	θ^{BEN+UI}	-0.578	-0.270	-0.386	-0.266	-0.345	-0.303	-0.183	-0.199
	θ	0.845	0.510	0.231	0.284	0.205	0.423	0.431	0.680
FI	θ^{TAX}	0.042	0.498	0.253	0.072	0.122	-0.111	0.119	0.239
	θ^{SIC}	0.109	0.029	-0.069	-0.025	-0.054	0.059	-0.036	0.059
	θ^{BEN+UI}	-0.502	-0.384	-0.329	-0.455	-0.565	-0.437	-0.336	-0.237
	θ	0.653	0.911	0.513	0.502	0.633	0.385	0.419	0.535
FR	θ^{TAX}	0.022	0.104	0.039	-0.022	-0.077	0.060	0.090	0.176
	θ^{SIC}	0.070	0.143	0.111	0.094	0.100	0.092	0.105	0.153
	θ^{BEN+UI}	-0.545	-0.440	-0.348	-0.414	-0.392	-0.326	-0.301	-0.250
	θ	0.637	0.687	0.499	0.486	0.415	0.479	0.495	0.579
HU	θ^{TAX}	-0.256	0.801	0.386	-1.009	-0.099	0.524	0.158	.
	θ^{SIC}	-0.316	0.749	0.089	-0.122	-0.036	0.136	0.270	.
	θ^{BEN+UI}	-1.155	0.957	-0.057	-1.092	0.321	-0.142	0.007	.
	θ	0.582	0.593	0.532	-0.040	-0.456	0.802	0.421	.
IE	θ^{TAX}	0.114	-0.013	0.312	-0.744	0.078	0.258	0.238	.
	θ^{SIC}	0.018	-0.340	0.125	0.542	0.031	-0.025	0.061	.
	θ^{BEN+UI}	-0.466	-0.131	0.101	0.004	-0.111	-0.050	-0.118	.
	θ	0.597	-0.222	0.337	-0.206	0.220	0.282	0.417	.
IT	θ^{TAX}	-0.066	0.126	0.084	-0.107	-0.029	0.161	0.316	.
	θ^{SIC}	0.029	0.101	0.086	0.061	0.003	0.081	0.099	.
	θ^{BEN+UI}	-0.291	-0.192	-0.112	-0.240	-0.261	-0.143	-0.031	.
	θ	0.254	0.419	0.282	0.194	0.235	0.384	0.446	.
LT	θ^{TAX}	0.112	1.252	0.112	0.028	0.060	0.111	0.240	.
	θ^{SIC}	-0.054	-0.914	0.033	-0.014	0.034	0.061	0.091	.
	θ^{BEN+UI}	-0.868	-0.209	0.321	-0.101	-0.260	-0.048	-0.009	.

