Automatic Stabilizers and Economic Crisis: US vs. Europe

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Abstract: This paper analyzes the effectiveness of the tax and transfer systems in the European Union and the US to act as an automatic stabilizer in the current economic crisis. We find that automatic stabilizers absorb 38 per cent of a proportional income shock in the EU, compared to 32 per cent in the US. In the case of an unemployment shock 47 per cent of the shock are absorbed in the EU, compared to 34 per cent in the US. This cushioning of disposable income leads to a demand stabilization of up to 31 per cent in the EU and up to 28 per cent in the US. There is large heterogeneity within the EU. Automatic stabilizers in Eastern and Southern Europe are much lower than in Central and Northern European countries. We also investigate whether countries with weak automatic stabilizers have enacted larger fiscal stimulus programs. We find no evidence supporting this view.

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¶This paper uses EUROMOD version D21 and TAXSIM v9. EUROMOD and TAXSIM are continually being improved and updated and the results presented here represent the best available at the time of writing. Our version of TAXSIM is based on the Survey of Consumer Finances (SCF) by the Federal Reserve Board. EUROMOD relies on micro-data from 17 different sources for 19 countries. These are the ECHP and EU-SILC by Eurostat, the Austrian version of the ECHP by Statistik Austria; the PSBH by the University of Liège and the University of Antwerp; the Estonian HBS by Statistics Estonia; the Income Distribution Survey by Statistics Finland; the EBF by INSEE; the GSOEP by DIW Berlin; the Greek HBS by the National Statistical Service of Greece; the Living in Ireland Survey by the Economic and Social Research Institute; the SHIW by the Bank of Italy; the PSELL-2 by CEPS/INSTEAD; the SEP by Statistics Netherlands; the Polish HBS by Warsaw University; the Slovenian HBS and Personal Income Tax database by the Statistical Office of Slovenia; the Income Distribution Survey by Statistics Sweden; and the FES by the UK Office for National Statistics (ONS) through the Data Archive. Material from the FES is Crown Copyright and is used by permission. Neither the ONS nor the Data Archive bears any responsibility for the analysis or interpretation of the data reported here. An equivalent disclaimer applies for all other data sources and their respective providers.

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1 Introduction

In the current economic crisis, the workings of automatic stabilizers are widely seen to play a key role in stabilizing demand and output. Automatic stabilizers are usually defined as those elements of fiscal policy which mitigate output fluctuations without discretionary government action (see, e.g., Eaton and Rosen (1980)). Despite the importance of automatic stabilizers for stabilizing the economy, "very little work has been done on automatic stabilization [...] in the last 20 years" (Blanchard (2006)). However, especially in the current crisis, it is important to assess the contribution of automatic stabilizers to overall fiscal expansion and to compare their magnitude across countries. Previous research on automatic stabilization has mainly relied on macro data. Exceptions based on micro data are Auerbach and Feenberg (2000) for the US and Mabbett and Schelkle (2007) for the EU-15. More comparative work based on micro data has been conducted on the differences in the tax wedge and effective marginal tax rates between the US and European countries (see, e.g., Piketty and Saez (2007)).

In this paper, we combine these two strands of the literature to compare the magnitude and composition of automatic stabilization between the US and Europe based on micro data estimates. We analyze the impact of automatic stabilizers using microsimulation models for 19 European countries (EUROMOD) and the US (TAXSIM). The microsimulation approach allows us to investigate the causal effects of different types of shocks on household disposable income, holding everything else constant and therefore avoiding endogeneity problems (see Bourguignon and Spadaro (2006)). We can hence single out the role of automatic stabilization which is not possible in an ex-post evaluation (or with macro data) as it is not possible to disentangle the effects of automatic stabilizers, active fiscal and monetary policy and behavioral responses like changes in labor supply or disability benefit take-up.

We run two controlled experiments of macro shocks to income and employment. The first is a proportional decline in household gross income by 5% (income shock). This is the usual way of modeling shocks in simulation studies analyzing automatic stabilizers. However, economic downturns typically affect households asymmetrically, with some households losing their jobs and suffering a sharp decline in income and other households being much less affected, as wages are usually rigid in the short term. We therefore consider a second macro shock where some households become unemployed, so that the unemployment rate increases such that total household income decreases by 5% (unemployment shock). We show that these two types of shocks and the resulting stabilization coefficients can be interpreted as an average effective marginal tax rate (EMTR) for the whole tax benefit system at the intensive (proportional income shock) or extensive (unemployment shock) margin. After identifying the effects of these shocks on disposable income, we use various methods to estimate the prevalence of credit constraints among households. Among these is the approach by Zeldes (1989) where financial wealth is the determinant for credit constraints, but also alternative approaches which are based on information regarding home ownership (Runkle (1991)) as well as on direct survey evidence (Jappelli et al. (1998)). On this basis, we calculate how the stabilization of disposable income can translate into demand stabilization.

As our measure of automatic stabilization, we extend the normalized tax change (Auerbach and Feenberg (2000)) to include other taxes as well as social contributions and benefits. Our income stabilization coefficient relates the shock absorption of the whole tax and transfer system to the overall size of the income shock. We take into account personal income taxes (at all government levels), social insurance contributions and payroll taxes paid by employers and employees, value added or sales taxes as well as transfers to private households such as unemployment benefits.[1] Computations are done according to the tax benefit rules which were in force before 2008 in order to avoid an endogeneity problem resulting from policy responses after the start of the crisis.

What does the present paper contribute to the literature? First, previous studies have focused on proportional income shocks whereas our analysis shows that automatic stabilizers work very differently in the case of unemployment shocks, which affect households asymmetrically.[2] This is especially important for assessing the effectiveness of automatic stabilizers in the current economic crisis. Second, we extend the micro data measure on automatic stabilization to different taxes and benefits. Our analysis includes a decomposition of the overall stabilization effects into the contributions of taxes, social insurance contributions and benefits. A further difference between our study and Auerbach and Feenberg (2000) is that we take into

[1] We abstract from other taxes, in particular corporate income taxes. For an analysis of automatic stabilizers in the corporate tax system see Devereux and Fuest (2009) and Buettner and Fuest (forthcoming).

[2] Auerbach and Feenberg (2000) do consider a shock where households at different income levels are affected differently, but the results are very similar to the case of a symmetric shock. Our analysis confirms this for the US, but not for Europe.

account unemployment benefits and state level income taxes. In an extension, we also consider consumption taxes. This explains why our estimates of overall automatic stabilization effects in the US are higher. Moreover, we use several different strategies for estimating liquidity constraints in order to explore the sensitivity of demand stabilization results. Third, to the best of our knowledge, our study is the first to estimate the prevalence of liquidity constraints for such a large set of European countries based on household data.[3] This is of key importance for assessing the role of automatic stabilizers for demand smoothing. Fourth, we extend the analysis to more recent years and countries - including transition countries from Eastern Europe - and we compare the US and Europe within the same microeconometric framework. Finally, we shed light on the issue whether macro indicators are a good proxy for micro data based stabilization coefficients. We also investigate whether bigger governments or more open economies have higher or lower automatic stabilizers.

We show that our extensions to previous research are important for the comparison between the U.S. and Europe as they help to identify driving forces in automatic stabilization. Our analysis leads to the following main results. In the case of an income shock, approximately 38% of the shock would be absorbed by automatic stabilizers in the EU. For the US, we find a value of 32%. This is surprising because automatic stabilizers in Europe are usually perceived to be drastically higher than in the US. Our results qualify this view to some extent, at least as far as proportional shocks on household income are concerned. When looking at the personal income tax only, the values for the US are even higher than the EU average. Within the EU, there is considerable heterogeneity, and results for overall stabilization of disposable income range from a value of 25% for Estonia to 56% for Denmark. In general, automatic stabilizers in Eastern and Southern European countries are considerably lower than in Continental and Northern European countries. In the case of the unemployment shock, the difference between the EU and the US is larger. EU automatic stabilizers absorb 47% of the shock whereas the stabilization effect in the US is only 34%. Again, there is considerable heterogeneity within the EU.

How does this cushioning of shocks translate into demand stabilization? If demand stabilization can only be achieved for liquidity constrained households, the

[3] There are several studies on liquidity constraints and the responsiveness of households to tax changes for the US (see, e.g., Zeldes (1989), Parker (1999), Souleles (1999), Johnson et al. (2006), Shapiro and Slemrod (1995, 2003, 2009))

picture changes significantly. Here, the results are very sensitive with respect to the method used for estimating liquidity constraints. In particular, results of estimates based on survey data differ significantly from results using other approaches. For the income shock, the cushioning effect of automatic stabilizers is now in the range of 4-24% in the EU depending on the method estimating liquidity constraints. For the US, we find values between 6-27%, which is again rather similar. For the unemployment shock, however, we find a larger difference. In the EU, the stabilization effect exceeds the comparable US value for all liquidity constraint estimation methods. It ranges from 13-31% whereas results for the US are between 7-28% and are thus similar to the values for the income shock. These results suggest that social transfers, in particular the rather generous systems of unemployment insurance in Europe, play a key role for demand stabilization and explain an important part of the difference in automatic stabilizers between Europe and the US.

A final issue we discuss in the paper is how fiscal stimulus programs of individual countries are related to automatic stabilizers. In particular, we ask whether countries with low automatic stabilizers have tried to compensate this by larger fiscal stimuli, but we find no correlation between the size of fiscal stimulus programs and automatic stabilizers. However, we do find that discretionary fiscal policy programmes have been smaller in more open economies.

The paper is structured as follows. In Section 2 we provide a short overview of previous research with respect to automatic stabilization and comparisons of US and European tax benefit systems. In addition, we discuss how stabilization effects can be measured. Section 3 describes the microsimulation models EUROMOD and TAXSIM and the different macro shock scenarios we consider. Section 4 presents the results on automatic stabilization which are discussed in Section 5 together with potential limitations of our approach. Section 6 concludes.

