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ABSTRACT

Social Protection as an Automatic Stabilizer*

This paper analyzes the effectiveness of social protection systems in Europe and the US to provide (income) insurance against macro level shocks in terms of automatic stabilizers. We find that automatic stabilizers absorb 38% of a proportional income shock and 47% of an idiosyncratic unemployment shock in Europe, compared to 32% and 34% in the US. There is large heterogeneity within Europe with stabilization being much lower in Eastern and Southern than in Central and Northern Europe. Our 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 explain a large part of the difference in automatic stabilizers between Europe and the US.

JEL Classification: E32, E63, H2, H31

Keywords: automatic stabilization, economic crisis, taxes and benefits

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1 Introduction

Throughout Europe, the current economic and financial crisis has had a severe impact on incomes and employment. In 2009 worldwide output fell by 0.9%, with a drop by 2.4% in the United States and 4.2% in the EU[1]. Both the magnitude of this economic contraction as well as its effects on labor markets, disposable household incomes and private consumption have been attenuated considerably by the work of automatic stabilization. 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)). During the current crisis, the tax and benefit system has been acting as an automatic stabilizer on both the revenue side as well as the expenditure side of the general government budget and the social security system in particular.

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.

In this policy paper, we report the results from a comprehensive comparison of the magnitude and composition of automatic stabilization between the US and Europe based on micro data estimates and discuss the implications for social policy.[2] In Dolls, Fuest and Peichl (2010a, 2010b), 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

[1] Data from the European Commission's Spring 2010 Economic Forecast.

[2] The results used in this paper are based on Dolls et al. (2010a, 2010b).

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.

2 Theoretical framework

Economic stabilization is primarily associated with the ability of taxes and transfers to stabilize income and in consequence consumption automatically in the face of economic downturns. The stabilizing character of the tax and transfer system relies on a simple mechanism: In the presence of a negative shock to income, taxes should react more than proportionately so that disposable income is affected less than proportionally by the downturn. Several components of government budgets are impacted by the macroeconomic situation in ways that operate to smooth the business cycle, with progressive income taxes and unemployment benefits being the most prominent example. Automatic stabilization might have effects not only on disposable income but also on GDP itself. If in a recession fewer taxes are collected and more transfers are paid, this should support private incomes and damp adverse movements in aggregate demand. We can expect this stabilizing property to be stronger if the tax system is more progressive (van den Noord, 2000).

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. However, in this chapter, we will concentrate on the first factor, the stabilization of disposable income after shocks on gross income.

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)). Based on this idea, in Dolls et al. (2010a), we define the "*income stabilization coefficient*" which 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 un-

employment benefits.[3] 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.

3 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.[4] The models can simulate most direct taxes and 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.

4 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

[3]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).

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

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.[5]

The increase of the unemployment rate is modeled through reweighting of our samples.[6] 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. The implicit assumption behind this approach is that the socio-demographic characteristics of the unemployed remain constant.[7]

5 Empirical Results

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 stabi-

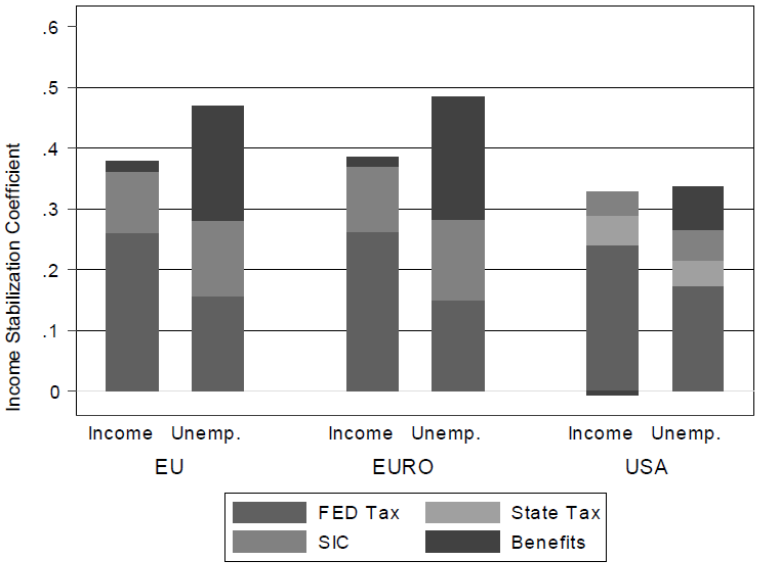
[5]Our scenarios can be seen as a conservative estimate of the expected impact of the current crisis (see Reinhart and Rogoff (2009) for effects of previous crises). The (qualitative) results are robust with respect to different sizes of the shocks. The results for the unemployment shock do not change 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 of this chapter. 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.

