# Crisis, Austerity and Automatic Stabilization*

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**Abstract**

We analyze how reforms of tax-benefit systems in the period 2007-2015 have affected the automatic stabilization capacity in the EU-27 based on harmonized European micro data and counterfactual simulation techniques. Factors like unemployment benefits or (progressive) income taxes can stabilize individual (and aggregate) income and smooth consumption demand in case of income or unemployment shocks. Our analysis allows to disentangle *automatic* changes in net government intervention from those that take place after explicit government legislature (*discretionary* changes) as well as changes in actual incomes and behavioral responses. We find automatic stabilizers to be generally heterogeneous across countries—both in levels and in terms of policy changes over the crisis. Stabilization coefficients vary from less than 25% in Eastern European countries to almost 60% in Belgium, Germany, and Denmark. We discuss the implications of our results for post-crisis recovery.

*JEL classification*: E63, E62, H31, H12
*Keywords*: Stabilization, Macroeconomic Stabilization, Fiscal Policy, Public Finance

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# 1 Introduction

The sovereign debt crisis in Europe led to budget consolidation measures in many EU countries. In some cases, fundamental changes in the structure of tax and transfer systems have taken place. Tax increases and spending cuts aimed at keeping government budgets at balance after GDP declined repesent an additional burden on household disposable incomes and have exacerbated the decline of household incomes. Yet, in the long term, increased taxes mean a higher fiscal stabilization effect of national tax-benefit systems–in particular the degree to which households are protected in the event of shocks to gross income. Unemployment benefits or progressive income taxes serve as Automatic Stabilizers against individual (and aggregate) income and smooth consumption demand in case of income and unemployment shocks.

By Automatic Stabilizers, we mean those elements of the tax and transfer system that mitigate fluctuations in output without discretionary government action (Dolls, Fuest and Peichl, 2012). Existing research on Automatic Stabilizers mainly relies on macro data (Girouard and André, 2005; Mourre, Isbasoiu, Paternoster and Salto, 2013; Mourre, Astarita and Princen, 2014) or structural models (McKay and Reis, 2016). In this paper, we follow the approach of Dolls et al. (2012) in using micro data for our analysis (other micro studies include Auerbach and Feenberg, 2000; Kniesner and Ziliak, 2002b,a; Mabbett and Schelkle, 2007).

Based on harmonized European micro data and counterfactual simulation techniques, we analyze how reforms of tax-benefit systems in the period 2007-2014 have affected the automatic stabilization capacity for households in the EU-27. In particular, 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. This allows us to disentangle the effect of changes in the tax and transfer systems (i.e. the "policy effect") from changes in actual incomes and demographics on the shock-absorption capacity of the tax and transfer systems and labor supply incentives. We identify the causal effect of gross income changes on changes in household disposable incomes by calculating the changes in direct taxes, social insurance contributions and benefit payments, holding everything else constant.

This is difficult or impossible in ex-post or macro data studies, as Automatic Stabilizers cannot be disentangled from discretionary fiscal or monetary policy. Further, household incomes are endogenous to taxes and transfers, as they create incentive effects that influence labor supply decisions. By holding fixed the datasets with 2007 incomes, we can isolate the effect of the policy change on the magnitude of Automatic Stabilizers, abstracting from behavioral responses and discretionary fiscal and

monetary policy.

Approaches based on Macro data use aggregate variables on government revenue and spending. However, these variables are endogenous to changes in household incomes. When households suffer declines in their gross incomes, their direct tax payments decrease (for the given tax system). When households become unemployed, they usually are entitled to receive unemployment insurance or social assistance. 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), suffer from endogenous regressors and cannot distinguish automatic stabilizer effects from discretionary policy measures. Our approach based on micro data and counterfactual simulations allows us to identify the causal effect of income shocks on government revenue and benefit expenditures. Other 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). We use the approach of (Dolls et al., 2012), who calculate automatic stabilizers for the 19 EU countries (using EUROMOD) and the United States (using TAXSIM).

As austerity measures have been implemented after the crisis to consolidate government budgets, we analyse the effect of policy reforms on government budgets if household incomes would have been stable. In doing so, we are able to single out and analyse the pure policy effect of the changes in the tax-and-transfer systems that have taken place, and abstract from the discretionary fiscal policy interventions that have taken place.

**Scenarios** We calculate the stabilizing effect of the tax-and-transfer system in two scenarios. The first is a stylized proportional shock of 5% to household gross incomes. The shock is the same in all countries and affects all households equally. The second scenario is an unemployment shock. We simulate the increase of the unemployment rate by 5 percentage points in every country. We use the measure of the *normalized tax change* (Pechman, 1973, 1987; Auerbach and Feenberg, 2000) as a measure for automatic stabilization. We focus on direct taxes on income, social insurance contributions (paid by employers and employees) as well as transfers, such as family, housing, or education benefits.

**Contribution** Our contribution to the literature is threefold. First, we analyse how tax and transfer systems of the EU27 countries have changed since the beginning of the financial crisis 2007 end the following sovereign debt crisis. Second, our paper contributes to the literature on fiscal integration in Europe (see e.g. Bargain, Dolls,

Fuest, Neumann, Peichl, Pestel and Siegloch, 2013) by providing new micro-estimates for the cushioning effects of national tax-benefit systems in the European Union. These estimates are crucial for an ex-ante evaluation of the effectiveness of different forms of supranational automatic stabilizers as discussed in the current policy debate in Europe (European Commission 2012, Van Rompuy et al. 2012). Third, we extend the analysis of Dolls et al. (2012) by using more recent data and a larger set of countries. Also, our focus is less on providing the comparison of countries, but instead on disentangling the policy effect over the crisis years from changes in the income distribution, household composition, and behavioral responses.

**Results** We find automatic stabilizers to be generally heterogeneous across countries– both in levels and in terms of policy changes over the crisis. The amount of a shock to gross income that is absorbed by the tax and transfer system varies from less than 25% in Eastern European countries to more than 50% in Belgium, Germany, and Denmark. Countries with stronger automatic stabilizers were relatively resilient during the crisis, while those with weak automatic stabilizers experienced major economic contractions and increases in unemployment. In most countries that changed their tax and benefit system, policy adjustments strengthened automatic stabilizers in the long-term perspective by fiscal consolidation measures such as tax increases which, however, can have destabilizing effects in the short term.

### 1.1 Literature

[TBC]

## 2 Data

### 2.1 Counterfactual Simulation

We consider a 5% decline in household incomes that affects all households and all countries equally.[1] We model the increase in the unemployment rate through reweighting. In particular, we increase the demographic weights of households already observed to be unemployed in the data. In other words, we implicitly assume that high productivity households are less likely to be affected by unemployment.

[1] In further analyses, as a stylized "average crisis shock" we will consider a combination of a proportional decrease in household incomes by 5% for all households and all countries, and an increase in the unemployment rate by 5 percentage points.

## 2.2 Data and Microsimulation Model

We use the European microsimulation model EUROMOD, which comes with harmonized adjusted versions of the EU-SILC database for each country. The EU-SILC is a harmonized, cross-sectional dataset for the EU member states.

## 2.3 EUROMOD

To calculate the disposable incomes from (modified) gross incomes we use the European microsimulation tool EUROMOD. Sutherland and Figari (2013) provide an overview of the recent version of EUROMOD. It contains the tax and benefit rules for the countries of the European Union.[2] We use the household data with an income reference period of 2007 for the analysis, and simulate the taxes and transfers of the policies for each year from 2007 to 2014.[3] This allows us to use counterfactual tax and benefit payments that would have prevailed if household demographics and incomes would not have changed. This lets us isolate the effect of the policy change on taxes and benefits.

Gross incomes after the shock are simply calculated by multiplying observed household incomes by 0.95. EUROMOD will then calculate the corresponding disposable income, that is, apply the appropriate tax rules to calculate the after-tax income and then simulate social insurance contributions as well as benefits and pensions the individual may be eligible for (conditional on demographic characteristics and labor market characteristics, such as the income from a previous employment or duration of former job) and add those to the after-tax income.

The data sets are based on the EU-SILC, which is a cross sectional survey of European households provided by Eurostat (2012).[4]

# 3 Methodology

In this section we describe the methodological procedure to calculate automatic stabilizers, both from a macro and from a micro perspective.

[2] We exclude Croatia from the analysis. As Croatia joint the EU relatively recently (2013), we don't have pre-crisis data available.

[3] For France and Malta, the 2006 and 2008 EU-SILC versions are used, respectively.

[4] In Austria, Belgium, Bulgaria, the Czech Republic, Greece, Spain, Italy, Lithuania, Luxembourg, Poland and Slovakia the national versions of SILC, provided by the respective national statistics institute, is used, either directly or in addition to the EU-SILC version (Sutherland and Figari, 2013). In the UK, the FRS dataset is used. The FRS will become the basis for the EU-SILC in the UK from 2013.