	θ	0.926	0.546	-0.176	0.114	0.355	0.221	0.340	.
LU	θ^{TAX}	-0.096	0.521	-0.021	-0.279	0.077	-0.101	0.138	.
	θ^{SIC}	0.017	0.087	0.053	0.011	0.085	0.104	0.091	.
	θ^{BEN+UI}	-0.553	-0.176	-0.237	-0.209	-0.274	-0.208	-0.150	.
	θ	0.474	0.784	0.268	-0.059	0.436	0.212	0.379	.
LV	θ^{TAX}	-0.021	0.435	-0.668	0.380	0.108	0.348	0.322	.
	θ^{SIC}	-0.160	0.008	0.118	-0.356	0.058	0.108	0.198	.
	θ^{BEN+UI}	-0.717	-0.387	0.172	-0.051	-0.005	-0.036	-0.063	.
	θ	0.536	0.830	-0.722	0.075	0.171	0.492	0.583	.
MT	θ^{TAX}	0.147	0.114	0.021	0.012	0.019	0.135	0.152	.
	θ^{SIC}	0.039	0.056	0.049	0.023	0.015	0.038	0.065	.
	θ^{BEN+UI}	-0.315	-0.185	-0.236	-0.150	-0.265	-0.095	-0.128	.
	θ	0.501	0.355	0.305	0.185	0.299	0.268	0.345	.
NL	θ^{TAX}	-0.044	0.059	0.089	0.011	-0.067	0.014	0.120	.
	θ^{SIC}	0.055	0.239	-0.019	-0.066	0.031	-0.084	0.309	.
	θ^{BEN+UI}	-0.552	-0.510	-0.419	-0.462	-0.385	-0.429	-0.312	.
	θ	0.563	0.809	0.488	0.408	0.349	0.359	0.741	.
PL	θ^{TAX}	-0.691	1.158	-0.197	-0.163	0.156	0.193	0.006	.
	θ^{SIC}	0.530	0.654	-0.115	-0.100	0.153	0.135	0.004	.
	θ^{BEN+UI}	-1.250	1.599	-0.785	-0.563	0.195	0.028	-0.335	.
	θ	1.089	0.213	0.472	0.300	0.113	0.300	0.345	.
PT	θ^{TAX}	0.080	0.243	0.003	-0.249	0.422	-0.910	0.218	0.266
	θ^{SIC}	0.056	0.118	0.082	0.028	0.077	-0.049	0.101	0.214
	θ^{BEN+UI}	-0.408	-0.454	-0.245	-0.126	0.222	-0.494	-0.059	-0.107
	θ	0.544	0.815	0.330	-0.096	0.277	-0.465	0.377	0.587
RO	θ^{TAX}	0.158	0.291	-0.162	0.021	0.264	-0.011	0.096	.
	θ^{SIC}	0.182	0.085	-0.065	0.398	0.140	0.027	0.083	.
	θ^{BEN+UI}	-0.048	-0.048	-0.775	-0.102	0.073	-0.357	-0.305	.
	θ	0.388	0.423	0.548	0.521	0.331	0.373	0.485	.
SE	θ^{TAX}	0.348	1.137	-0.513	-0.025	0.019	0.177	0.365	.
	θ^{SIC}	0.059	0.198	-0.133	-0.013	-0.008	0.039	0.062	.
	θ^{BEN+UI}	-0.200	0.634	-1.286	-0.582	-0.539	-0.262	-0.185	.
	θ	0.606	0.701	0.641	0.544	0.550	0.479	0.612	.

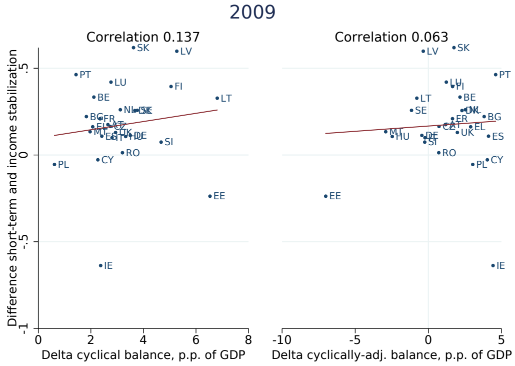
SI	θ^{TAX}	0.054	0.150	0.039	0.144	0.065	0.133	0.109	.
	θ^{SIC}	-0.008	0.166	0.105	0.126	0.106	0.132	0.112	.
	θ^{BEN+UI}	-0.432	-0.140	-0.214	-0.190	-0.853	-0.164	-0.160	.
	θ	0.478	0.456	0.358	0.460	1.023	0.429	0.381	.
SK	θ^{TAX}	-0.103	0.287	0.047	-0.258	0.003	0.089	0.104	0.070
	θ^{SIC}	-0.209	0.028	0.112	0.111	0.052	-0.334	0.145	0.273
	θ^{BEN+UI}	-0.876	-0.613	-0.228	-0.256	-0.302	-0.186	-0.091	-0.062
	θ	0.563	0.929	0.387	0.109	0.357	-0.059	0.340	0.404
UK	θ^{TAX}	0.822	0.483	-0.252	0.439	-0.393	0.421	-0.111	-0.218
	θ^{SIC}	0.208	0.140	-0.038	0.123	-0.129	0.147	-0.036	-0.101
	θ^{BEN+UI}	0.435	0.085	-0.495	0.350	-0.757	0.443	-0.430	-0.662
	θ	0.595	0.538	0.205	0.213	0.235	0.125	0.284	0.344
EU	θ^{TAX}	0.095	0.351	0.022	-0.013	-0.034	0.138	0.134	0.137
	θ^{SIC}	0.089	0.153	0.046	0.057	0.050	0.091	0.085	0.089
	θ^{BEN+UI}	-0.423	-0.059	-0.342	-0.256	-0.305	-0.144	-0.243	-0.301
	θ	0.606	0.563	0.410	0.299	0.321	0.373	0.462	0.527
EA	θ^{TAX}	0.031	0.194	0.110	-0.077	-0.021	0.088	0.184	0.233
	θ^{SIC}	0.050	0.116	0.087	0.055	0.065	0.080	0.114	0.136
	θ^{BEN+UI}	-0.453	-0.304	-0.237	-0.326	-0.315	-0.263	-0.211	-0.222
	θ	0.534	0.614	0.433	0.304	0.359	0.431	0.509	0.591