[6]For the reweighting procedure, we follow the approach of Immervoll 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.

[7]Cf. Deville and Saerndal (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)).

lizers in the EU (and Euroland). For the US, we find a slightly lower value of 32%. This difference of just six percentage points is surprising in so far as automatic stabilizers in Europe are usually considered to be drastically higher than in the US.[8] 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 – US vs. EU



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 A2 in the Appendix shows that benefits alone absorb 19% of the shock in Europe compared to just 7% in the US.

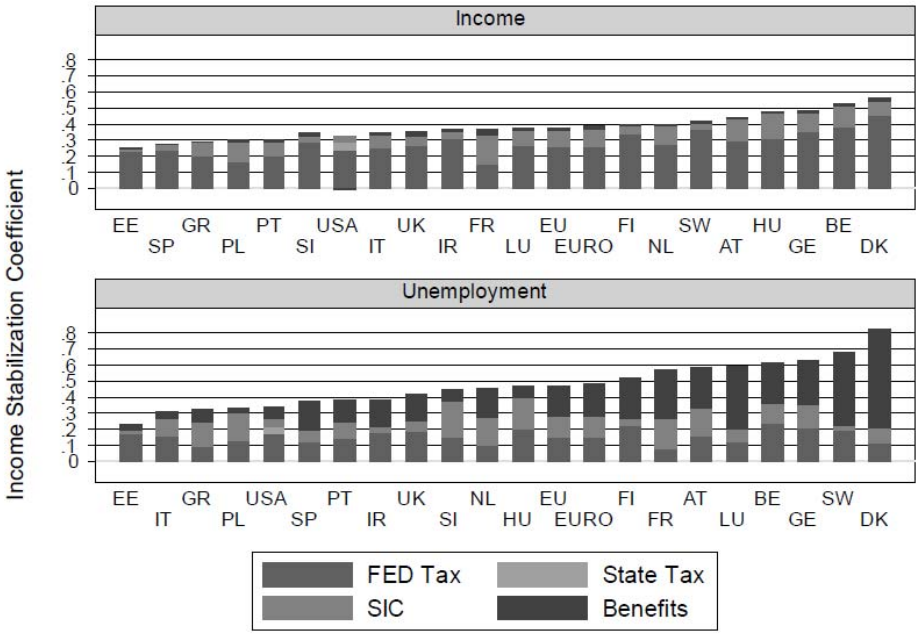
Cross-country differences

The results for the stabilization coefficient vary considerably across countries, as can be seen from Figure 2 (and Tables A1 and A2 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,

[8]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).

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 for both scenarios – Country Ranking



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.

Stabilization and Income Distribution

Table A3 shows that in case of the proportional income shock, the stabilization coefficients are an increasing function of the income quantiles. This result is due to higher changes between market and disposable income for high income groups. It is worth mentioning that even a proportional tax would yield increasing coefficients for higher quantiles, i.e. progressivity of the income tax is not required for this result.

In contrast to the increasing stabilization by income quantile for the income shock, stabilization results for the unemployment shock follow a somewhat different pattern as demonstrated in Table A4. Here, with the exception of some Eastern and Southern European countries, we find high stabilization also for the lowest income groups. As the unemployment shock is modeled through reweighting of our sample taking into account individual characteristics of the unemployed, a large part of the newly unemployed comes from lower income quantiles. The fact that tax and transfer systems in countries such as Estonia, Greece, Italy, Poland, Portugal, Slovenia or Spain provide only weak stabilization for low income groups can be explained by rather low unemployment benefits in these countries.