2 Previous research and theoretical framework

2.1 Previous research

There are two strands of literature which are related to our paper. The first is the literature on the analysis and measurement of automatic fiscal stabilizers. In the empirical literature[4], two types of studies prevail: macro data studies and micro data approaches.[5] The common baseline of macro data studies is to measure the cyclical elasticitiy of different budget components such as the income tax, social security contributions, the corporate tax, indirect taxes or unemployment benefits. Different approaches have been proposed, for example regressing changes in fiscal variables on the growth rate of GDP or estimating elasticities on the basis of macroeconometric models.[6] Sachs and Sala-i Martin (1992) and Bayoumi and Masson (1995) use time series data and find values of 30%-40% for disposable income stabilization in the US. However, these approaches raise several issues, in particular the challenge of separating discretionary actions from automatic stabilizers in combination with identification problems resulting from endogenous regressors. Related to the literature on macro estimations of automatic stabilization are studies that focus on the relationship between output volatility, public sector size and openness of the economy (Cameron (1978), Galí (1994), Rodrik (1998), Fatàs and Mihov (2001), Auerbach and Hassett (2002)).

Much less work has been done on the measurement of automatic stabilizers with micro data. Auerbach and Feenberg (2000) use the NBER's microsimulation model TAXSIM to estimate the automatic stabilization for the US from 1962-95 and find values for the stabilization of disposable income ranging between 25%-35%. Auerbach (2009) has updated this analysis and finds a value of around 25% for more recent years. Mabbett and Schelkle (2007) conduct a similar analysis for 15 Western European countries in 1998 and find higher stabilization effects than in the US, with results ranging from 32%-58%.[7] How does this smoothing of disposable income affect household demand? To the best of our knowledge, Auerbach and Feenberg (2000) is the only simulation study which tries to estimate the demand effect taking into account liquidity constraints. They use the method suggested by Zeldes (1989) and find that approximately two thirds of all households are likely

[4] A theoretical analysis of automatic stabilizers in a real business cycle model can be found in Galí (1994).

[5] Early estimates on the responsiveness of the tax system to income fluctuations are discussed in the Appendix of Goode (1976). More recent contributions include Fatàs and Mihov (2001), Blanchard and Perotti (2002), Mélitz and Zumer (2002).

[6] Cf. van den Noord (2000) or Girouard and André (2005).

[7] Mabbett and Schelkle (2007) rely for their analysis (which is a more recent version of Mabbett (2004)) on the results from an inflation scenario taken from Immvervoll et al. (2006) who use the microsimulation model EUROMOD to increase earnings by 10% in order to simulate the sensitivity of poverty indicators with respect to macro level changes.

to be liquidity constrained. Given this, the contribution of automatic stabilizers to demand smoothing is reduced to approximately 15% of the initial income shock.

The second strand of related literature focuses on international comparisons of income tax systems in terms of effective average and marginal tax rates, and individual tax wedges between the US and European countries. This literature has mainly relied on micro data and the simulation approach in order to take into account the heterogeneity of the population. Piketty and Saez (2007) use a large public micro-file tax return data set for the US to compute average tax rates for five federal taxes and different income groups. They complement the analysis for the US with a comparison to France and the UK. A key finding from their analysis is that today (and in contrast to 1970), France, a typical continental European welfare state, has higher average tax rates than the two Anglo-Saxon countries. The French tax system is also more progressive. Immvervoll (2004) discusses conceptual issues with regard to macro- and micro-based measures of the tax burden and compares effective tax rates in fourteen EU Member States. In general, he finds a large heterogeneity across countries with average and marginal effective tax rates being lowest in southern European countries. Other studies take as given that European tax systems reveal a higher degree of progressivity (e.g. Alesina and Glaeser (2004)) or higher (marginal) tax rates in general (e.g. Prescott (2004) or Alesina et al. (2005)) and discuss to what extent differences in economic outcomes such as hours worked can be explained by different tax structures. By providing new measures of the average effective marginal tax rate (EMTR) both at the intensive and extensive margin for the US and 19 European countries, this paper sheds further light on existing differences between the US and European tax and transfer systems.

2.2 Theoretical framework

The extent to which automatic stabilizers mitigate the impact of income shocks on household demand essentially depends on two factors. Firstly, the tax and transfer system determines the way in which a given shock to gross income translates into a change in disposable income. For instance, in the presence of a proportional income tax with a tax rate of 40%, a shock on gross income of one hundred Euros leads to a decline in disposable income of 60 Euros. In this case, the tax absorbs 40% of the shock to gross income. A progressive tax, in turn, would have a stronger stabilizing effect. The second factor is the link between current disposable income and current demand for goods and services. If the income shock is perceived as transitory and current demand depends on some concept of permanent income, and if households can borrow or use accumulated savings, their demand will not change. In this case, the impact of automatic stabilizers on current demand would be equal to zero. Things are different, though, if households are liquidity constrained. In this case, their current expenditures do depend on disposable income so that automatic stabilizers play a role.

A common measure for estimating automatic stabilization is the "normalized tax change" used by Auerbach and Feenberg (2000) which can be interpreted as "the tax system's built-in flexibility" (Pechman (1973, 1987)). It shows how changes in market income translate into changes in disposable income through changes in personal income tax payments. We extend the concept of normalized tax change to include other taxes as well as social insurance contributions and transfers like e.g. unemployment benefits. We take into account personal income taxes (at all government levels), social insurance contributions as well as payroll taxes and transfers to private households such as unemployment benefits.

Market income Y_i^M of individual i is defined as the sum of all incomes from market activities:

$$Y_i^M = E_i + Q_i + I_i + P_i + O_i \qquad (1)$$

where E_i is labour income, Q_i business income, I_i capital income, P_i property income, and O_i other income. Disposable income Y_i^D is defined as market income minus net government intervention $G_i = T_i + S_i - B_i$:

$$Y_i^D = Y_i^M - G_i = Y_i^M - (T_i + S_i - B_i) \qquad (2)$$

where T_i are direct taxes, S_i employee social insurance contributions, and B_i are social cash benefits (i.e. negative taxes). Note that an extended analysis including employer social insurance contributions and consumption taxes is presented in Section 4.4.

We analyze the impact of automatic stabilizers in two steps. The first is the stabilization of disposable income and the second is the stabilization of demand. Consider first the stabilization of disposable income. Throughout the rest of the paper, we refer to our measure of this effect as the *income stabilization coefficient* τ^I. We derive τ^I from a general functional relationship between disposable income and market income:

$$\tau^I = \tau^I(Y^M, T, S, B). \tag{3}$$

The derivation can be either done at the macro or at the micro level. On the macro level, the aggregate change in market income (ΔY^M) is transmitted via τ^I into an aggregate change in disposable income (ΔY^D):

$$\Delta Y^D = (1 - \tau)\, \Delta Y^M \tag{4}$$

However, one issue when computing τ^I with macro data is that this data includes behavioral and general equilibrium effects as well as discretionary policy measures. Therefore, a measure of automatic stabilization based on macro data captures all these effects. In order to single out the pure size of automatic stabilization, we compute τ^I using arithmetic changes (Δ) in total disposable income ($\sum_i \Delta Y_i^D$) and market income ($\sum_i \Delta Y_i^M$) based on micro level information:

$$\begin{aligned} \sum_i \Delta Y_i^D &= (1 - \tau^I) \sum_i \Delta Y_i^M \\ \tau^I &= 1 - \frac{\sum_i \Delta Y_i^D}{\sum_i \Delta Y_i^M} = \frac{\sum_i \left(\Delta Y_i^M - \Delta Y_i^D\right)}{\sum_i \Delta Y_i^M} = \frac{\sum_i \Delta G_i}{\sum_i \Delta Y_i^M} \end{aligned} \tag{5}$$

where τ^I measures the sensitivity of disposable income, Y_i^D, with respect to market income, Y_i^M. The higher τ^I, the stronger the stabilization effect. For example,. $\tau^I = 0.4$ implies that 40% of the income shock is absorbed by the tax benefit system. Note that the income stabilization coefficient is not only determined by the size of government (e.g. measured as expenditure or revenue in percent of GDP) but also depends on the structure of the tax benefit system and the design of the different components.

The definition of τ^I resembles that of an average effective marginal tax rate (EMTR), which is usually computed in this way using micro data (Immvervoll (2004)). In the case of the proportional income shock, τ^I can be interpreted as the EMTR along the intensive margin, whereas in the case of the unemployment shock, it resembles the EMTR along the extensive margin (participation tax rate, see, e.g., Saez (2001, 2002), Kleven and Kreiner (2006) or Immervoll et al. (2007)).