Note: A missing value in the 2015 column indicates that the tax policy is not available in EUROMOD G4.0. EU and EA averages are population weighted. *Source*: Own calculations using EUROMOD.

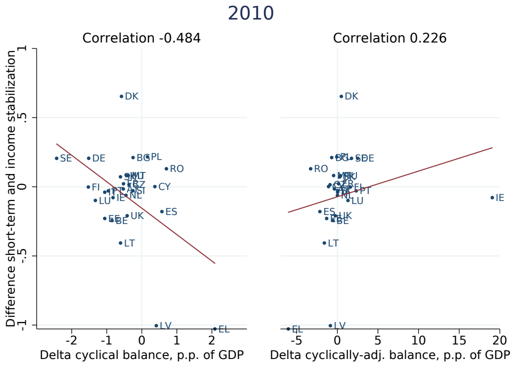
B. Micro vs. Macro Measures (Unemployment Shock)



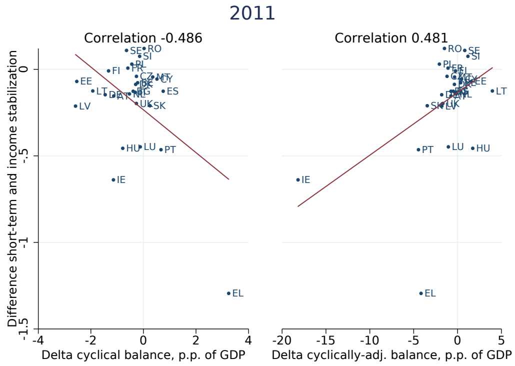
(a) 2008



(b) 2009

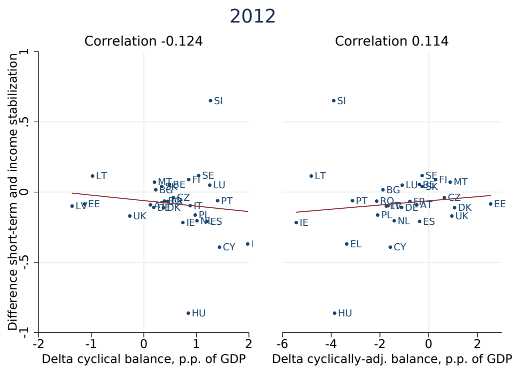


(c) 2010

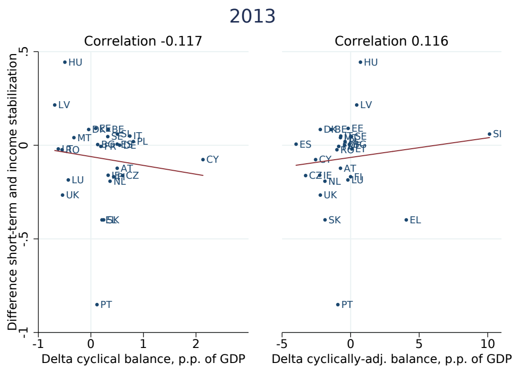


(d) 2011

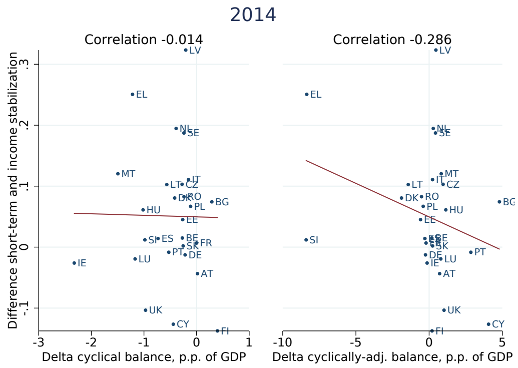
Figure 10: Micro vs. Macro Estimates of Fiscal Stabilization: Unemployment Shock



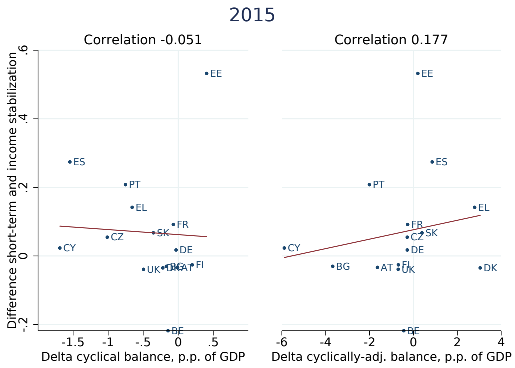
(e) 2012



(f) 2013



(g) 2014



(h) 2015