What are the distributional consequences of the two macro shocks described above? Table A5 shows the percentage changes in the Gini coefficient and in the headcount ratios for being poor or rich, all based on equivalent disposable income.[9]

While the proportional income shock (IS) leads to a reduction of the Gini coefficient in all countries, the asymmetric unemployment shock (US) increases inequality in 15 out of 19 countries. In the latter case, we find a reduction of the Gini coefficient only in Denmark, Luxembourg, Portugal and Sweden. In the case of the income shock, the largest reductions of the Gini coefficient occur in Belgium, Denmark, Sweden and the UK (all >2%), the smallest ones in Greece and Slovenia (each <0.5%). In the case of the unemployment shock, distributional implications crucially depend on which income groups are hardest hit by unemployment and income losses. If low income groups are the first who loose their jobs during a recession, one can expect an increase in inequality. However, if also middle or upper income groups are affected which seems to be relevant especially in long-lasting recessions such as the current one, distributional implications become more ambiguous. This ambiguity in terms of distributional effects of an asymmetric shock is reflected in the positive and negative signs of the Gini change.

Comparing the headcount ratios for both shock scenarios, we can conclude that, not surprisingly, in case of the unemployment shock richness is decreasing less than in the case of the proportional income shock.[10] With the exception of Slovenia, the percentage reduction of rich people is substantially higher in the latter shock scenario. However, no such clear conclusion can be drawn considering the percentage change in poverty. In

[9] To account for differences in family size and composition, we adjust disposable income using the OECD modified equivalence scale which assigns a value of 1 to the household head, of 0.5 to each additional adult member, and of 0.3 to each child.

[10]The reweighting approach used for modeling an increase in unemployment is implicitly based on the assumption that the socio-demographic characteristics of the unemployed remain constant.

countries such as Ireland or the United Kingdom, the asymmetric unemployment shock leads to a much stronger increase in the headcount for the poor than the income shock. However, the opposite is true for countries such as Greece, Luxembourg or the Netherlands. Here, distributional implications depend again crucially on which income groups are actually the first who become unemployed in a recession.

"Explaining" the cross-country differences

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). We do not find that more open economies, as measured by the ratio of exports plus imports over GDP, 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.

We have also analyzed the claim that countries with smaller automatic stabilizers have engaged in more discretionary fiscal policy action. 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 point to the fact 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 compensate for this. According to our results, there is no correlation between fiscal stimulus programs of individual countries and stabilization coefficients.

A further concern in the policy debate put forward by supporters of large and coordinated discretionary measures was that countries could limit the size of their programs at the expense of countries with more generous fiscal policy responses. The central factor behind this hypothesis is the degree of openness of an economy. The more open an economy is, i.e. the stronger the economic ties with other countries are, the more likely it is that a country gains from other countries' fiscal stimulus packages or, conversely, the more likely it is that own fiscal stimulus measures spill over to other countries. Hence, the idea behind this argument is that some countries might show a free-rider

behavior and profit from spill-over effects of discretionary measures.[11] However, we find that more open countries have passed smaller stimulus programs. The same result holds for countries with higher budget deficits or debt levels. 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.

6 Conclusions and policy implications

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

Our results suggest that social protection systems, in particular the rather generous systems of unemployment insurance in Europe, play a key role for the stabilization of disposable incomes 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.

Another important result of our analysis is that automatic stabilizers are very heterogeneous 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

[11] 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.

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.

Furthermore, our results suggest that countries with stronger automatic stabilizers have been relatively resilient during the crisis, while those with weak stabilizers have experienced major economic contractions and increases in unemployment. Note however, that correlation does not imply causation. Hence, it is unclear whether strong automatic stabilizers helped the northern EU countries coping with the crisis, or if it was the underlying strength of these economies that allowed them to afford generous unemployment benefits, social welfare payments and the rest. Nonetheless, cutting unemployment benefits in countries of southern Europe, as recently suggested by the IMF, does not seem to be the appropriate measure to reach a balanced budget. Automatic stabilizers have the major advantage of providing income replacement immediately, i.e. when unemployment starts to rise and incomes fall. While means-tested income support is generally available as a basic social security net in most EU Member States, unemployment insurance systems are more exclusive as they do not protect all types of workers equally. As the extent of unemployment risks and the 'quality' of social protection provided to different socio-economic groups does not coincide, one can argue that in general those most affected are the least protected. Here, a discretionary expansion of benefit generosity or easing access to benefits can play a substantial role in reaction to crises. However, discretionary changes to benefit systems or the creation of new benefits may take some time and may be more difficult to administer and deliver, in particular if new groups are to be integrated or new benefits created – or if fiscal restrictions are considered.