## 3.1 Income Stabilization

Measuring the stabilization provided by a tax system requires some form of assessment of how a household's tax payment (or benefit receipt) and thus, disposable income, varies with changes in the gross income. A possible measure is the elasticity of the taxes with respect to income changes (see Auerbach and Feenberg, 2000), 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 relatie 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 of aggregate income means that taxes can serve as a more effective automatic stabilizer. Auerbach and Feenberg (2000) use an instrument proposed by Pechman (1973), which is the ratio of changes in the disposable income to changes in market income, which they refer to as the normalized tax change.

The mechanism behind the 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 Euros. Then 30 percent of the shock would be absorbed by the proportional tax, leaving a decline of 70 Euros of disposable income. For a progressive tax system, as is in effect in the majority of the European countries, the stabilizing effect would be even larger (Dolls et al., 2012, p. 281). Let the aforementioned household be subject to progressive taxation, and after the initial shock, her marginal tax rate would drop to 25 percent. Then this provides an additional cushioning of the decline in disposable income. Automatic stabilizers of this kind have been estimated by Dolls et al. (2012) for 19 European countries and the United States.

They consider a five percent shock on market income, defined as

$$Y_i^M = Y_i^E + Y_i^Q + Y_i^I + Y_i^P + Y_i^O, \tag{3.1}$$

where $Y_i^E, Y_i^Q, Y_i^I, Y_i^P, Y_i^O$, respectively denote labor income, business income, capital income, property income, and other income. The disposable income is equal to the market income minus net government intervention, which consists of direct taxes ($T_i$) and social insurance contributions ($S_i$) minus social benefits ($B_i$). Defining the net government intervention as $G_i = T_i + S_i - B_i$, the disposable income is

$$Y_i^D = Y_i^M - G_i = Y_i^M - (T_i + S_i - B_i). \tag{3.2}$$

The Income Stabilization Coefficient is denoted by $\tau^I$ and measures how a shock on

market income $\Delta Y^M$ translates to a shock on households' disposable income $\Delta Y^D$:

$$\Delta Y^D = \left(1 - \tau^I\right) \Delta Y^M$$

The difference operator $\Delta$ denotes the difference of some aggregate Variable, say $X$, between its value in a baseline state $X^0$, and its value after a simulated shock, $X^1$. In other words, for some variable $X$, we define $\Delta X = X^1 - X^0$.

This calculation can be done at the individual (that is, household) level, that is, aggregating incomes over all households and then calculating the income changes as aggregates. This has the advantage of allowing to disentangle a tax system's built-in stabilization from discretionary policy or behavioral effects, while general equilibrium effects will be neglected (Dolls et al., 2012, p. 282).

The stabilization coefficient can be written as

$$\begin{aligned} \sum_i \Delta Y_i^D &= (1 - \tau^I) \sum_i \Delta Y_i^M \\ \Leftrightarrow \tau^I &= 1 - \frac{\sum_i \Delta Y_i^D}{\sum_i \Delta Y_i^M}. \end{aligned}$$

$\tau^I$ can be interpreted as the fraction of a shock that is absorbed by the tax benefit system.

Using (3.2), it is possible to decompose the income stabilizer into the stabilizing effect provided by taxes, social insurance contributions and benefits. By definition, these three individual stabilizers add up to the overall income stabilizer

$$\tau^I = \tau_T^I + \tau_S^I + \tau_B^I = \frac{\sum_i \Delta T_i}{\sum_i \Delta Y_i^M} + \frac{\sum_i \Delta S_i}{\sum_i \Delta Y_i^M} - \frac{\sum_i \Delta B_i}{\sum_i \Delta Y_i^M}. \tag{3.3}$$

So far, the Social Insurance Contributions (SIC) included those paid by the employees as well as SIC paid by the self-employed. Social insurance contributions paid by the employers are left out. This is ultimately an assumption on the incidence of the social insurance contributions. Throughout this paper, we make the assumption that the employers have to bear their share of the social insurance contribution and can not shift it to employees, so that it will not affect the employees' wages. This assumption is somewhat strong as employers may well try to shift their share of the SIC to employees. Dolls et al. (2012, p. 286) compare income stabilization coefficients including social insurance contributions by employers and find that only in some countries the inclusion of the employers SIC substantially increases stabilizers. Results are not directly comparable as the shock is now simulated on the *gross* income, which they define as market income plus employers' social insurance contributions.

## 3.2 Short Term Effects of Policy Adjustments

The income stabilization coefficient, or "built-in flexibility" measure, is constructed in a way that it measures the long-term, or steady state, stabilization capacity of a tax and transfer system. It does not take into account the additional effect on household disposable incomes that occurs when changes of the tax and transfer system come into effect, nor should it do so. Instead, it is a measure of a certain *property* of the tax and transfer system. In times of severe disruptions in household incomes, to focus exclusively on the measure of a long-term property would be incomplete: The introduction of, for example, tax increases can be de-stabilizing in the short run, adding to an already dramatic decline in household incomes, although it certainly increases our measure of an automatic stabilization coefficient. Hence we complement the income stabilization measure by a new measure that takes into account the additional burden to be borne by households on introduction of the new policy. The measure is constructed as follows. We now calculate the difference in disposable incomes for household $i$ when subject to tax policy in period $t$ and when subject to tax policy in period $t+1$:

$$\begin{aligned}\theta^I_{t+1} &= \frac{(T^1_{t+1} - T^0_t) + (S^1_{t+1} - S^0_t) - (B^1_{t+1} - B^0_t)}{\Delta Y^M_t} \\ &= \frac{\left(T^1_{t+1} + S^1_{t+1} - B^1_{t+1}\right) - \left(T^0_t + S^0_t - B^0_t\right)}{\left(Y^{M1}_t - Y^{M0}_t\right)} \\ &= \frac{\left(Y^{M1}_{t+1} - Y^{D1}_{t+1}\right) - \left(Y^{M0}_t - Y^{D0}_t\right)}{\left(Y^{M1}_t - Y^{M0}_t\right)} \\ &= \frac{\left(Y^{M1}_{t+1} - Y^{M0}_t\right) - \left(Y^{D1}_{t+1} - Y^{D0}_t\right)}{\left(Y^{M1}_t - Y^{M0}_t\right)}\end{aligned} \tag{3.4}$$

From equation (3.4), we derive a decomposition of the destabilization measure $\tau^I_t$:[5]

$$\theta^I_{t+1} = \frac{(T^1_{t+1} - T^0_t) + (S^1_{t+1} - S^0_t) - (B^1_{t+1} - B^0_t)}{\Delta Y^M_t} = \theta^T_{t+1} + \theta^S_{t+1} - \theta^B_{t+1} \tag{3.5}$$

For instance, in the measure $\theta^T_{t+1} = \left(T^1_{t+1} - T^0_t\right)/\Delta Y^M_t$, the numerator is the difference of the actual tax payment with the policy in period $t$ and the hypothetical payment after an aggregate simulated shock under the (hypothetical) tax policy $t+1$.

[5]This decomposition is analogous to the one for the built-in flexibility measure in equation (3.3).

### 3.2.1 Assessing the Degree to Which Governments Let Automatic Stabilizers Work

We use the measure of de-stabilization introduced above to distinguish three cases that allow us to shed light on how governments actually let automatic stabilizers work. From the sign and magnitude of the measure above, we can assess if the government of a country in a certain year let stabilizers work, or adjusted the tax and transfer system, thereby potentially shutting off the automatic stabilization channel.

**Government is budget constrained.** If the government of a country is budget constrained, we expect it to keep the net government intervention (tax revenue and social insurance contributions minus benefit payments) constant after the income decline. We suppose that budget constrained governments wish to keep tax revenue constant after the decline of aggregate income, and adjust the tax system accordingly. That is, governments change the tax and transfer system in a way that ensures revenue stability: $T^1_{t+1} = T^0_t$. Using this in the respective component of equation (3.5), this implies that $\theta^T_{t+1} = 0$. In other words, a value of zero implies that the government was budget constrained in that period and did not let automatic stabilizers work.

**Government lets automatic stabilizers work (not budget constrained).** If the government is not budget constrained, it can keep the level of *after-shock* tax revenue constant. To achieve this, the government sets $T^1_{t+1} = T^1_t$. In words, the government changes the tax system in such a way that the after-shock tax revenue from the previous period is still maintained after the reform. We interpret this as the case when the government lets automatic stabilizers work to full effect. In this case, the destabilization measure equals the stabilization coefficient: $\theta^T_{t+1} = \tau^T_t$.

**Budget consolidation / debt repayment.** If the government needs to increase tax revenue after the decline of aggregate income, for instance because it has to raise additional revenue to repay its debt, it will have to adjust the tax system such that the revenue after the aggregate income shock is larger than it was in the baseline policy year before the aggregate decline occured: $T^1_{t+1} > T^0_t$. It can be seen that in this case $\theta^T_{t+1} < 0$.

## 3.3 Macro Budget-Measures

We compare our measure of automatic stabilizers with those calculate using the EU Methodology, based on Macro variables.