(Continued) Micro vs. Macro Estimates of Fiscal Stabilization: Unemployment Shock

Notes: The figure plots the difference between short-term and income stabilization coefficients on the y-axis and changes in cyclical and cyclically-adjusted net borrowing on the x-axis. Short-term stabilization coefficients for year t capture policy changes from $t-1$ to t. *Source:* Own calculations using EUROMOD. Data on cyclical and cyclically-adjusted net borrowing are from the AMECO database.

C. Cyclicality of fiscal effects (Additional Results)

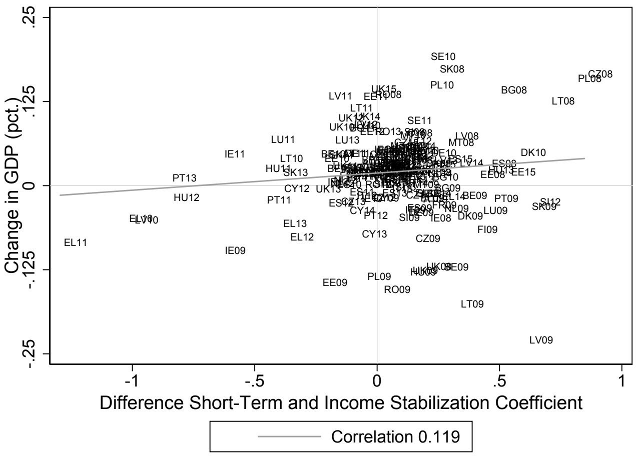
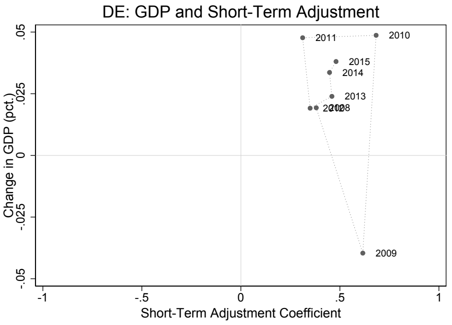
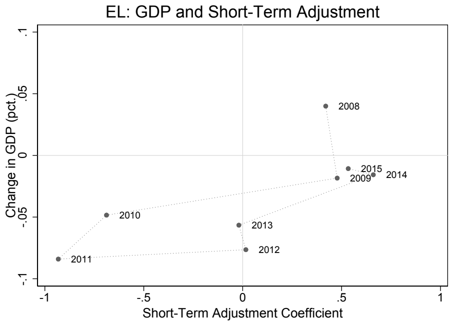