Another advantage of the micro data based approach is that it enable us to explore the extent to which different individual components of the tax transfer system contribute to automatic stabilization. Comparing tax benefit systems in Europe and the US, we are interested in the weight of each component in the respective country. We therefore decompose the coefficient into its components which include taxes, social insurance contributions and benefits:

$$\tau^I = \sum_f \tau_f^I = \tau_T^I + \tau_S^I + \tau_B^I = \frac{\sum_i \Delta T_i}{\sum_i \Delta Y_i^M} + \frac{\sum_i \Delta S_i}{\sum_i \Delta Y_i^M} - \frac{\sum_i \Delta B_i}{\sum_i \Delta Y_i^M} = \frac{\sum_i (\Delta T_i + \Delta S_i - \Delta B_i)}{\sum_i \Delta Y_i^M} \tag{6}$$

Consider next the second step of the analysis, the impact on demand. In order to stabilize final demand and output, the cushioning effect on disposable income has to be transmitted to expenditures for goods and services. If current demand depends on some concept of permanent income, demand will not change in response to a transitory income shock. Things are different, though, if households are liquidity constrained and cannot borrow. In this case, their current expenditures do depend on disposable income so that automatic stabilizers play a role. Following Auerbach and Feenberg (2000), we assume that households who face liquidity constraints fully adjust consumption expenditure after changes in disposable income while no such behavior occurs among households without liquidity constraints.[8] The adjustment of liquidity constrained households is such that changes in disposable income are equal to changes in consumption. Hence, the coefficient which measures stabilization of aggregate demand becomes:

$$\tau^C = 1 - \frac{\sum_i \Delta C_i^{LQ}}{\sum_i \Delta Y_i^M} \tag{7}$$

where ΔC_i^{LQ} denotes the consumption response of liquidity constrained households. In the following, we refer to τ^C as the *demand stabilization coefficient*. In order to explore the sensitivity of our estimates of the demand stabilization coefficient with respect to the way in which liquidity constrained households are identified, we choose four different approaches. In the first one, we use the same approach as Auerbach and Feenberg (2000) and follow Zeldes (1989) to split the samples according to a specific wealth to income ratio. A household is liquidity constrained

[8] Note that the term "liquidity constraint" does not have to be interpreted in an absolute inability to borrow but can also come in a milder form of a substantial difference between borrowing and lending rates which can result in distortions of the timing of purchases. Note further that our demand stabilization coefficient does not predict the overall change of final demand, but the extent to which demand of liquidity constrained households is stabilized by the tax benefit system.

if the household's net financial wealth W_i (derived from capitalized asset incomes) is less than the disposable income of at least two months, i.e:

$$LQ_i = \mathbf{1}\left[W_i \leq \frac{2}{12}Y_i^D\right] \tag{8}$$

The second approach makes use of information regarding homeowners in the data and classifies those households as liquidity constrained who are either non-homeowners or who own their home but still have to pay mortgage interest (see, e.g. Runkle (1991)). The third approach combines the previous two, i.e. only households who are both non-homeowners and who do not have enough financial wealth according to the Zeldes-criterium are assumed to be liquidity constrained. Finally, in a fourth approach we use direct information from household surveys for the identification of liquidity constrained households.[9]

3 Data and methodology

3.1 Microsimulation using TAXSIM and EUROMOD

We use microsimulation techniques to simulate taxes, benefits and disposable income under different scenarios for a representative micro-data sample of households. Simulation analysis allows conducting a controlled experiment by changing the parameters of interest while holding everything else constant (cf. Bourguignon and Spadaro (2006)). We therefore do not have to deal with endogeneity problems when identifying the effects of the policy reform under consideration.

Simulations are carried out using TAXSIM - the NBER's microsimulation model for calculating liabilities under US Federal and State income tax laws from individual data - and EUROMOD, a static tax-benefit model for 19 EU countries, which was designed for comparative analysis.[10] The models can simulate most direct taxes and

[9]See, e.g. Jappelli et al. (1998). Our data for the US, the Survey of Consumer Finances, contains questions about credit applications which have been either rejected, not fully approved or which have not been submitted because of the fear of rejection. In the fourth approach, we classify all US households as liquidity constrained who answer the questions above with "yes". Unfortunately, no comparable information is available in our data for European countries. Therefore, we rely on EU SILC data and conduct a logit estimation with the binary variable "capacity to face unexpected financial expenses" as dependent variable. In a next step, making an out-of-sample prediction, we are able to detect liquidity constrained households in our data. Results of these estimations are available from the authors upon request.

[10]For more information on TAXSIM see Feenberg and Coutts (1993) or visit

benefits except those based on previous contributions as this information is usually not available from the cross-sectional survey data used as input datasets. Information on these instruments is taken directly from the original data sources. Both models assume full benefit take-up and tax compliance, focusing on the intended effects of tax-benefit systems. The main stages of the simulations are the following. First, a micro-data sample and tax-benefit rules are read into the model. Then for each tax and benefit instrument, the model constructs corresponding assessment units, ascertains which are eligible for that instrument and determines the amount of benefit or tax liability for each member of the unit. Finally, after all taxes and benefits in question are simulated, disposable income is calculated.

3.2 Scenarios

The existing literature on stabilization so far has concentrated on increases in earnings or gross incomes to examine the stabilizing impact of tax benefit systems. In the light of the current economic crisis, there is much more interest in a downturn scenario. Reinhart and Rogoff (2009) stress that recessions which follow a financial crisis have particularly severe effects on asset prices, output and unemployment. Therefore, we are interested not only in a scenario of a uniform decrease in incomes but also in an increase of the unemployment rate. We compare a scenario where gross incomes are proportionally decreased by 5% for all households (income shock) to a scenario where some households are made unemployed and therefore lose all their labor earnings (unemployment shock). In the latter scenario, the unemployment rate increases such that total household income decreases by 5% as well in order to make both scenarios as comparable as possible.[11]

http://www.nber.org/taxsim/. For further information on EUROMOD see Sutherland (2001, 2007). There are also country reports available with detailed information on the input data, the modeling and validation of each tax benefit system, see http://www.iser.essex.ac.uk/research/euromod. The tax-benefit systems included in the model have been validated against aggregated administrative statistics as well as national tax-benefit models (where available), and the robustness checked through numerous applications (see, e.g., Bargain (2006)).

[11] Our scenarios can be seen as a conservative estimate of the expected impact of the current crisis (see Reinhart and Rogoff (2009) for effects of previous crises). The (qualitative) results are robust with respect to different sizes of the shocks. The results for the unemployment shock do not change much when we model it as an increase of the unemployment rate by 5 percentage points for each country. It would be further possible to derive more complicated scenarios with different shocks on different income sources or a combination of income and unemployment shock. However, this would only have an impact on the distribution of changes which are not relevant in the analysis

The increase of the unemployment rate is modeled through reweighting of our samples.[12] The weights of the unemployed are increased while those of the employed with similar characteristics are decreased, i.e., in effect, a fraction of employed households is made unemployed. With this reweighting approach we control for several individual and household characteristics that determine the risk of becoming unemployed (see Appendix A.2). The implicit assumption behind this approach is that the socio-demographic characteristics of the unemployed remain constant.[13]

4 Results

4.1 US vs. Europe

We start our analysis by comparing the US to Europe. Our simulation model includes 19 European countries which we treat as one single country (i.e. the "United States of Europe"). All of them are EU member states, which is why we refer to this group as the EU, bearing in mind that some EU member countries are missing. We also consider the countries of the Euro area and refer to this group as 'Euro'. Figure 1 summarizes the results of our baseline simulation, which focuses on the income tax, social insurance contributions (or payroll taxes) paid by employees and benefits. Consider first the income shock. Approximately 38% of such a shock would be absorbed by automatic stabilizers in the EU (and Euroland). For the US, we find a slightly lower value of 32%. This difference of just six percentage points is

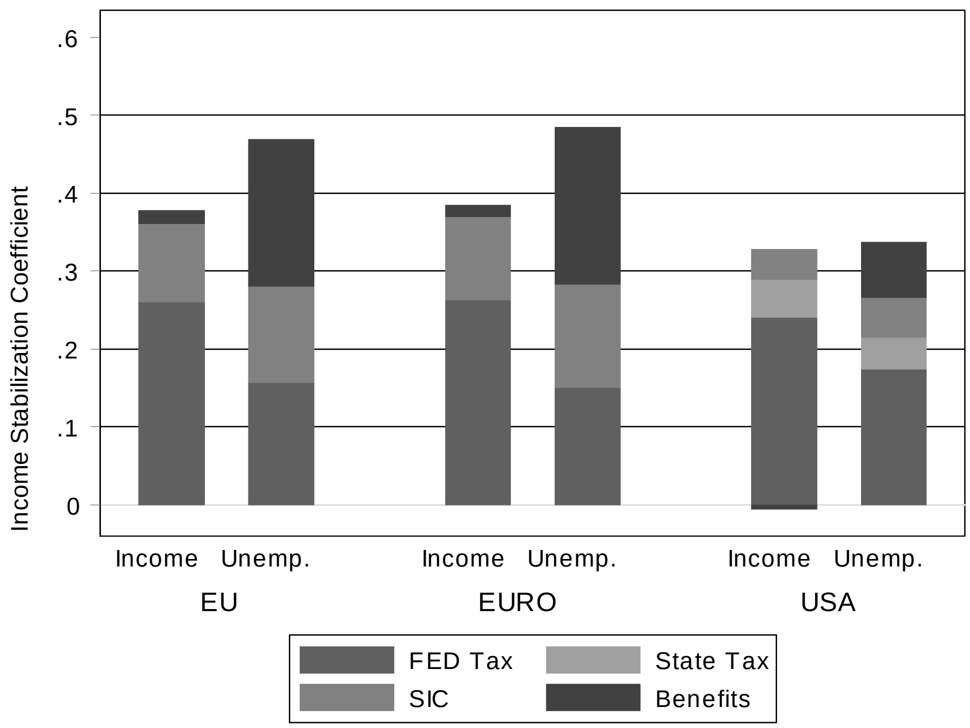
of this paper. Therefore, we focus on these two simple scenarios in order to make our analysis as simple as possible. One should note, though, that our analysis is not a forecasting exercise. We do not aim at quantifying the exact effects of the current economic crisis but of stylized scenarios in order to explore the build-in automatic stabilizers of existing pre-crisis tax-benefit systems. Conducting an ex-post analysis would include discretionary government reactions and behavioral responses (see, e.g., Aaberge et al. (2000) for an empirical ex-post analysis of a previous crisis in the Nordic countries) and we would not be able to identify the role of automatic stabilization.

[12] For the reweigthing procedure, we follow the approach of Immvervoll et al. (2006), who have also simulated an increase in unemployment through reweighting of the sample. Their analysis focuses on changes in absolute and relative poverty rates after changes in the income distribution and the employment rate.