[TBC]

In principle, discretionary and structural fiscal policy measures are not trivially observable. A common approach to single out *discretionary* and *structural*, or long-term, components of fiscal policy is to decompose government budgets into a cyclical and a cyclically-adjusted (structural) component (see Girouard and André (2005), and updates by Mourre et al. (2013) and Mourre et al. (2014)). Using this approach, the cyclically adjusted budget $CAB$ is the residual of the net borrowing as a fraction of GDP ($D/Y$) and the cyclical component of the budget ($CC$):

$$CAB = \frac{D}{Y} - CC$$

As $D/Y$ can be observed from government budget, finding a representation of the cyclical component allows the calculation of the structural balance as the residual. The EU method proposes that the cyclical component is the product of the economy's deviation from potential GDP (output gap) and a measure of how the budget changes with respect to changes in GDP: $CC = \varepsilon \cdot OG$, where $OG = (Y - \overline{Y})/\overline{Y}$ denotes the output gap, and $\varepsilon$ denotes the semi-elasticity of the budget, measuring the change in the budget in percentage-points with respect to a percentage change in GDP. To finally derive a measure of the automatic stabilization effect on economic activity, some indicator of how GDP responds to government intervention is necessary: we call this the fiscal multiplier, $FM$. The stabilizing effect on economic activity ($AS$) can then be written as the product of the cyclical component of government budget and the fiscal multiplier:

$$AS = OG \cdot \varepsilon \cdot FM \tag{3.6}$$

It becomes apparent that the two key parameters in the calculations above are the budgetary semi-elasticity $\varepsilon$, and the output gap $OG$ (see Mourre et al., 2014, p. 9), so it is worth looking more into it. The semi-elasticity is defined as follows:

$$\varepsilon = \frac{d\left(\frac{D}{Y}\right)}{\frac{dY}{Y}}$$

Further, it can be shown (see Mourre et al., 2014, p. 10) that

$$CAB = \frac{D}{Y} - \varepsilon \cdot OG = \frac{\overline{D}}{\overline{Y}},$$

that is, the cyclically-adjusted budget is defined as the budget balance when output is at its potential. The semi-elasticity, in contrast, is the percentage point change of actual net borrowing as a fraction of GDP with respect to a percentage change in GDP. It can be further broken down into a revenue and an expenditure component:

$$\varepsilon = \frac{d\left(\frac{D}{Y}\right)}{\frac{dY}{Y}} = \frac{d\left(\frac{R}{Y}\right)}{\frac{dY}{Y}} - \frac{d\left(\frac{G}{Y}\right)}{\frac{dY}{Y}}$$

In other words, the budgetary semi-elasticity is the difference of the semi-elasticity of revenue and the semi-elasticity of expenditure. To fix ideas, consider the case of a recession. The economy is below potential GDP, and the growth rate of GDP ($dY/Y$) is negative.[6] We expect the semi-elasticity of the revenue-to-GDP ratio to be close to zero, as taxes usually follow the cyclical pattern of GDP. Total revenue as a fraction of GDP will hence remain roughly constant (Mourre et al., 2014). The semi-elasticity of expenditure, meanwhile, is negative. Only unemployment-related spending is cyclical, but it represents only a small amount out of total spending. Hence, spending does not change much over the business cycle[7], while GDP does, so the *ratio* of expenditures to GDP changes over the business cycle. In particular, this ratio increases in bad times and decreases in good times. The change of the ratio with respect to GDP growth rate is hence negative. In a recession, with negative GDP growth and GDP below potential, we would expect the expenditure elasticity to take on a positive sign. Assuming a zero revenue semi-elasticity, the overall budget elasticity has a negative sign. It can then be seen from equation (3.6) that, given a negative output gap and some (positive) fiscal multiplier, a stabilizing effect on economic activity occurs.

## 3.4 Impact of Fiscal Adjustment on Economic Performance

We use a fixed effects regression of the dataset of the countries under consideration (EU27) for the years of our analysis (years 2007 to 2013), regressing the growth rate of GDP and the unemployment rate on measures of change in government intervention to find effects of changes in government spending on measures of economic performance. As explanatory variables we use *simulated* measures of government tax and expenditure shocks. These measures are simulated to avoid endogeneity problems that are common to the literature that uses measures of cyclically adjusted budget (CAB) We construct measures of "government shock" analogous to Zidar (2015). As measures of government tax shock we use the change in tax revenue as a fraction of GDP. Our use of micro data allows to aggregate these variables by income groups. Specificially, we use both the change of tax revenue collected from the bottom 90 percent as well as the top 10 percent of the income distribution as a fraction of overall GDP as explanatory variables.

The recent economic downturn began to affect Europe by the end of 2008 (Sutherland and Figari, 2013). As most data is of incomes in 2007 and the majority of the tax policies was already in effect in 2008, the data and simulations can be expected to be clear of

[6]Note that growth rate and (deviation from) potential GDP are distinct concepts.
[7]This may be different in severe recessions with austerity measures.

endogeneity caused by policy responses that have occurred since the start of the crisis (Dolls et al., 2012).

In the context of the tax and benefits simulation it is important to keep in mind that it is possible that the legal tax rules and regulations are not fully respected, or that households, in spite of being entitled to certain benefits, refrain from actually making use of them, for example due to a social stigma or some other form of costs for the households. Due to a lack of available data, EUROMOD does not explicitly model tax evasion or the non-take-up of benefits. This means that, in general, both a full benefits take-up as well as full tax compliance is assumed for most countries. The problem that can arise is that the amounts of taxes payments and received benefits is overestimated in the simulation, with the magnitude of the effect varying across countries (Sutherland and Figari, 2013; Jara and Tumino, 2013).

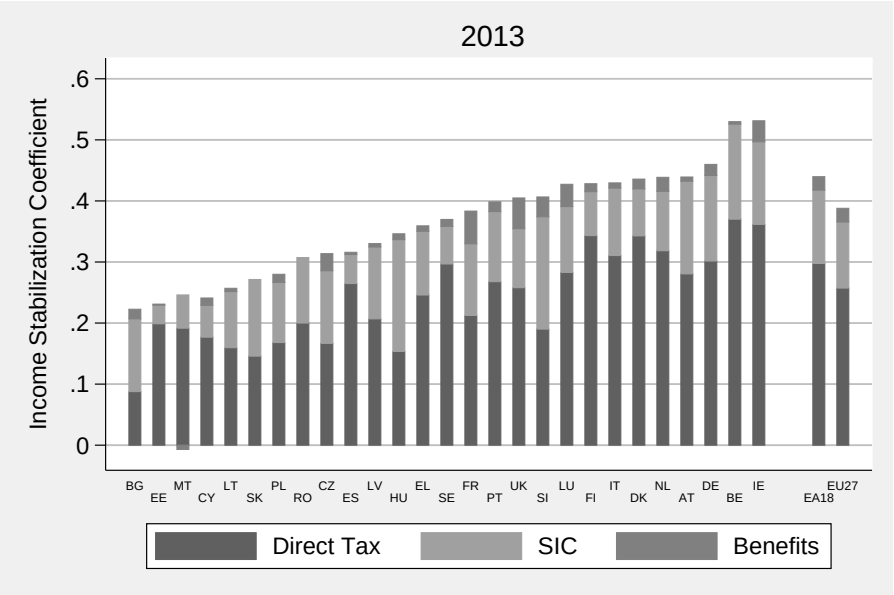
When calculating income and labor supply stabilizers, this could, in turn, lead to an overestimation of those stabilizers. The full take-up and tax-compliance assumptions is regularly interpreted as describing the *intended* effects of the tax and benefit system.Although not explicitly modeled, EUROMOD allows for a simple correction at household level of benefits non-take up and tax evasion. These corrections can be switched on and off or adjusted to suit the users needs (Sutherland and Figari, 2013, p. 12).

Like other survey data, there are certain drawbacks to keep in mind when using EUROMOD. For example, financial incomes are not well covered in the data, affecting the simulation of capital taxes. Also, as SILC data are aggregated in annual terms, the necessary monthly-based means-tests of incomes and assets for certain benefits cannot be carried out as detailed as they should. Furthermore, the harmonization that is done (and that provides one of the great advantages of comparability over the countries) is problematic as the tax and transfer systems are very heterogeneous across countries. As benefits are aggregated according to their function (such as old age, unemployment etc.), individual payments have to be recovered using some kind of imputation procedure, which will reduce the precision of the estimates (Sutherland and Figari, 2013; Figari, Levy and Sutherland, 2007).

Several adjustments are made to bring the EU-SILC data sets in a format that is expected by EUROMOD. For instance, the EU-SILC variables are all in annual terms. To comply with EUROMOD, they are converted into monthly values. Also, many incomes and financial variables are first reported on household level in SILC and are then disaggregated to an individual level.