Figure 11: Delta Income and Short-term Stabilization and Change in GDP: Unemployment Shock

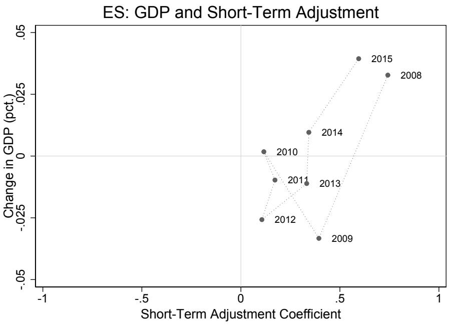
Notes: The figure plots changes in GDP on the y-axis and the difference between income and short-term stabilization coefficients on the x-axis. Short-term stabilization coefficients for year t capture policy changes from $t-1$ to t. *Source:* Own calculations using EUROMOD. Data on GDP are at 2010 reference levels from the AMECO database.



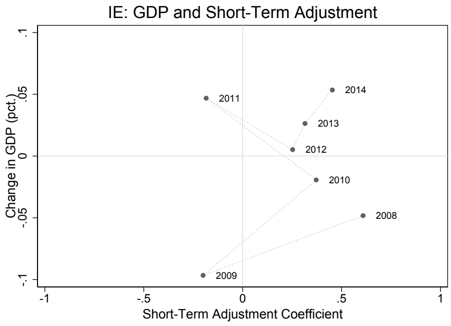
(a) DE



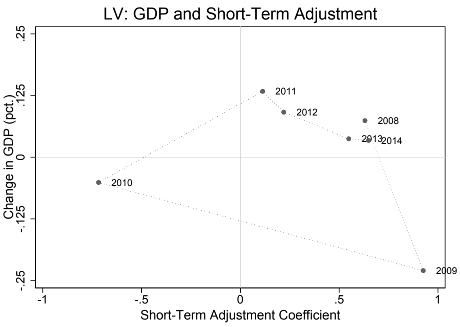
(b) EL



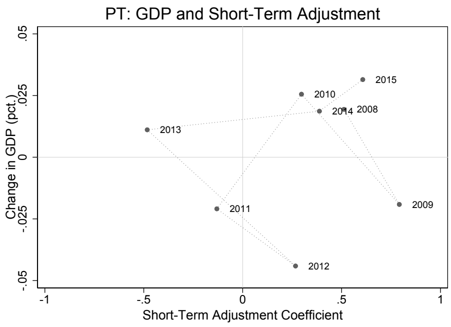
(c) ES



(d) IE



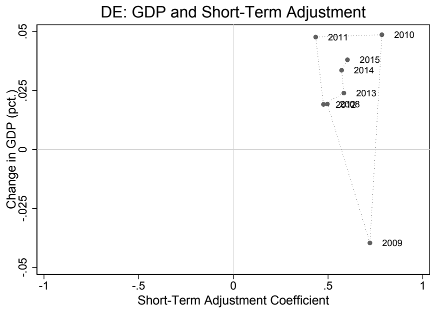
(e) LV



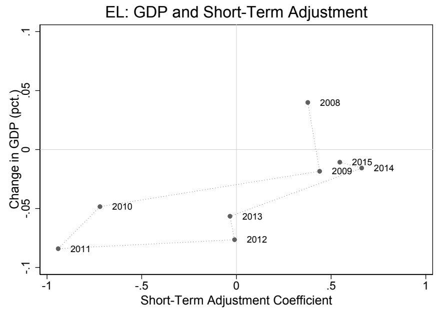
(f) PT

Figure 12: Short-term Adjustment Coefficient and Change in GDP: Income Shock

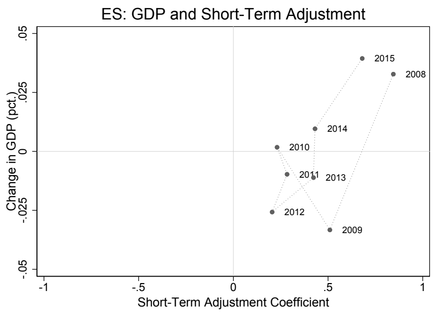