Our results have to be interpreted in the light of various limitations of our analysis. Firstly, our analysis abstracts from automatic stabilization through other taxes, in particular corporate income taxes. Secondly, our analysis is purely positive and does not allow concluding that automatic stabilizers should be higher or lower. Increasing taxes and transfers would lead to higher automatic stabilizers, but economic distortions would also increase. Finally, 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.

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Appendix

Table A1: Decomposition income scenario

	FEDTax	StateTax	SIC	BEN	TaxSicBen
Austria	0.294	0.000	0.139	0.006	0.439
Belgium	0.382	0.000	0.131	0.014	0.527
Denmark	0.455	0.000	0.086	0.018	0.558
Estonia	0.228	0.000	0.021	0.004	0.253
Finland	0.340	0.000	0.050	0.006	0.396
France	0.153	0.000	0.181	0.036	0.370
Germany	0.351	0.000	0.118	0.012	0.481
Greece	0.203	0.000	0.088	0.000	0.291
Hungary	0.307	0.000	0.160	0.009	0.476
Ireland	0.310	0.000	0.039	0.014	0.363
Italy	0.254	0.000	0.079	0.013	0.346
Luxem-bourg	0.265	0.000	0.097	0.012	0.374
Nether-lands	0.270	0.000	0.116	0.011	0.397
Poland	0.168	0.000	0.118	0.015	0.301
Portugal	0.203	0.000	0.090	0.010	0.303
Slovenia	0.289	0.000	0.031	0.028	0.317
Spain	0.240	0.000	0.035	0.001	0.277
Sweden	0.368	0.000	0.040	0.012	0.420
United Kingdom	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 A2: Decomposition unemployment scenario

	FEDTax	StateTax	SIC	BEN	TaxSicBen
Austria	0.163	0.000	0.171	0.252	0.585
Belgium	0.240	0.000	0.123	0.249	0.612
Denmark	0.116	0.000	0.092	0.615	0.823
Estonia	0.173	0.000	0.023	0.036	0.233
Finland	0.221	0.000	0.049	0.248	0.519
France	0.075	0.000	0.190	0.303	0.568
Germany	0.209	0.000	0.145	0.269	0.624
Greece	0.093	0.000	0.150	0.079	0.322
Hungary	0.203	0.000	0.191	0.073	0.467
Ireland	0.178	0.000	0.036	0.173	0.387
Italy	0.164	0.000	0.105	0.042	0.311
Luxem-bourg	0.127	0.000	0.080	0.387	0.593
Nether-lands	0.104	0.000	0.171	0.178	0.452
Poland	0.134	0.000	0.166	0.030	0.329
Portugal	0.146	0.000	0.097	0.143	0.386
Slovenia	0.152	0.000	0.221	0.073	0.431
Spain	0.124	0.000	0.068	0.184	0.376
Sweden	0.199	0.000	0.027	0.452	0.678
United Kingdom	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 A3: Stabilization of income groups - Proportional Income Shock