[13] Cf. Deville and Särndal (1992) and DiNardo et al. (1996). This approach is equivalent to estimating probabilities of becoming unemployed (see, e.g., Bell and Blanchflower (2009)) and then selecting the individuals with the highest probabilities when controlling for the same characteristics in the reweighting estimation (see Herault (2009)). The reweighting procedure is to some extent sensitive to changes in control variables. However, this mainly affects the distribution of the shock (which we do not analyze) and not the overall or mean effects which are important for the analysis in this paper.

surprising in so far as automatic stabilizers in Europe are usually considered to be drastically higher than in the US.[14] Our results qualify this view to a certain degree, at least as far as proportional income shocks are concerned. Figure 1 shows that taxes and social insurance contributions are the dominating factors which drive τ in case of a uniform income shock. Benefits are of minor importance in this scenario.

Figure 1: Decomposition of stabilization coefficient for both scenarios



Source: Own calculations based on EUROMOD and TAXSIM

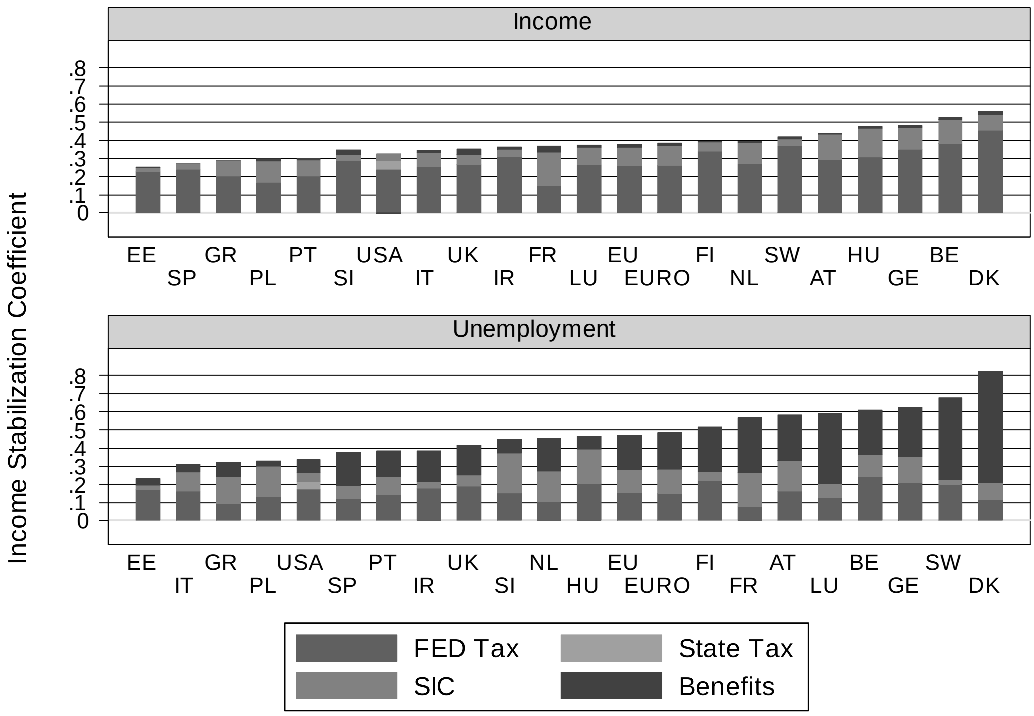
In the case of the unemployment shock, the difference between the EU and the US is larger. EU automatic stabilizers now absorb 47% of the shock (49% in the Euro zone) whereas the stabilization effect in the US is only 34%. This difference can be explained with the importance of unemployment benefits which account for a large part of stabilization in Europe in this scenario. Table 3 in the Appendix shows that benefits alone absorb 19% of the shock in Europe compared to just 7% in the US.

[14] Note that for the US the value of the stabilization coefficient for the federal income tax only is below 25% which is in line with the results of Auerbach and Feenberg (2000).

4.2 Country decomposition

The results for the stabilization coefficient vary considerably across countries, as can be seen from Figure 2 (and Tables 2 and 3 in the Appendix). In the case of the income shock, we find the highest stabilization coefficient for Denmark, where automatic stabilizers cushion 56% of the shock. Belgium (53%), Germany (48%) and, surprisingly, Hungary (48%) also have strong automatic stabilizers. The lowest values are found for Estonia (25%), Spain (28%) and Greece (29%). With the exception of France, taxes seem to have a stronger stabilizing role than social security contributions.

Figure 2: Decomposition of income stabilization coefficient in both scenarios for different countries



Source: Own calculations based on EUROMOD and TAXSIM

In case of the unemployment shock, the stabilization coefficients are larger for the majority of countries. Again, the highest value emerges for Denmark (82%), followed by Sweden (68%), Germany (62%) Belgium (61%) and Luxembourg (59%). The relatively low value of stabilization from (unemployment) benefits in Finland compared to its neighboring Nordic countries might be surprising at a first glance but can be explained with the fact that Finland has the least generous unemployment benefits of the Nordic countries (see Aaberge et al. (2000)). Hungary (47%) is now at the EU average due to the relatively low level of unemployment benefits. At the other end of the spectrum, there are some countries with values below the US level of 34%. These include Estonia (23%), Italy (31%), and, to a lesser extent, Poland (33%).

When looking only at the personal income tax, it is surprising that the values for the US (federal and state level income tax combined) are higher than the EU average. To some extent, this qualifies the widespread view that tax progressivity is higher in Europe (e.g., Alesina and Glaeser (2004) or Piketty and Saez (2007)). Of course, this can be partly explained by the considerable heterogeneity within Europe. But still, only a few countries like Belgium, Germany and the Nordic countries have higher contributions of stabilization coming from the personal income tax.

4.3 Demand stabilization

How does this cushioning of shocks translate into demand stabilization? The results for stabilization of aggregate demand in the EU and the US are shown in Table 1 and Figure 3.[15] The demand stabilization coefficients are lower than the income stabilization coefficients since demand stabilization can only be achieved for liquidity constrained households. Moreover, there is considerable variation for the demand stabilization coefficient depending on the respective approach for the identification of liquidity constrained households. For the income shock (IS), results range from 4-24% for the EU and from 6-27% for the US. Taking the Zeldes criterion, i.e. net wealth (based on asset income), as the determinant for liquidity constraints, demand stabilization is 22% in the EU and 17% in the US. Demand stabilization coefficients which are based on home ownership information yield higher values whereas those based on direct survey evidence with respect to liquidity constraints lead to much lower coefficients. For the unemployment shock (US), the EU-US gap widens again. While in the US demand stabilization coefficients mostly remain on their level of the income shock, they are now substantially higher for the EU-group reaching a peak

[15] Note that in Tables 1 and 4 as well as in Figure 3, the first approach for the identification of liquidity constraints refers to the financial wealth criterion (Zeldes), the second to the real estate property criterion (Runkle), the third is a combination of both and the fourth refers to survey evidence.

Table 1: Demand taus

	$\tau_1^C IS$	$\tau_2^C IS$	$\tau_3^C IS$	$\tau_4^C IS$	$\tau_1^C US$	$\tau_2^C US$	$\tau_3^C US$	$\tau_4^C US$	$\tau^I IS$	$\tau^I US$
AT	0.363	0.308	0.275	0.036	0.497	0.441	0.397	0.138	0.439	0.585
BE	0.345	0.404	0.287	0.021	0.442	0.426	0.337	0.105	0.527	0.612
DK	0.285	0.448	0.268	0.020	0.592	0.641	0.532	0.230	0.558	0.823
EE	0.242	0.071	0.067	0.008	0.225	0.060	0.058	0.063	0.253	0.233
FI	0.248	0.290	0.215	0.033	0.352	0.362	0.292	0.119	0.396	0.519
FR	0.115	0.285	0.142	0.048	0.259	0.448	0.279	0.164	0.370	0.568
GE	0.143	0.388	0.218	0.080	0.253	0.507	0.336	0.235	0.481	0.624
GR	0.230	0.120	0.102	0.007	0.263	0.124	0.109	0.027	0.291	0.322
HU	0.455	0.109	0.103	0.121	0.448	0.090	0.084	0.185	0.476	0.467
IR	0.186	0.246	0.171	0.034	0.243	0.265	0.206	0.132	0.363	0.387
IT	0.283	0.129	0.114	0.019	0.233	0.099	0.084	0.033	0.346	0.311
LU	0.256	0.294	0.231	0.025	0.440	0.469	0.413	0.098	0.374	0.593
NL	0.227	0.304	0.215	0.025	0.288	0.365	0.276	0.119	0.397	0.452
PL	0.296	0.153	0.151	0.056	0.324	0.173	0.171	0.097	0.301	0.329
PT	0.240	0.152	0.142	0.007	0.313	0.200	0.189	0.008	0.303	0.386
SI	0.090	0.021	0.011	0.030	0.227	0.036	0.029	0.083	0.317	0.431
SP	0.183	0.039	0.034	0.014	0.264	0.060	0.055	0.057	0.277	0.376
SW	0.201	0.405	0.254	0.028	0.409	0.647	0.463	0.159	0.420	0.678
UK	0.263	0.286	0.241	0.024	0.349	0.366	0.332	0.164	0.352	0.415
EU	0.221	0.242	0.167	0.041	0.297	0.313	0.236	0.132	0.378	0.469
EURO	0.195	0.241	0.153	0.040	0.270	0.312	0.220	0.126	0.385	0.485
USA	0.174	0.272	0.160	0.056	0.197	0.278	0.176	0.073	0.322	0.337

Source: Own calculations based on EUROMOD and TAXSIM

of 31%. These results suggest that the transfers to the unemployed, in particular the rather generous systems of unemployment insurance in Europe, play a key role for demand stabilization and drive the difference in automatic stabilizers between Europe and the US.