# 4 Results

Figure 1: Income Stabilization Coefficient 2013



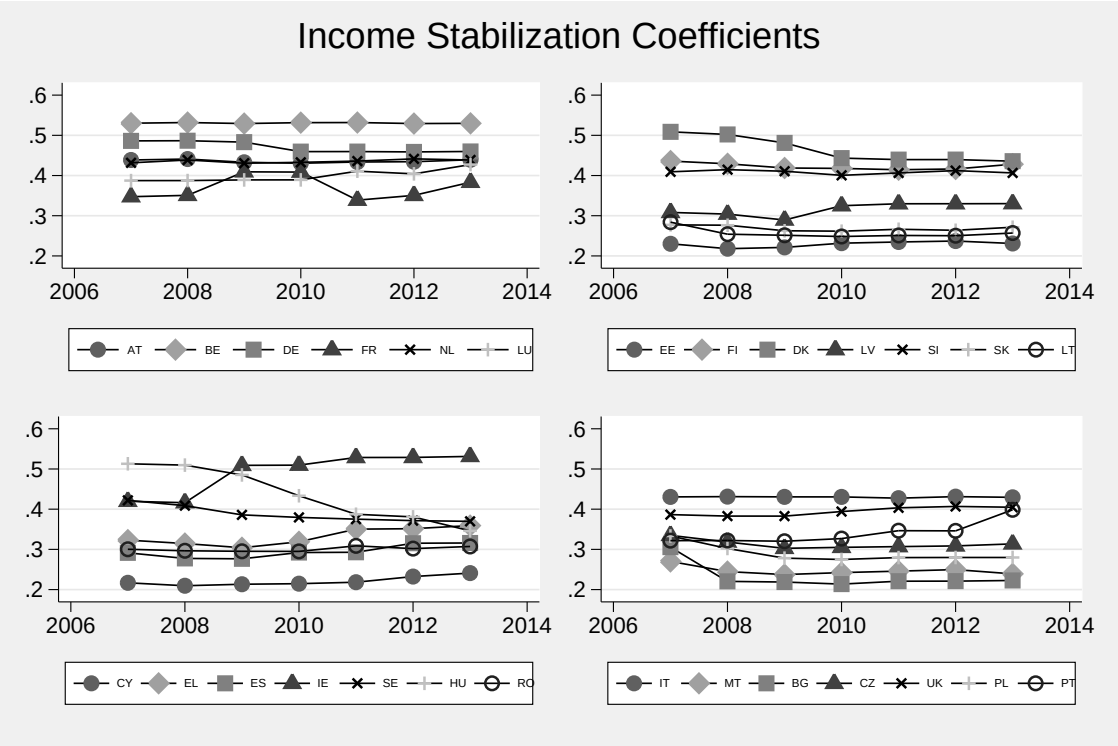

*Source:* Own calculations using EUROMOD. Calculated as the aggregate change in disposable income as a fraction of market income.

Figure 1 shows the results of the automatic stabilization coefficient using the 2013 tax policy. The graph shows the calculations of equation (3.3), decomposed by component of the tax and transfer system. Stabilizers are heterogenous across countries, ranging from a little over 0.2 in Eastern and Southern European countries (Bulgaria, Baltics, Malta, Cyprus) at the lower end to values around 0.5 in Western European and Nordic countries (Belgium, Germany, Denmark, Austria). Ireland is an exception, with the second highest coefficient over 0.5. Ireland has financed its budget consolidation after the crisis through tax increases, hence the increase in automatic stabilizers.

## 4.1 Automatic Stabilizers over Time

Figure 2 summarizes central results. Changes in income stabilization coefficients over the years are different across countries. Countries that have experienced major changes include Latvia (increase after 2009), France (decrease after 2010), Ireland (increase after 2008), Greece (increase after 2010), while other countries remain relatively constant. The evolution of stabilizers for the EU-27 and the Euro Area (EA-18) shows, that averages remain relatively stable over time. In 2010, a slight in Automatic Stabilizers

Figure 2: Income Stabilization Coefficients




*Source:* Own calculations using EUROMOD. Calculated as the aggregate change in disposable income as a fraction of market income.

can be seen. What is striking is that stabilizers are much higher in the EA-18 (average) than in the EU-27 countries (on average).

Figure 3 shows the change of the income stabilzation coefficient in 2007 to 2013. The largest changes have occured in Hungary (-0.16), which has since 2007 adopted a flat tax, and Ireland, which has increased taxes as a budget consolidation measure. Many of the countries hat have been hit hard during the crisis, such as Estonia, Cyprus, Portual, Grees, Spain, and to a lesser extent Italy, UK and France, have increased automatic stabilizers since 2007. Countries with relatively high stabilizers, such as Denmark, Germany and Sweden, have decreased stabilizers. Others, such as Belgium, Austria, Netherlands and Finland have changed stabilizers not at all or only moderately.

Graph 4 shows the first differences of $\tau$ from year to year. If the country is plotted to the right (left) hand side of the vertical bar, it has increased (decreased) stabilizers from the previous year to the given year. It shows that shortly after the crisis (2007/2008, upper left panel), only few countries saw an increase in the stabilization coefficient. Instead, countries hit by the crisis (Spain, Baltics), saw a decrease in $\tau$, due to tax reliefs in an attempt of stimulating the economy. Widespread consolidation policies seem

Figure 3: Change in $\tau$: 2013 vs. 2007

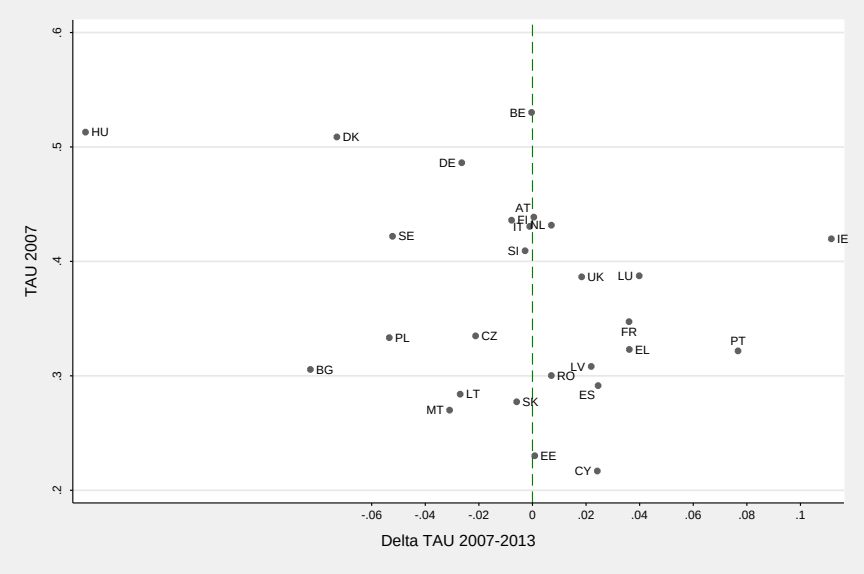
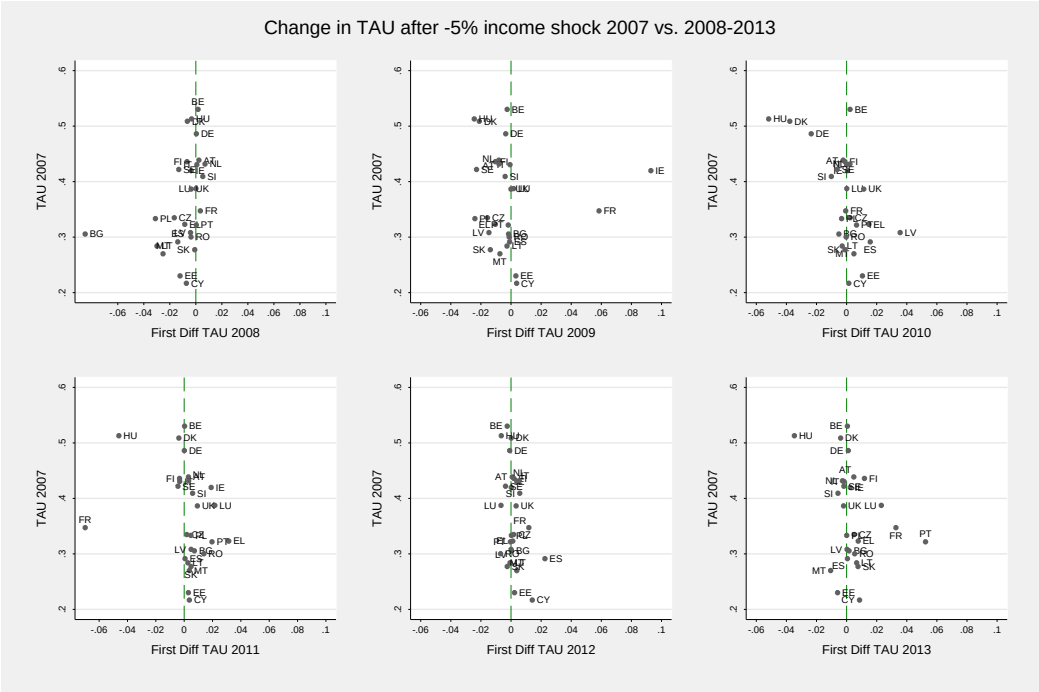