Notes: The figure plots changes in GDP on the y-axis and the short-term stabilization coefficient on the x-axis. Short-term stabilization coefficients for year t capture policy changes from $t-1$ to t. *Source:* Own calculations using EUROMOD. Data on GDP are at 2010 reference levels from the AMECO database.



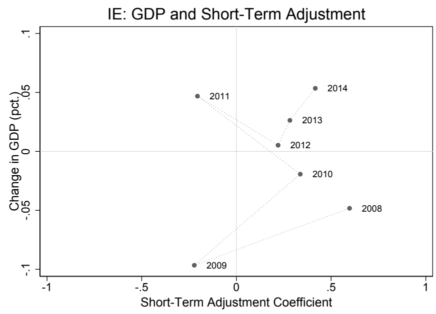
(a) DE



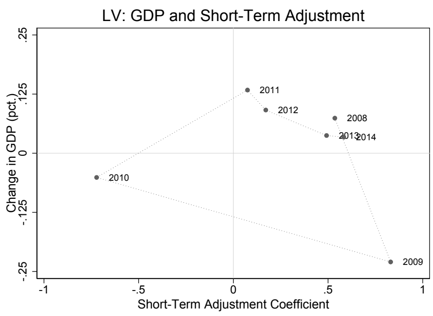
(b) EL



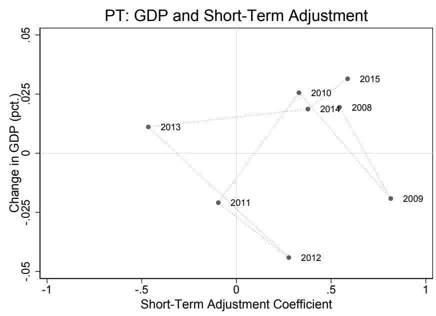
(c) ES



(d) IE



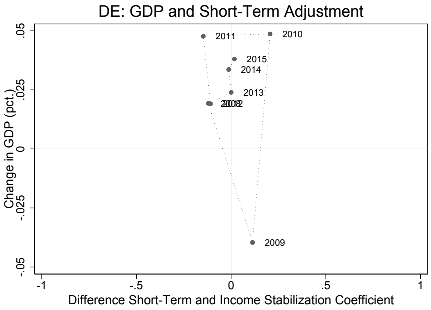
(e) LV



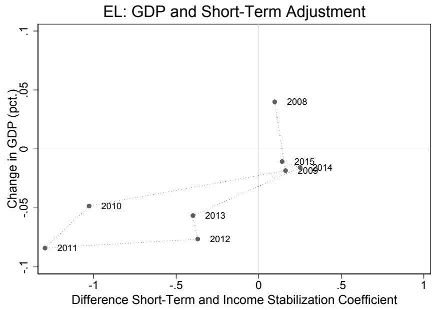
(f) PT

Figure 13: Short-term Adjustment Coefficient and Change in GDP: Unemployment Shock

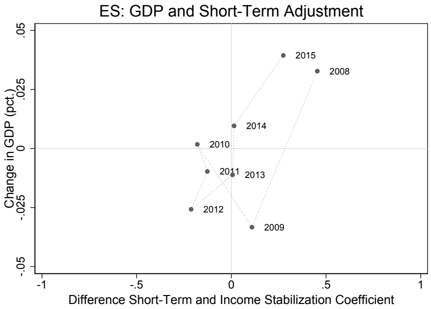
Notes: The figure plots changes in GDP on the y-axis and the short-term stabilization coefficient on the x-axis. Short-term stabilization coefficients for year t capture policy changes from $t-1$ to t. *Source:* Own calculations using EUROMOD. Data on GDP are at 2010 reference levels from the AMECO database.