For a more in-depth analysis taking into account country-specific results, it is useful to consider first the shares of liquidity constrained households for each approach as depicted in Table 4 in the Appendix. The Zeldes approach would suggest that households are more likely to be liquidity constrained in Eastern than in Western European countries because financial wealth is typically lower in the new member states. Our estimates confirm this as can be seen in Table 4.[16] For this reason, auto-

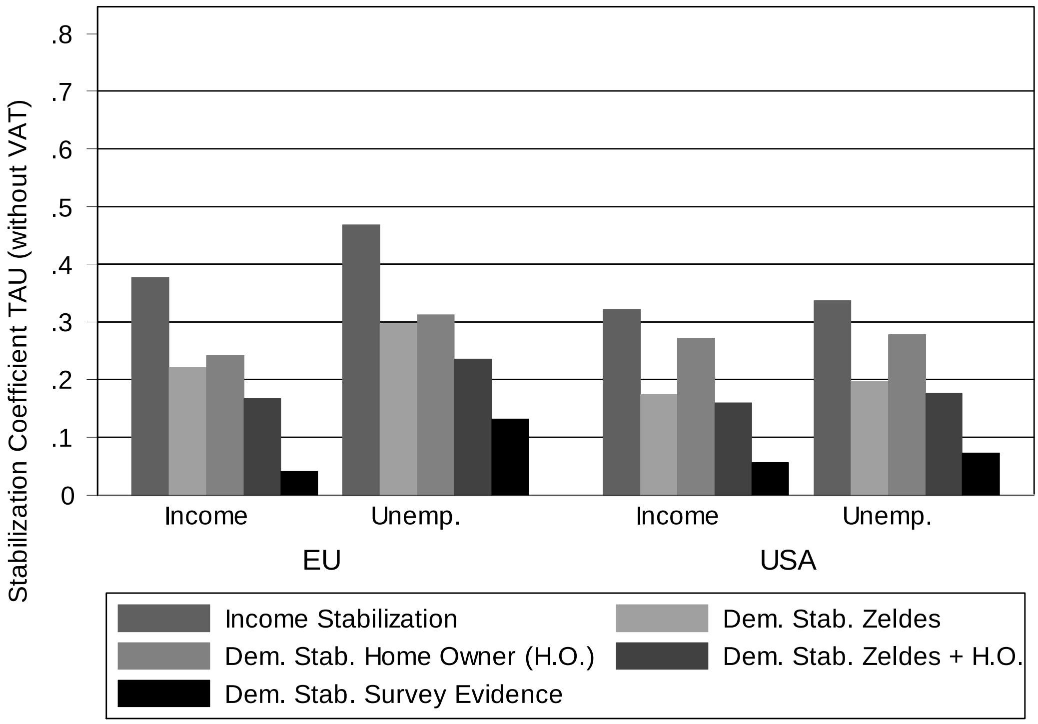
[16] As, according to the Zeldes criterion, liquidity constrained households are those households with low financial wealth and thus typically low income, one can expect that their share of income (IShare1) is lower than their share in the total population. In our data, this is true for all countries (see Table 4).

matic stabilizers will be more important for demand stabilization in these countries, at least if the Zeldes criterion is used for the identification of liquidity constrained households. A different picture emerges if home ownership is the determinant for liquidity constraints. It is remarkable that the share of households who own their homes is relatively high in Eastern and Southern European countries. This suggests a lower share of liquidity constrained households and thus a lower contribution of automatic stabilizers to demand stabilization. By definition, the third approach, which combines information on financial wealth and home ownership, yields lower shares of constrained households than each approach alone. Both criteria for liquidity constraints - insufficient financial wealth and non home-ownership (or mortgage payments) - have to be fulfilled. However, as stated above lowest shares of liquidity constrained households are estimated when relying on direct survey evidence.

Finally, focusing on results for individual EU countries, there is large heterogeneity in demand stabilization across countries and, at least for some countries, across the different approaches for the identification of liquidity constraints. If financial wealth is the determinant for liquidity constraints, demand stabilization is highest in Hungary (46%) and the stabilization effect is above the EU average for Poland (30%) and Estonia (24%), although disposable income stabilization is below the EU average in these two countries. Relatively low values for automatic stabilization effects of the tax and transfer systems on demand are found in countries where households are relatively wealthy, so that liquidity constraints are less important. These include Sweden, with a stabilization coefficient of 20%, and in particular Germany (14%) and France (11%). However, as indicated by the relatively low share of liquidity constrained households in Eastern and Southern European countries according to the homeowner approach, automatic stabilization of demand is weaker in these countries if this approach is employed. In this case, automatic stabilization of demand is below the EU average in all countries of Eastern and Southern Europe, whereas demand stabilization in countries of Continental Europe, in the Nordic countries as well as in Ireland and in the UK is above the EU average.[17]

[17] Note that this holds for the income shock and, with the exception of Ireland, also for the unemployment shock.

Figure 3: Income and demand stabilization



Source: Own calculations based on EUROMOD and TAXSIM

4.4 Extension: Employer social insurance contributions and consumption taxes

One limitation of our analysis is that we neglect various taxes which are certainly relevant as automatic stabilizers and which differ in their relevance across countries. In this section, we extend our analysis to employer social insurance contributions and consumption taxes, which include value added, excise and sales taxes. We did not include these taxes in our baseline simulations because they raise specific conceptual issues.

4.4.1 Employer contributions

Consider first the case of employer social insurance contributions (or payroll taxes). Including them requires us to make an assumption on their incidence. So far, we have assumed that all taxes and transfers are borne by employees, so that a smoothing of shocks through the tax and transfer system actually benefits the employees. We will make the same assumption for employer social insurance contributions. This implies that, in a hypothetical situation without taxes, social insurance contributions and transfers, the income of household i would be gross income, which we define as follows:

$$Y_i^G = Y_i^M + S_i^{ER} \tag{9}$$

where Y_i^G is gross income, Y_i^M market income and S_i^{ER} employer social insurance contributions. We now consider a shock to gross income and ask which part of this shock is absorbed by the tax and transfer system. The income stabilization coefficient is now given by

$$\tau^I = \sum_f \tau_f^I = \frac{\sum_i \left(\Delta T_i + \Delta S_i + \Delta S_i^{ER} - \Delta B_i\right)}{\sum_i \Delta Y_i^G}.$$

How does the inclusion of employer social insurance contributions affect the stabilization effects? For the EU, the income stabilization coefficient is now equal to 48% for the income shock and 56% for the unemployment shock. For the US, we find respective values of 36% for the income shock and 39% for the unemployment shock. The results by country are given in Table 5 in the Appendix.[18] In countries such as Italy or Sweden, employer social insurance contributions make up a large proportion of total contributions leading to a substantial increase in stabilization through SIC in these countries. However, the results cannot be compared directly to those of the preceding section because the stabilization effect is now measured in per cent of a shock to Y_i^G, not Y_i^M.

4.4.2 Consumption taxes

How can consumption taxes be integrated into this framework? In order to make the results comparable to our baseline simulations, we return to the case where we exclude employer social insurance contributions from the analysis. The data we use includes no information on consumption expenditures of households, so that the consumption taxes actually paid cannot be calculated directly. Instead, we use

[18] Note that, when comparing these results to those of our baseline simulation, it has to be taken into account that we now consider a shock on Y_i^G, not on Y_i^M. This explains, for instance, why the measured stabilization coefficient of income taxes is now lower.

implicit tax rates (ITR) on consumption taken from European Commission (2009b) for European countries and McIntyre et al. (2003) for the US. The ITR is a measure for the effective tax burden which includes several consumption taxes such as VAT or sales taxes, energy and other excise taxes. This implicit tax rate relates consumption taxes paid to overall consumption. Given this, we can write the budget constraint of household i as

$$Y_i^M = C_i(1 + t^C) + A_i + T_i + S_i - B_i$$

where t^C is the implicit consumption tax rate, $T^C = t^C C$ the consumption tax payments, and A_i represents savings.

What is the role of the consumption tax for automatic stabilization? This depends on the reaction of consumption to the income shock. Our analysis assumes that only liquidity constrained households will adjust their consumption to an income shock. An automatic stabilization effect of consumption taxes can only occur for these households, where changes in disposable income are equal to changes in consumption and, hence, consumption tax payments. Given this, we focus on demand, rather than income stabilization through the consumption tax. The demand stabilization coefficient can now be written as:

$$\tau^{Ct} = \frac{\sum_h \left(\Delta T_h^C + \Delta T_h + \Delta S_h - \Delta B_h\right)}{\sum_i \Delta Y_i^M} \tag{10}$$

where h is the index for the liquidity constrained households.

The results are given in Table 6 in the Appendix: Demand stabilization through the consumption tax (according to the financial wealth criterion) is higher in the EU than in the US. Within the EU, we find highest stabilization coefficients in Eastern European countries which can again be explained by the high proportion of liquidity constrained households and a relatively higher share of direct taxes.

5 Discussion of the results

In this section, we discuss a number of possible objections to and questions raised by our analysis. These include the relation of our results to widely used macro indicators of automatic stabilizers, the role of other taxes, the correlation between automatic stabilizers and other macro variables like e.g. openness and, finally, the correlations between discretionary fiscal stimulus programs and automatic stabilizers as well as openness.

5.1 Stabilization coefficients and simple macro indicators

One could argue that macro measures like e.g. the tax revenue to GDP ratio reveal sufficient information on the magnitude of automatic stabilizers in the different countries. For instance, the IMF (2009) has recently used aggregate tax to GDP ratios as proxies for the size of automatic stabilizers in G-20 countries. The upper panel of Figure 4 depicts the relation between the ratio of average revenue 2006-2010 to GDP and the income stabilization coefficient for the proportional income shock.[19] With a correlation of 0.58, one can conclude that government size is indeed a good predictor for the amount of automatic stabilization. The picture changes, however, if stabilization of aggregate household demand is considered, i.e. if we account for liquidity constraints.[20] As shown in Figure 4 (lower panel), with a coefficient of 0.26 government size and stabilization of aggregate household demand are only weakly correlated.[21]

These simple correlations suggest that macro indicators like tax revenue to GDP ratios are useful indicators for the stabilization effect of the tax and transfer system on disposable income but can be misleading as indicators of the stabilization effect on household demand. The reason is that the latter depends on the presence of liquidity constraints. The income share of liquidity constrained households, however, is negatively correlated with the size of government. In our analysis, we find a correlation of -0.25 (see also Figure 7 in the Appendix).