Figure 4: AS Changes: Year-to-year 2007-2013: $\tau$

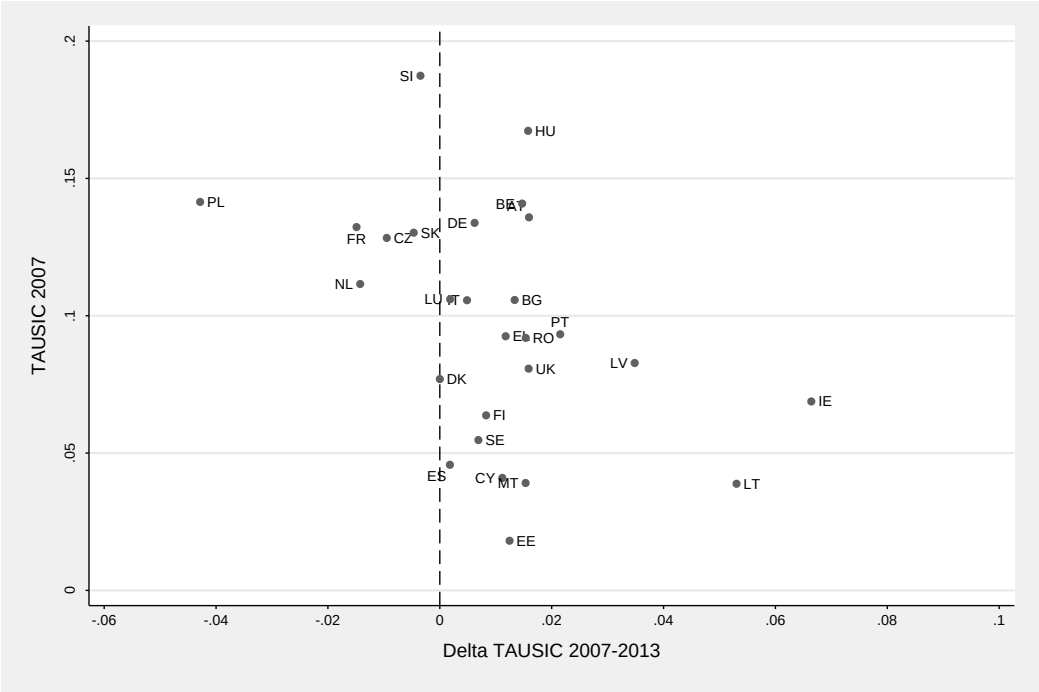



to push countries towards higher automatic stabilizers from 2010/2011 (bottom left panel).

Figure 5 plots the changes in the stabilization coefficient attributed to social insurance contributions, $\tau_{\text{SIC}}$.

There is a negative correlation between size of the SIC-based stabilizer and *change*

Figure 5: AS Changes 2007-2013: $\tau_{SIC}$




in the SIC-based stabilizer from 2007 to 2013, that is, countries with a lower stabilzer have increased, while those with a higher stabilizer have decreased or left constant the stabilizers.

## 4.2 De-Stabilizer

It can be seen from figure 9 that the destabilization measure lies on or close to the dashed line or to the right of it. This indicates that initially, most countries (except Romania, Netherlands and Poland) did let automatic stabilizers through direct taxes work.

## 4.3 Government Shocks

We calculate Tax shocks as in Zidar (2015):

$$\frac{Y_{c,t} - Y_{c,t-1}}{Y_{c,t}} \tag{4.1}$$

## 4.4 Macro-Measures: Automatic Stabilization and Austerity

### 4.4.1 Output Gaps

The macro-based AS coefficient differs from the micro estimates, in that the micro estimates represent "upper bounds" on the macro coefficient. The difference arises because the stabilizing effect of (direct) taxes measured in the micro context is larger than in the macro estimation. In the latter case, the revenue elasticity is close to zero (which measures the change in the tax receipts when GDP changes), while tax payments react a lot on household level.

Also, the macro elasticity measures includes other margins, such as labor supply adjustments, that we abstract from in our analysis.

### 4.4.2 Budget Deficits

## 4.5 Robustness Checks

- So far, results are for income shock. From previous studies, the results vary only slightly when an unemployment shock is considered (modeled through reweighting). Particularly, the role of unemployment insurance (UI) is more important, which we want to explore further.
- Modelling of UI is not included for all countries in EUROMOD. We thus implement an own simulation of UI benefits (for those countries that do not have UI simulation for now, and for those who already have the simulation as a cross-check).

# 5 Conclusion

In this paper we analyze the changes in the tax and transfer system of the EU27 over the course of the crisis and its aftermath. Based on harmonized European micro data and counterfactual simulation techniques, we analyze how reforms of tax-benefit systems in the period 2007-2014 have affected the automatic stabilization capacity for households in the EU-27. We isolate this effect from discretionary fiscal policy measures as well as behavioral responses of households by holding constant pre-crisis household income data and demographic characteristics and combining it with the tax and benefit systems from 2007-2014.

We assess the extent to which member states had room for fiscal policy by analyzing government deficits and their cyclical and cyclically-adjusted components with a focus

on the role that automatic fiscal stabilizers played. We complement these results with an analysis of macroeconomic data on government debt and the sensitivity of government budgets with respect to output fluctuations, and provide (counterfactual) growth rates that would have emerged in the absence of automatic stabilizers over the crisis. We find automatic stabilizers to be generally heterogeneous across countries—both in levels and in terms of policy changes over the crisis. Stabilization coefficients vary from less than 25% in Eastern European countries to more than 50% in Belgium, Germany, and Denmark. Countries with stronger automatic stabilizers were relatively resilient during the crisis, while those with weak automatic stabilizers experienced major economic contractions and increases in unemployment. In most countries that changed their tax and benefit system, policy adjustments strengthened automatic stabilizers in the long-term perspective by fiscal consolidation measures such as tax increases which, however, can have destabilizing effects in the short term.

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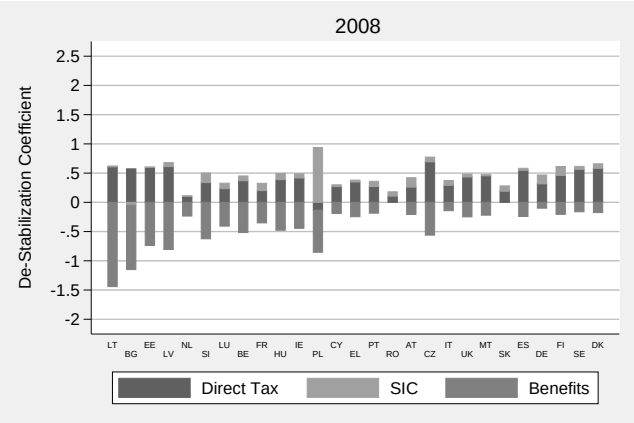
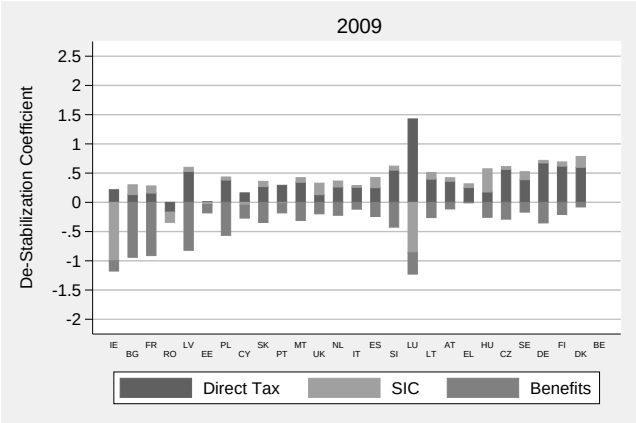
Figure 6: De-Stabilizer by Tax-Transfer Component