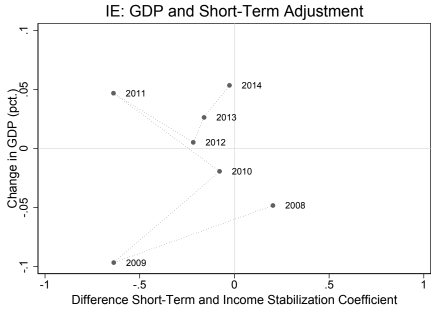
(a) DE



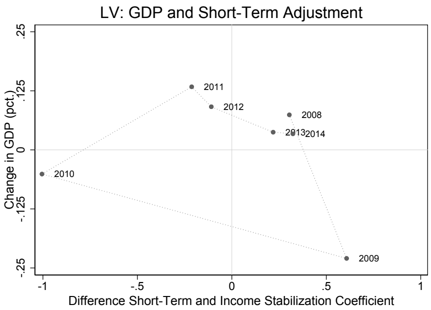
(b) EL



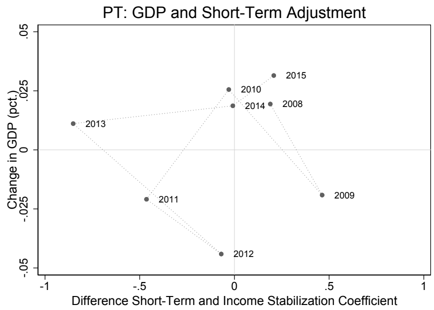
(c) ES



(d) IE



(e) LV



(f) PT

Figure 14: Short-term Adjustment Coefficient and Change in GDP: Unemployment Shock

Notes: The figure plots changes in GDP on the y-axis and the difference between income and short-term stabilization coefficients on the x-axis. Short-term stabilization coefficients for year t capture policy changes from $t-1$ to t. *Source:* Own calculations using EUROMOD. Data on GDP are at 2010 reference levels from the AMECO database.

References

Alesina, A., O. Barbiero, C. Favero, F. Giavazzi, and M. Paradisi (2015). Austerity in 2009-2013. *Economic Policy 30*(83), 383–437.

Auerbach, A. J. and D. Feenberg (2000). The significance of federal taxes as automatic stabilizers. *Journal of Economic Perspectives 14*(3), 37–56.

Auerbach, A. J. and K. A. Hassett (2002). Fiscal policy and uncertainty. *International Finance 5*(2), 229–249.

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

Bargain, O., M. Dolls, H. Immervoll, D. Neumann, A. Peichl, and N. Pestel (2015). Tax policy and income inequality in the U. S., 1979–2007: A Decomposition Approach. *Economic Inquiry 53*(2), 1061–1085.

Bayoumi, T. and P. R. Masson (1995). Fiscal flows in the united states and canada: Lessons for monetary union in europe. *European Economic Review 39*, 253–274.

Bourguignon, F. and A. Spadaro (2006, January). Microsimulation as a tool for evaluating redistribution policies. *The Journal of Economic Inequality 4*(1), 77–106.

Callan, T., K. Doorley, and M. Savage (2018). Inequality in EU Crisis Countries: How Effective Were Automatic Stabilisers? *IZA Discussion Paper No. 11439*.

Deroose, S., M. Larch, and A. Schächter (2008). Constricted, lame and pro-cyclical? Fiscal policy in the euro area revisited. European Economy - Economic Papers 353.

Devries, P., J. Guajardo, D. Leigh, and A. Pescatori (2011). A New Action-based Dataset of Fiscal Consolidation. IMF Working Paper. WP/11/128.

Di Maggio, M. and A. Kermani (2016). The Importance of Unemployment Insurance as an Automatic Stabilizer. NBER Working Paper No. 22625.