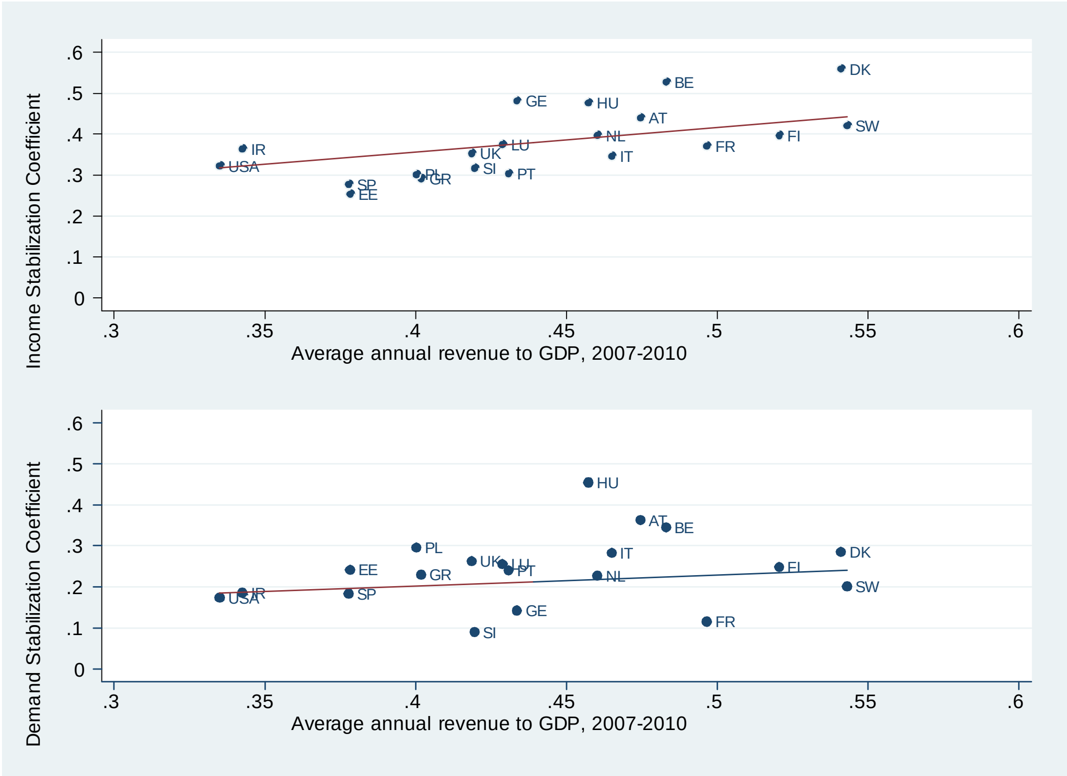
Another interesting point arises from Figure 4 when making vertical comparisons between similar countries. For instance, Denmark and Sweden, and - to some extent - Belgium and France have similar levels of revenue to GDP ratios. However, the stabilization is higher in Denmark and Belgium. In both countries, the importance of the (progressive) income tax is higher, whereas Sweden and France rely more on proportional social insurance contributions. Therefore, not only the size but also the structure of the tax benefit system are important for its possibilities of automatic

[19] All figures and correlations in this section are population-weighted in order to control for different country sizes. However, results are similar to those without population-weighting. We also obtained similar results when using the government spending to GDP ratio instead of revenue as a measure of the size of the government.

[20] In this section, we always refer to the demand stabilization coefficient based on the Zeldes criterium.

[21] The respective correlations for the unemployment shock are 0.69 and 0.65.

Figure 4: Government size and income and demand stabilization coefficients



Source: Own calculations based on EUROMOD and TAXSIM, European Commission (2009a).

stabilization.

5.2 Automatic stabilizers and openness

It is a striking feature of our results that automatic stabilizers differ significantly within Europe. In particular, automatic stabilizers in Eastern and Southern European countries are much weaker than in the rest of Europe. One factor contributing to this is that government size is often positively correlated with per capita incomes, at least in Europe. The stabilization of disposable incomes will therefore be higher in high income countries, just as a side effect of a larger public sector.

But differences in automatic stabilizers across countries may also have other reasons. In particular, the effectiveness of demand stabilization as a way of stabilizing domestic output is smaller, the more open the economy. In very open economies, domestic output will depend heavily on export demand and higher demand by domestic households will partly lead to higher imports. Clearly, openness of the economy has a number of other implications for the tax and transfer system, including the view that more open economies need more insurance against shocks as argued, e.g., by Rodrik (1998). Figure 5 depicts the relationship between income stabilization coefficients and openness as measured by the ratio of exports plus imports over GDP. As graph 5 shows, it is not the case that more open economies have weaker automatic stabilizers, the correlation is even positive (0.57). Our results thus support the hypothesis of Rodrik (1998) that income stabilization is higher in more open economies. For the demand stabilization coefficient, we find a similar correlation.

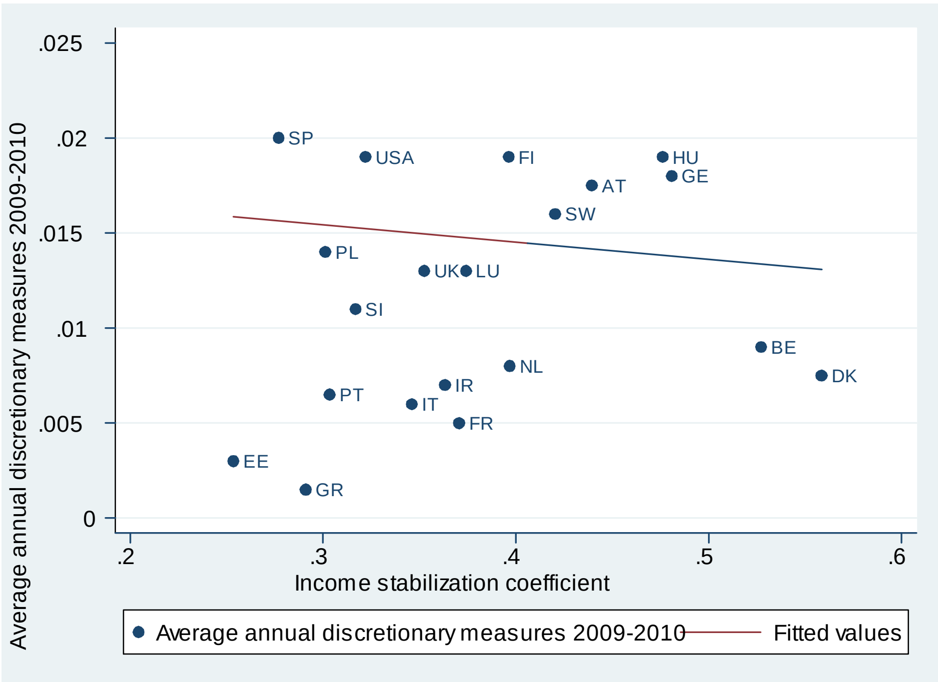
Figure 5: Income stabilization coefficient and openness of the economy

Source: Own calculations based on EUROMOD and TAXSIM, Heston et al. (2006).

5.3 Automatic stabilizers and discretionary fiscal policy

In the debate on fiscal policy responses to the crisis, some countries have been criticized for being reluctant to enact fiscal stimulus programs in order to stabilize demand, in particular Germany. One reaction to this criticism was to argue that automatic stabilizers in Germany are more important than in other countries, so that less discretionary action is required. This raises the general question of whether countries with weaker automatic stabilizers have taken more discretionary fiscal policy action. To shed some light on this issue, we relate the size of fiscal stimulus programs as measured by the IMF (2009) to stabilization coefficients.

Figure 6: Discretionary measures and income stabilization coefficient



Source: Own calculations based on EUROMOD and TAXSIM, European Commission (2009c), IMF (2009) and International Labour Office and International Institute for Labour Studies (2009).

Graph 6 shows that income stabilization coefficients are largely uncorrelated to the size of fiscal stimulus programs (-0.10). A larger negative correlation emerges when we consider demand stabilization coefficients (see Graph 8 in the Appendix). The weak correlation between automatic stabilizers and discretionary measures qualifies the view that countries with lower automatic stabilizers have engaged in more discretionary fiscal policy action (e.g., IMF (2009), p. 27).

A further concern in the policy debate put forward by supporters of large and coordinated discretionary measures is that countries could limit the size of their programs at the expense of countries with more generous fiscal policy responses. The idea behind this argument is that some countries might show a free-rider behavior and profit from spill-over effects of discretionary measures.[22] Therefore, we investigate the hypothesis if more open countries which are supposed to benefit more from spill-over effects indeed passed smaller stimulus programs. We find a negative correlation of -0.40 between the average annual discretionary measures in 2009 and 2010 and the coefficient for openness which supports the hypothesis.[23]

6 Conclusions

In this paper we have used the microsimulation models for the tax and transfer systems of 19 European countries (EUROMOD) and the US (TAXSIM) to investigate the extent to which automatic stabilizers cushion household disposable income and household demand in the event of macroeconomic shocks. Our baseline simulations focus on the personal income tax, employee social insurance contributions and benefits. We find that the amount of automatic stabilization depends strongly on the type of income shock. In the case of a proportional income shock, approximately 38% of the shock would be absorbed by automatic stabilizers in the EU. For the US, we find a value of 32%. Within the EU, there is considerable heterogeneity, and results range from a value of 25% for Estonia to 56% for Denmark. In general automatic stabilizers in Eastern and Southern European countries are considerably lower than in Continental and Northern European countries.