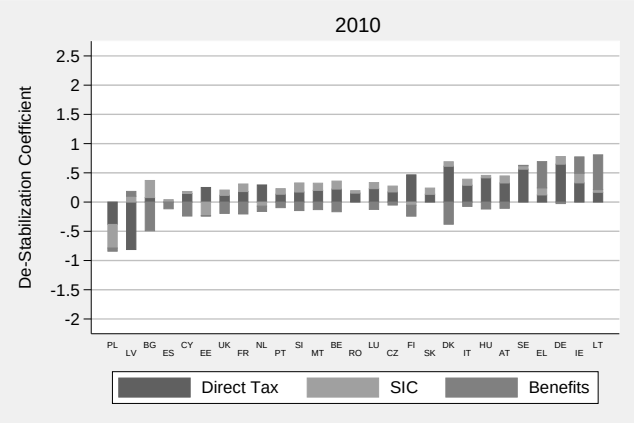
(a) 2008



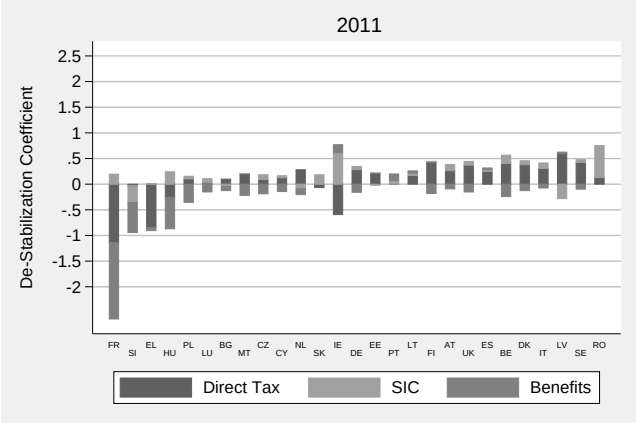

(b) 2009



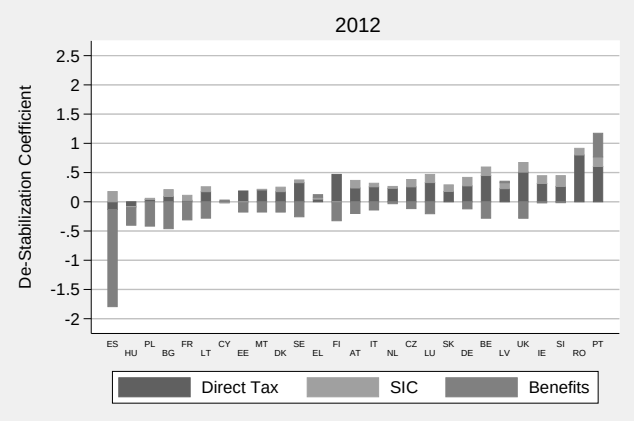

(c) 2010



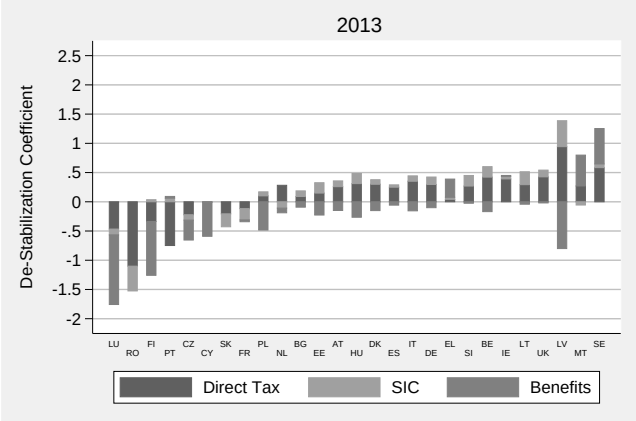

(d) 2011




(e) 2012



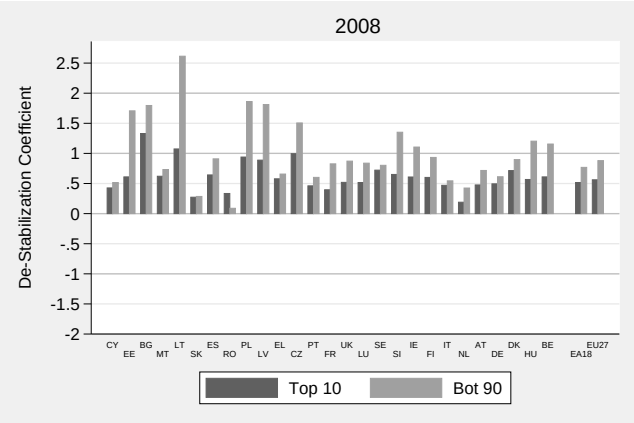

(f) 2013



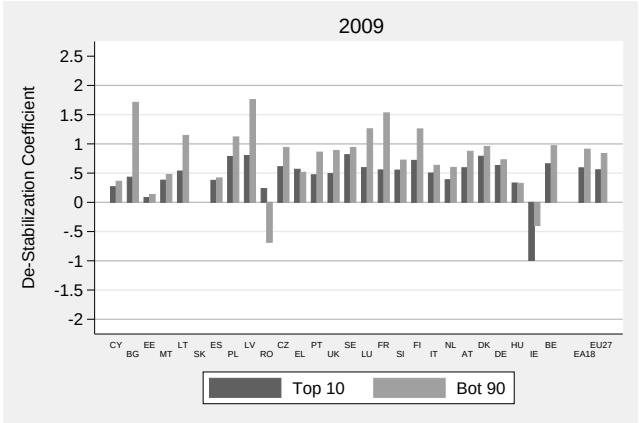

*Notes:* This figure shows the de-stabilization coefficient by component of the tax and transfer system (direct taxes, social insurance contributions and unemployment benefits).

Figure 7: De-Stabilizer by Income Group

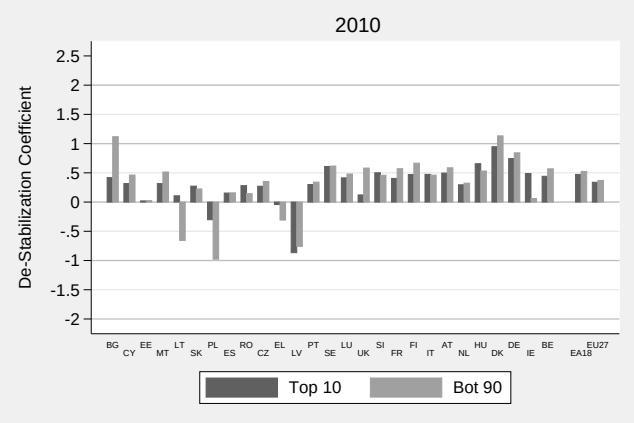
(a) 2008



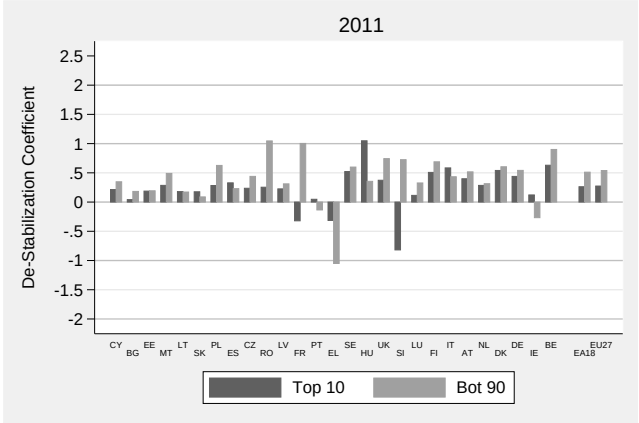

(b) 2009




(c) 2010




(d) 2011

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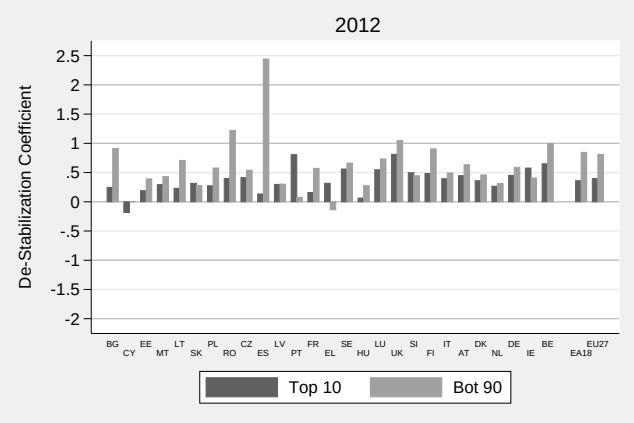
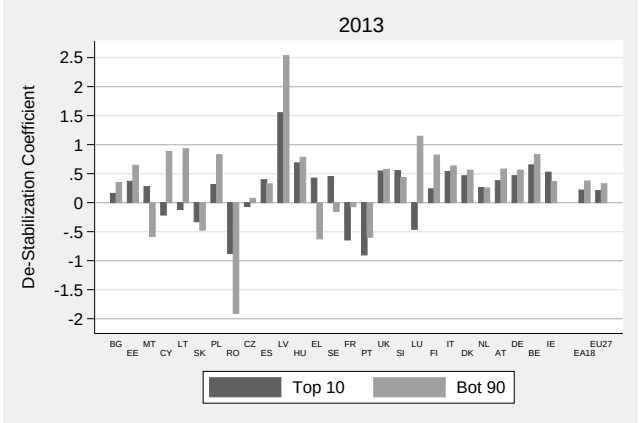


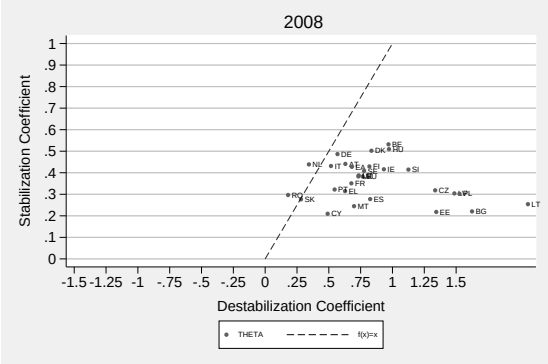

(f) 2013



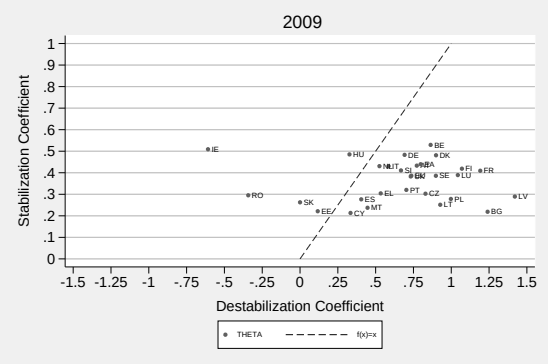

*Notes:* This figure shows the de-stabilization coefficient by income group (top 10 percent and bottom 90 percent).