	TAU	Q1	Q2	Q3	Q4	Q5
Austria	0.439	0.023	0.045	0.072	0.107	0.192
Belgium	0.527	0.022	0.051	0.082	0.128	0.244
Denmark	0.558	0.017	0.046	0.088	0.135	0.273
Estonia	0.253	0.010	0.019	0.036	0.063	0.126
Finland	0.396	0.010	0.031	0.063	0.099	0.192
France	0.370	0.032	0.036	0.053	0.079	0.171
Germany	0.481	0.019	0.045	0.072	0.116	0.228
Greece	0.291	0.004	0.015	0.033	0.063	0.176
Hungary	0.476	0.029	0.041	0.056	0.097	0.254
Ireland	0.363	0.009	0.026	0.048	0.084	0.197
Italy	0.346	0.010	0.035	0.051	0.077	0.173
Luxem-bourg	0.374	0.019	0.022	0.042	0.082	0.208
Nether-lands	0.397	0.020	0.040	0.062	0.093	0.182
Poland	0.301	0.017	0.032	0.047	0.060	0.145
Portugal	0.303	0.012	0.013	0.029	0.055	0.194
Slovenia	0.317	0.022	0.010	0.008	0.037	0.240
Spain	0.277	0.006	0.020	0.036	0.062	0.153
Sweden	0.420	0.022	0.041	0.066	0.096	0.196
United Kingdom	0.352	0.010	0.034	0.047	0.079	0.182

Source: Own calculations based on EUROMOD.

Table A4: Stabilization of income groups - Unemployment Shock

	TAU	Q1	Q2	Q3	Q4	Q5
Austria	0.585	0.111	0.094	0.069	0.130	0.181
Belgium	0.612	0.143	0.087	0.067	0.101	0.215
Denmark	0.823	0.095	0.189	0.166	0.196	0.177
Estonia	0.233	0.062	0.019	0.019	0.041	0.091
Finland	0.519	0.118	0.057	0.074	0.093	0.176
France	0.568	0.102	0.102	0.088	0.092	0.185
Germany	0.624	0.144	0.078	0.090	0.118	0.193
Greece	0.322	0.016	0.031	0.040	0.071	0.164
Hungary	0.467	0.091	0.045	0.048	0.071	0.212
Ireland	0.387	0.101	0.049	0.044	0.061	0.132
Italy	0.311	0.011	0.021	0.047	0.081	0.151
Luxem-bourg	0.593	0.148	0.177	0.056	0.070	0.142
Nether-lands	0.452	0.123	0.048	0.054	0.088	0.140
Poland	0.329	0.031	0.035	0.048	0.066	0.150
Portugal	0.386	0.014	0.005	0.040	0.075	0.252
Slovenia	0.431	0.045	0.038	0.056	0.083	0.210
Spain	0.376	0.038	0.049	0.065	0.076	0.148
Sweden	0.678	0.160	0.109	0.109	0.110	0.190
United Kingdom	0.415	0.142	0.034	0.030	0.060	0.150

Source: Own calculations based on EUROMOD.

Table A5: Effect of shocks on income distribution

	Income shock			Unemployment shock		
	Gini	Poor	Rich	Gini	Poor	Rich
Austria	-1.297	4.760	-12.088	0.304	4.421	-3.619
Belgium	-2.270	2.673	-16.241	0.126	3.869	-4.322
Denmark	-2.064	3.838	-18.903	-0.218	1.176	-5.054
Estonia	-1.622	4.529	-11.508	0.914	6.542	-2.989
Finland	-1.806	5.622	-13.981	0.347	7.104	-3.428
France	-1.422	7.458	-9.947	0.210	4.083	-2.409
Germany	-1.489	4.141	-12.982	0.445	6.245	-3.469
Greece	-0.338	7.288	-11.355	0.166	2.509	-2.820
Hungary	-0.604	5.701	-9.241	0.518	5.612	-3.861
Ireland	-1.335	3.701	-12.591	1.154	10.295	-7.285
Italy	-0.735	4.910	-5.857	0.507	3.567	-2.234
Luxem-bourg	-1.233	9.994	-14.276	-0.225	1.335	-3.843
Nether-lands	-1.232	10.629	-16.256	0.652	7.892	-3.985
Poland	-0.923	6.749	-9.692	0.281	3.757	-2.639
Portugal	-0.611	4.693	-6.055	-0.709	1.528	-2.667
Slovenia	-0.318	0.273	-1.290	0.327	4.354	-2.931
Spain	-0.693	6.343	-13.806	0.590	3.545	-3.003
Sweden	-2.050	4.215	-15.446	-0.154	3.444	-3.774
United Kingdom	-2.219	3.753	-13.001	1.074	7.895	-2.873

Source: Own calculations based on EUROMOD.