In the case of an unemployment shock, which affects households asymmetrically, the difference between the EU and the US is larger. EU automatic stabilizers absorb

[22] In that sense, a fiscal stimulus program can be seen as a positive externality since potential positive effects are not limited to the country of origin.

[23] Cf. Graph 9 in the Appendix. A multivariate regression of discretionary measures on the income stabilization coefficients, a measure of openness of the respective economies and their governments' budget balance in 2007 leads to significant coefficients of openness and the budget balance; whereas the relationship between discretionary fiscal policy and the amount of automatic stabilization remains insignificant. This result indicates that in addition to the argument above about openness, some governments have been constrained by weak budget positions in their decision making about discretionary fiscal policy. However, due to the very small sample size, this inference should be interpreted with caution.

47% of the shock whereas the stabilization effect in the US is only 34%. Again, there is considerable heterogeneity within the EU.

These results suggest that social transfers, in particular the rather generous systems of unemployment insurance in Europe, play a key role for the stabilization of disposable incomes and household demand and explain a large part of the difference in automatic stabilizers between Europe and the US. This is confirmed by the decomposition of stabilization effects in our analysis. In the case of the unemployment shocks, benefits alone absorb 19% of the shock in Europe compared to just 7% in the US, whereas the stabilizing effect of income taxes (taking into account State taxes in the US as well) is similar. To some extent, this qualifies the view that automatic stabilizers are larger in Europe than in the US. This is only true for countries like Belgium, Denmark, Finland, Germany or Sweden.

How does this cushioning of shocks translate into demand stabilization? Since demand stabilization can only be achieved for liquidity constrained households, the picture changes significantly. For the income shock, the cushioning effect of automatic stabilizers ranges from 4-24% in the EU. For the US, we find values between 6-27%, which is again rather similar. The values for the Euro area are close to those for the EU. For the unemployment shock, however, we find a large difference. In the EU, the stabilization effect ranges from 13-31% whereas the values for the US (7-28%) are close to those for the income shock.

A second key result of our analysis is that demand stabilization differs considerably from disposable income stabilization. This has important policy implications, also for discretionary fiscal policy. Focusing on income stabilization may lead policymakers to overestimate the effect of automatic stabilizers.

A third important result of our analysis is that automatic stabilizers are very heterogenous within Europe. Interestingly, Eastern and Southern European countries are characterized by rather low automatic stabilizers. This is surprising, at least from an insurance point of view because lower average income (and wealth) implies that households are more vulnerable to income shocks. One explanation for this finding could be that countries with lower per capita incomes tend to have smaller public sectors. From this perspective, weaker automatic stabilizers in Eastern and Southern European countries are a potentially unintended side effect of the lower demand for government activity including redistribution. Another potential explanation, the idea that more open economies have weaker automatic stabilizers because domestic demand spills over to other countries, seems to be inconsistent with the data, at least as far as the simple correlation between stabilization coefficients and trade to GDP ratios is concerned.

Finally, we have discussed the claim that countries with smaller automatic stabilizers have engaged in more discretionary fiscal policy action. According to our results, there is no correlation between fiscal stimulus programs of individual countries and stabilization coefficients. However, we find that more open countries and countries with higher budget deficits have passed smaller stimulus programs. All in all, our results suggest that policymakers did not take into account the forces of automatic stabilizers when designing active fiscal policy measures to tackle the current economic crisis.

These results have to be interpreted in the light of various limitations of our analysis. Firstly, the role of tax and transfer systems for stabilizing household demand, not just disposable income, is based on strong assumptions on the link between disposable income and household expenditures. Although we have used what we believe to be the best available methods for estimating liquidity constraints, considerable uncertainty remains as to whether these methods lead to an appropriate description of household behavior. Secondly, our analysis abstracts from automatic stabilization through other taxes, in particular corporate income taxes. Thirdly, we have abstracted from the role of labor supply or other behavioral adjustments for the impact of automatic stabilizers. We intend to pursue these issues in future research.

A Appendix:

A.1 Additional results

Table 2: Decomposition income scenario

	FEDTax	StateTax	SIC	BEN	TaxSicBen
AT	0.294	0.000	0.139	0.006	0.439
BE	0.382	0.000	0.131	0.014	0.527
DK	0.455	0.000	0.086	0.018	0.558
EE	0.228	0.000	0.021	0.004	0.253
FI	0.340	0.000	0.050	0.006	0.396
FR	0.153	0.000	0.181	0.036	0.370
GE	0.351	0.000	0.118	0.012	0.481
GR	0.203	0.000	0.088	0.000	0.291
HU	0.307	0.000	0.160	0.009	0.476
IR	0.310	0.000	0.039	0.014	0.363
IT	0.254	0.000	0.079	0.013	0.346
LU	0.265	0.000	0.097	0.012	0.374
NL	0.270	0.000	0.116	0.011	0.397
PL	0.168	0.000	0.118	0.015	0.301
PT	0.203	0.000	0.090	0.010	0.303
SI	0.289	0.000	0.031	0.028	0.317
SP	0.240	0.000	0.035	0.001	0.277
SW	0.368	0.000	0.040	0.012	0.420
UK	0.267	0.000	0.054	0.031	0.352
EU	0.260	0.000	0.100	0.017	0.378
EURO	0.263	0.000	0.108	0.015	0.385
USA	0.240	0.049	0.039	-0.006	0.322

Source: Own calculations based on EUROMOD and TAXSIM

Table 3: Decomposition unemployment scenario

	FEDTax	StateTax	SIC	BEN	TaxSicBen
AT	0.163	0.000	0.171	0.252	0.585
BE	0.240	0.000	0.123	0.249	0.612
DK	0.116	0.000	0.092	0.615	0.823
EE	0.173	0.000	0.023	0.036	0.233
FI	0.221	0.000	0.049	0.248	0.519
FR	0.075	0.000	0.190	0.303	0.568
GE	0.209	0.000	0.145	0.269	0.624
GR	0.093	0.000	0.150	0.079	0.322
HU	0.203	0.000	0.191	0.073	0.467
IR	0.178	0.000	0.036	0.173	0.387
IT	0.164	0.000	0.105	0.042	0.311
LU	0.127	0.000	0.080	0.387	0.593
NL	0.104	0.000	0.171	0.178	0.452
PL	0.134	0.000	0.166	0.030	0.329
PT	0.146	0.000	0.097	0.143	0.386
SI	0.152	0.000	0.221	0.073	0.431
SP	0.124	0.000	0.068	0.184	0.376
SW	0.199	0.000	0.027	0.452	0.678
UK	0.191	0.000	0.061	0.163	0.415
EU	0.156	0.000	0.124	0.188	0.469
EURO	0.150	0.000	0.133	0.202	0.485
USA	0.174	0.041	0.051	0.071	0.337

Source: Own calculations based on EUROMOD and TAXSIM

Table 4: Shares of liquidity constrained households

	Share1	Share2	Share3	Share4	IShare1	IShare2	IShare3	IShare4
AT	0.844	0.690	0.627	0.302	0.827	0.708	0.631	0.088
BE	0.702	0.637	0.492	0.228	0.633	0.761	0.529	0.039
DK	0.581	0.747	0.501	0.218	0.516	0.799	0.481	0.039
EE	0.975	0.229	0.223	0.264	0.955	0.267	0.254	0.028
FI	0.696	0.631	0.519	0.334	0.585	0.691	0.498	0.089
FR	0.365	0.673	0.393	0.340	0.296	0.752	0.367	0.120
GE	0.328	0.761	0.435	0.392	0.287	0.789	0.438	0.159
GR	0.845	0.347	0.314	0.318	0.808	0.419	0.366	0.053
HU	0.973	0.159	0.155	0.620	0.958	0.228	0.219	0.282
IR	0.663	0.602	0.473	0.396	0.538	0.654	0.464	0.091
IT	0.762	0.331	0.279	0.330	0.733	0.350	0.293	0.076
LU	0.708	0.639	0.537	0.210	0.692	0.785	0.625	0.066
NL	0.637	0.765	0.579	0.240	0.570	0.759	0.529	0.058
PL	0.985	0.475	0.471	0.560	0.982	0.460	0.454	0.192
PT	0.861	0.461	0.433	0.215	0.800	0.489	0.452	0.023
SI	0.661	0.103	0.092	0.440	0.522	0.080	0.064	0.108
SP	0.709	0.180	0.161	0.306	0.681	0.151	0.136	0.066
SW	0.528	0.915	0.609	0.201	0.472	0.960	0.591	0.062
UK	0.793	0.725	0.648	0.263	0.735	0.794	0.667	0.062
EU	0.641	0.562	0.418	0.346	0.596	0.597	0.417	0.106
EURO	0.561	0.543	0.369	0.333	0.513	0.575	0.364	0.101
USA	0.743	0.796	0.632	0.269	0.486	0.765	0.434	0.168