Figure 8: Stabilization vs. De-Stabilization

(a) 2008




(b) 2009

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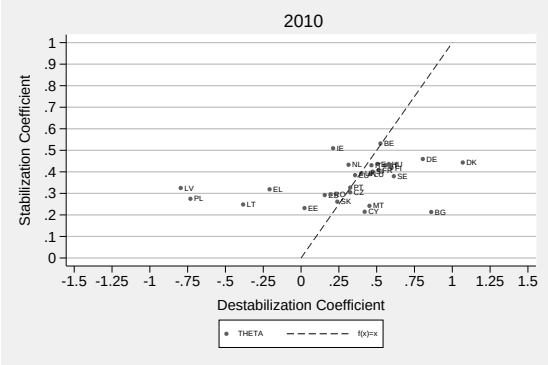


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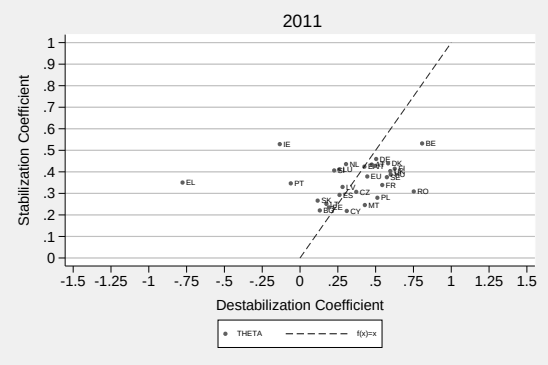


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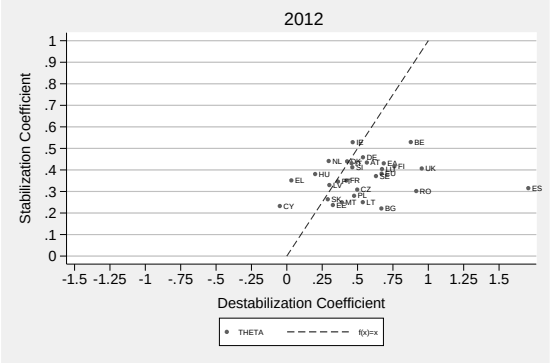
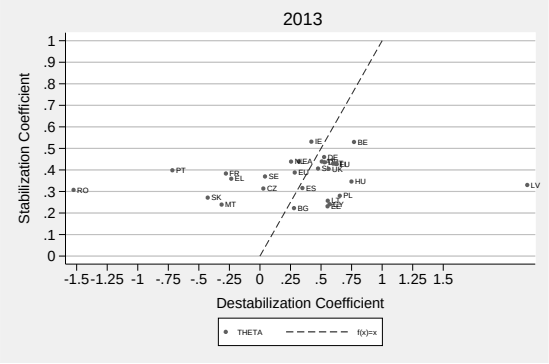


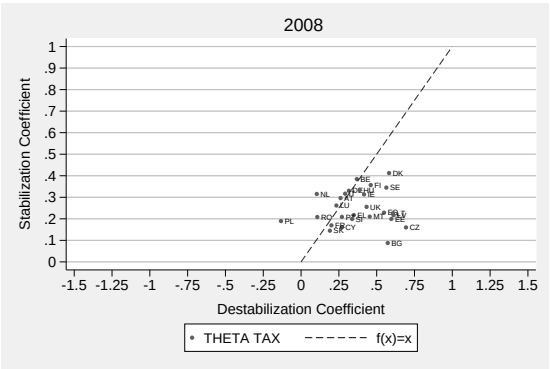

(f) 2013




*Notes:* Plots the destabilizer measure (on x-axis) against the Income Stabilization Coefficient (y-axis). We distinguish three cases: *(i)* a value of zero of the destabilization coefficient implies that the government was budget constrained in that period and did not let automatic stabilizers work. *(ii)* If the government is not budget constrained, it can keep the level of *after-shock* tax revenue constant. In this case, the destabilization measure equals the stabilization coefficient, that is, the point is close to or on the dashed line. *(iii)* If the government needs to increase tax revenue after the decline of aggregate income, for instance because it has to raise additional revenue to repay its debt, the de-stabilization measure will be negative.

Figure 9: Stabilization vs. De-Stabilization: Direct Taxes

(a) 2008

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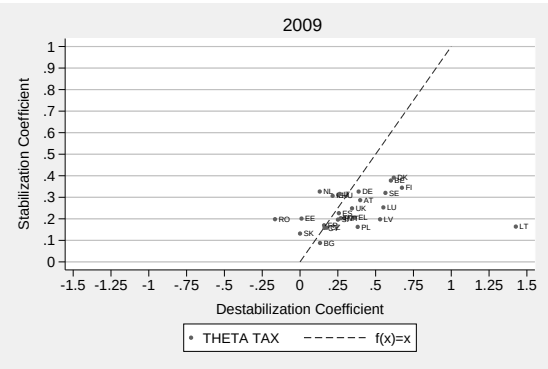


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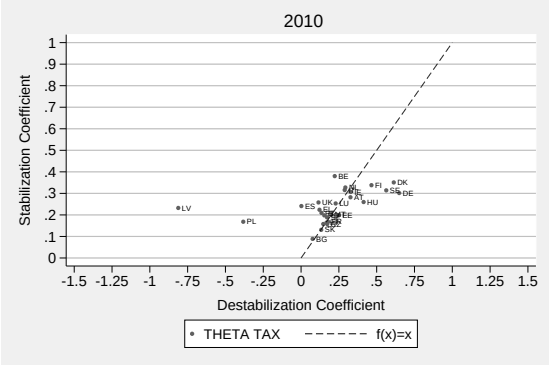


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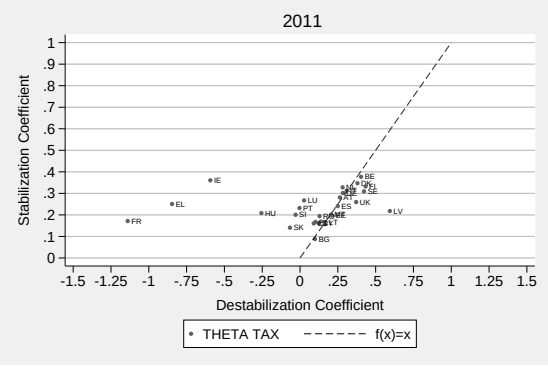


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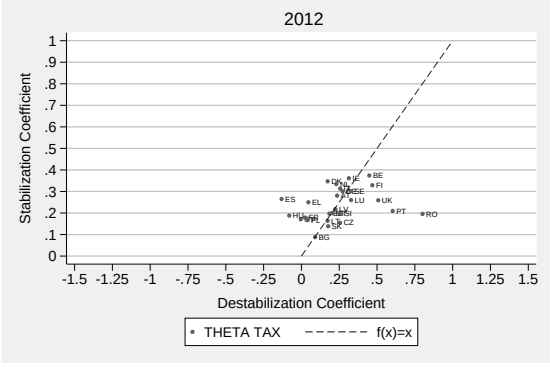