Dolls, M., C. Fuest, and A. Peichl (2012). Automatic stabilizers and economic crisis: US vs. Europe. *Journal of Public Economics 96*, 279–294.

European Central Bank (2010, April). Euro Area Fiscal Policies and the Crisis. Occasional Paper Series. No 109.

Eurostat (2012, October). 2010 comparative EU intermediate quality report.

Fatás, A. and I. Mihov (2001). Government size and automatic stabilizers: International and intranational evidence. *Journal of International Economics 55*, 3–28.

Fatás, A. and I. Mihov (2009). The Euro and Fiscal Policy. NBER Working Paper No. 14722.

Galí, J. (1994). Government size and macroeconomic stability. *European Economic Review 38*, 117–132.

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

in't Veld, J., M. Larch, and M. Vandeweyer (2013). Automatic Fiscal Stabilisers: What They Are and What They Do. *Open Economies Review 24*, 147–163.

Kniesner, T. J. and J. P. Ziliak (2002a, July). Explicit versus implicit income insurance. *Journal of Risk and Uncertainty 25*(1), 5–20.

Kniesner, T. J. and J. P. Ziliak (2002b). Tax reform and automatic stabilization. *American Economic Review 92*(3), 590–612.

Mabbett, D. and W. Schelkle (2007). Bringing macroeconomics back into the political economy of reform: the Lisbon agenda and the 'fiscal philosophy' of EMU. *Journal of Common Market Studies 45*(1), 81–103.

McKay, A. and R. Reis (2016). The role of automatic stabilizers in the U.S. business cycle. *Econometrica 84*(1), 141–194.

Mourre, G., C. Astarita, and S. Princen (2014). Adjusting the Budget Balance for the Business Cycle: The EU Methodology. *European Economy Economic Papers 536*.

Paulus, A., F. Figari, and H. Sutherland (2017). The design of fiscal consolidation measures in the European Union: distributional effects and implications for macroeconomic recovery. *Oxford Economic Papers 69*(3), 632–654.

Paulus, A., H. Sutherland, and I. Tasseva (2019). Indexing out of poverty? Fiscal drag and benefit erosion in cross-national perspective. *Review of Income and Wealth*, forthcoming.

Paulus, A. and I. V. Tasseva (2018). Europe through the crisis: Discretionary policy changes and automatic stabiliser. Working Paper EM16/18, EUROMOD.

Pechman, J. A. (1973). Responsiveness of the federal individual income tax to changes in income. *Brookings Papers on Economic Activity 2*, 385–427.

Pechman, J. A. (1987). *Federal Tax Policy.* Studies of Government finance: 2. Brookings Institution.

Sala-i-Martin, X. X. and J. D. Sachs (1992). Fiscal federalism and optimum currency areas: Evidence for europe from the united states. In M. B. Canzoneri, V. Grilli, and P. R. Masson (Eds.), *Establishing a Central Bank: Issues in Europe and Lessons from the U.S.* Cambridge University Press.

Sutherland, H. (2018). Quality Assessment of Microsimulation Models - The Case of EUROMOD. *International Journal of Microsimulation 11*(1), 198–223.

Sutherland, H. and F. Figari (2013). EUROMOD: The European Union tax-benefit simulation model. *EUROMOD Working Paper No. EM 8/13*.

Turrini, A., G. Koltay, F. Pierini, C. Goffard, and A. Kiss (2015). A decade of labour market reforms in the EU: insights from the LABREF database. *IZA Journal of Labor Policy 4*(1), 12.

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The mission of EconPol Europe is to contribute its research findings to help solve the pressing economic and fiscal policy issues facing the European Union, and thus to anchor more deeply the European idea in the member states. Its tasks consist of joint interdisciplinary research in the following areas

1) sustainable growth and 'best practice',

2) reform of EU policies and the EU budget,

3) capital markets and the regulation of the financial sector and

4) governance and macroeconomic policy in the European Monetary Union.

Its task is also to transfer its research results to the relevant target groups in government, business and research as well as to the general public.