Source: Own calculations based on EUROMOD and TAXSIM

Table 5: Results including employer SIC

	$\tau_{Tax}IS$	$\tau_{SIC}IS$	$\tau_{Ben}IS$	$\tau_{TB}IS$	$\tau_{Tax}US$	$\tau_{SIC}US$	$\tau_{Ben}US$	$\tau_{TB}US$
AT	0.253	0.258	0.006	0.517	0.136	0.304	0.211	0.652
BE	0.317	0.278	0.012	0.607	0.200	0.272	0.207	0.678
DK	0.447	0.101	0.017	0.566	0.115	0.103	0.607	0.826
EE	0.174	0.257	0.003	0.433	0.128	0.276	0.027	0.431
FI	0.281	0.215	0.005	0.501	0.181	0.221	0.203	0.606
FR	0.092	0.508	0.022	0.622	0.047	0.498	0.188	0.732
GE	0.314	0.211	0.010	0.535	0.182	0.254	0.235	0.672
GR	0.187	0.157	0.000	0.345	0.084	0.235	0.071	0.390
HU	0.243	0.335	0.007	0.585	0.160	0.361	0.058	0.579
IR	0.295	0.087	0.013	0.395	0.171	0.077	0.165	0.413
IT	0.210	0.238	0.011	0.458	0.132	0.280	0.034	0.446
LU	0.243	0.173	0.011	0.427	0.118	0.144	0.360	0.622
NL	0.267	0.124	0.011	0.402	0.093	0.255	0.160	0.508
PL	0.148	0.223	0.013	0.384	0.115	0.283	0.025	0.423
PT	0.170	0.239	0.009	0.417	0.124	0.232	0.122	0.478
SI	0.287	0.038	0.028	0.321	0.133	0.319	0.064	0.503
SP	0.205	0.175	0.001	0.382	0.099	0.256	0.147	0.502
SW	0.286	0.254	0.010	0.549	0.152	0.258	0.345	0.754
UK	0.246	0.128	0.029	0.403	0.179	0.122	0.152	0.453
EU	0.223	0.241	0.014	0.478	0.132	0.275	0.153	0.560
EURO	0.222	0.265	0.011	0.497	0.123	0.305	0.158	0.587
USA	0.289	0.077	-0.006	0.360	0.215	0.102	0.071	0.388

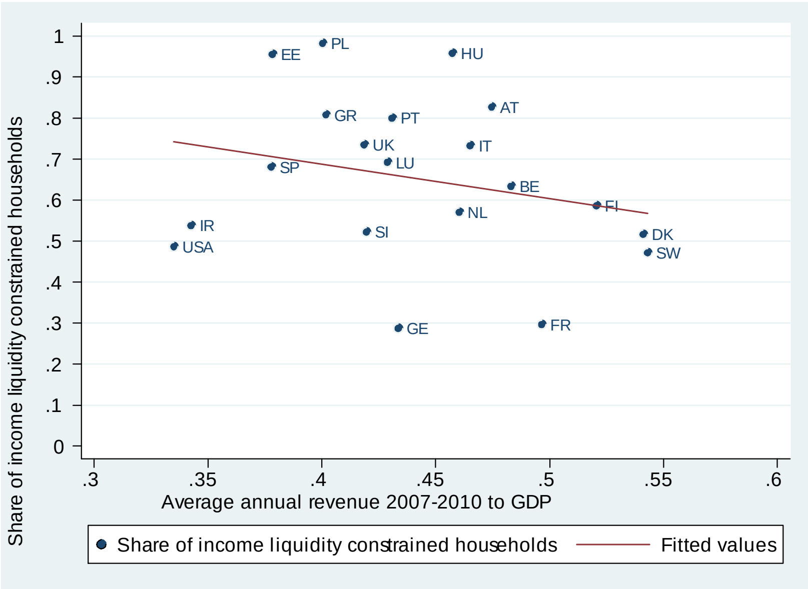
Source: Own calculations based on EUROMOD and TAXSIM

Table 6: Results including Consumption Taxes

	$\tau_1^{CT} IS$	$\tau_1^{C\ incl.CT} IS$	$\tau_1^{CT} US$	$\tau_1^{C\ incl.CT} US$
AT	0.103	0.466	0.072	0.570
BE	0.061	0.406	0.043	0.485
DK	0.077	0.363	0.008	0.601
EE	0.158	0.400	0.160	0.386
FI	0.095	0.344	0.069	0.421
FR	0.037	0.152	0.007	0.266
GE	0.027	0.169	0.005	0.257
GR	0.090	0.319	0.083	0.346
HU	0.133	0.588	0.135	0.583
IR	0.083	0.268	0.072	0.315
IT	0.078	0.360	0.099	0.332
LU	0.104	0.360	0.070	0.510
NL	0.083	0.310	0.073	0.361
PL	0.134	0.430	0.129	0.453
PT	0.111	0.351	0.089	0.401
SI	0.041	0.131	0.062	0.289
SP	0.078	0.262	0.068	0.333
SW	0.072	0.273	0.014	0.424
UK	0.090	0.353	0.084	0.434
EU	0.072	0.293	0.060	0.357
EURO	0.059	0.253	0.046	0.316
USA	0.020	0.194	0.025	0.222

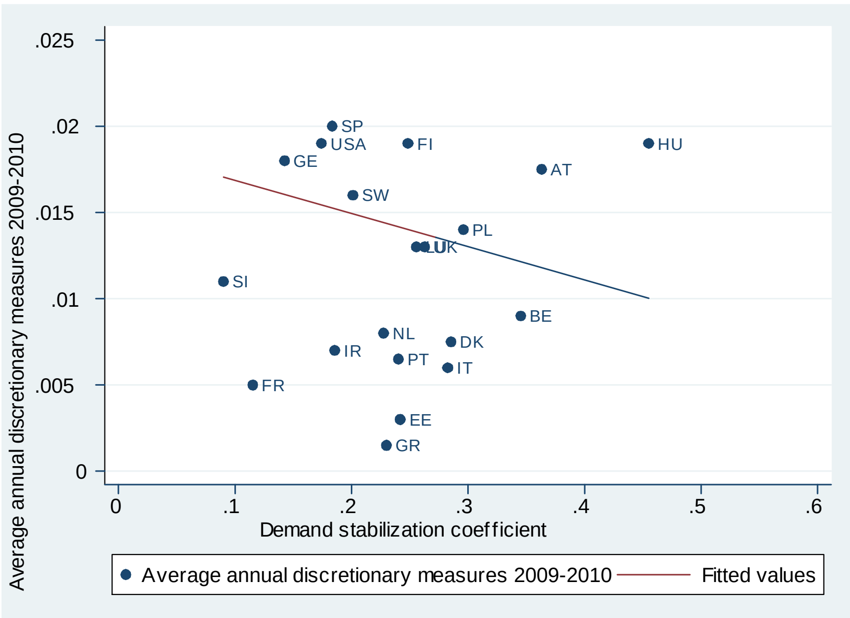
Source: Own calculations based on EUROMOD and TAXSIM

Figure 7: Income share of liquidity constrained households and government revenue



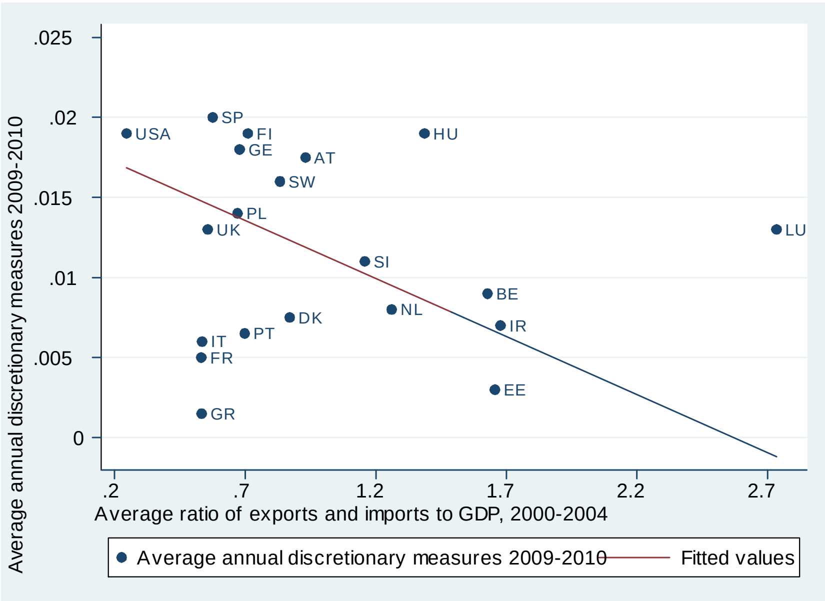
Source: Own calculations based on EUROMOD and TAXSIM, European Commission (2009a).

Figure 8: Discretionary measures and demand stabilization



Source: Own calculations based on EUROMOD and TAXSIM, European Commission (2009c), IMF (2009).

Figure 9: Discretionary measures and openness of the economy



Source: Heston et al. (2006), European Commission (2009c), International Labour Office and International Institute for Labour Studies (2009) and IMF (2009).

A.2 Reweighting procedure for increasing unemployment

In order to increase the unemployment rate while keeping the aggregate counts of other key individual and household characteristics constant, we follow the approach taken by Immvervoll et al. (2006). The increase of the unemployment rates is modeled through reweighting of our samples while controlling for several individual and household characteristics that determine the risk of becoming unemployed.

We follow Immvervoll et al. (2006) and define the unemployed as people aged 19–59 declaring themselves to be out of work and looking for a job. The within-database national 'unemployment rate' is calculated as the ratio of these unemployed to those in the labor force, defined as the unemployed plus people aged 19–59 who are (self)employed. The increased total number of unemployed people is calculated such that total household income decreases by 5% within each country.

In EUROMOD, the baseline household weights supplied with the national databases have been calculated to adjust for sample design and/or differential non-response (see Sutherland (2001) for details). Weights are then recalculated using the existing weights as a starting point, but (a) using the increased (decreased) number of unemployed (employed) people as the control totals for them, and (b) also controlling for individual demographic and household composition variables using the existing grossed-up totals for these categories as control totals. The specific variables used as controls are:

- employment status
- age (0–18, 19–24, 25–49, 50–59, 60+)
- gender
- marital status and household size
- education
- region

This method implies that the households without any unemployed people that are similar to households with unemployed people (according to the above variables) will have their weights reduced. In other words, these are the households who are 'made unemployed' in our exercise.

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