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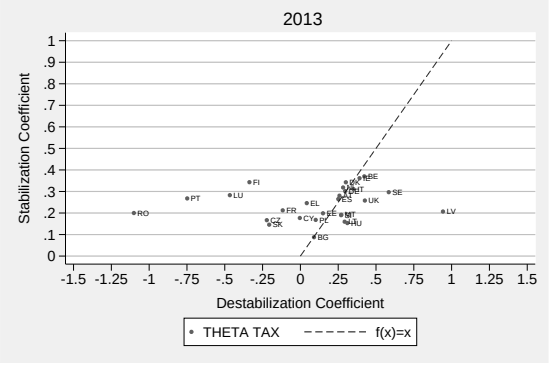
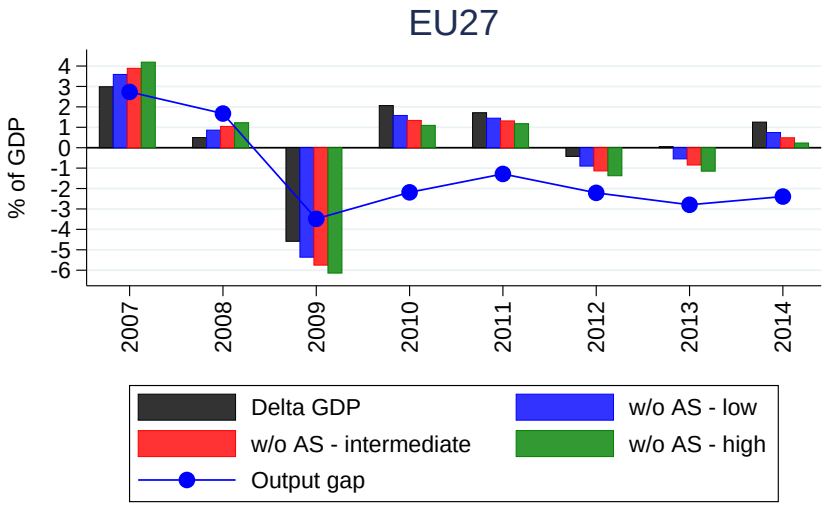


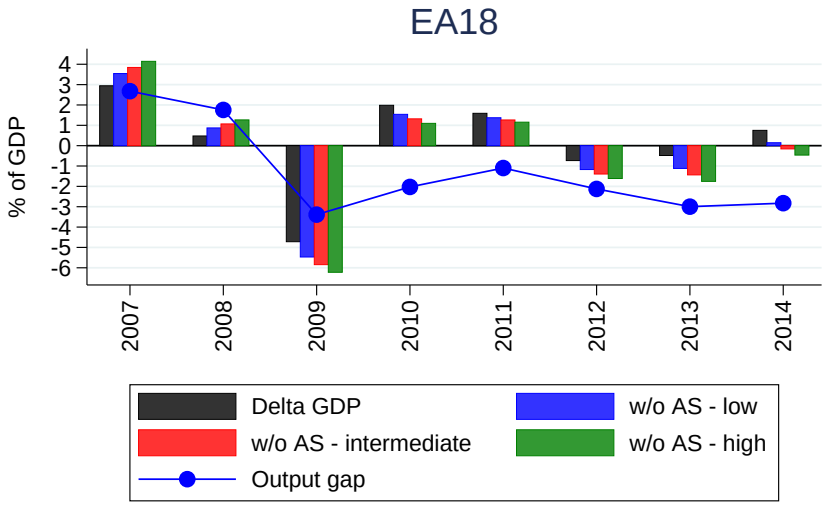

*Notes:* Plots the destabilizer-through-direct-taxes measure $\theta^{TAX}$ (on x-axis) against the Income Stabilization Coefficient of direct taxes $\tau^{TAX}$(y-axis). We distinguish three cases: *(i)* a value of zero of the destabilization coefficient implies that the government was budget constrained in that period and did not let automatic stabilizers work. *(ii)* If the government is not budget constrained, it can keep the level of *after-shock* tax revenue constant. In this case, the destabilization measure equals the stabilization coefficient, that is, the point is close to or on the dashed line. *(iii)* If the government needs to increase tax revenue after the decline of aggregate income, for instance because it has to raise additional revenue to repay its debt, the de-stabilization measure will be negative.

Figure 10: EU-27: Output Gap and GDP Growth counterfactual




Source: AMECO, Note: Estimate for 2014

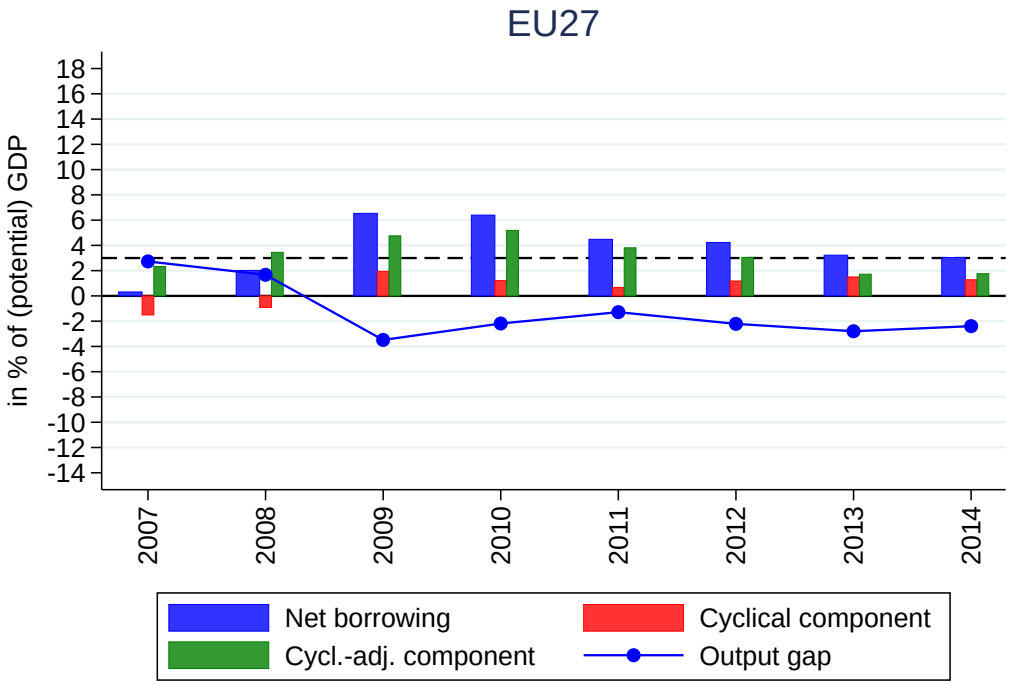
Figure 11: EA-18: Output Gap and GDP Growth counterfactual




Source: AMECO, Note: Estimate for 2014

*Source:* Own calculations using EUROMOD. Calculated as the aggregate change in disposable income as a fraction of market income.

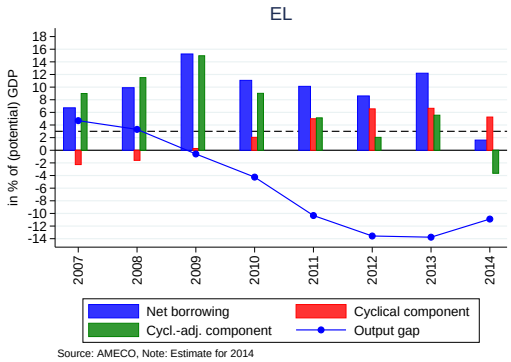
Figure 12: Budget Deficits: EU27




Source: AMECO, Note: Estimate for 2014

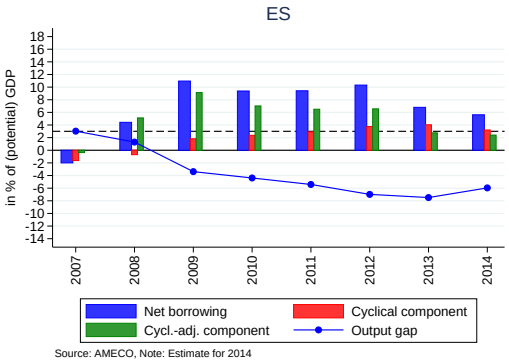
Figure 13: Budget Deficits

(a) Greece



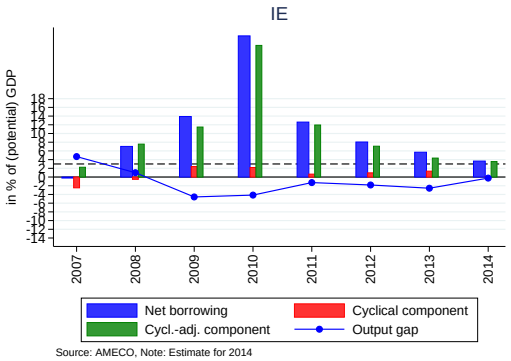

Source: AMECO, Note: Estimate for 2014

(b) Spain



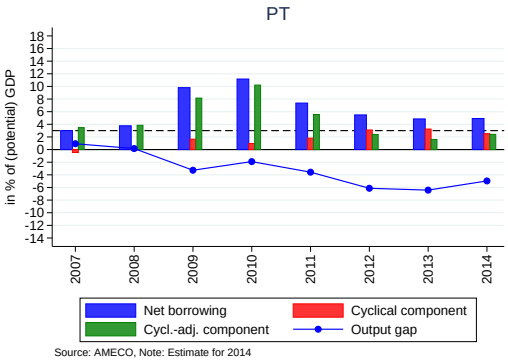

Source: AMECO, Note: Estimate for 2014

(c) Ireland




Source: AMECO, Note: Estimate for 2014

(d) Portugal




Source: AMECO, Note: Estimate for 2014